INTERIM COMMITTEE FOR COORDINATION OF INVESTIGATIONS OF THE LOWER MEKONG BASIN

WATER BALANCE STUDY PHASE 3 REPORT

INVESTIGATION OF DRY SEASON FLOWS

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LOWER MEKONG BASIN

WATER BALANCE STUDY

PHASE III

Investigation of dry season flows

This report has been prepared by
the INSTITUTE OF HYDROLOGY
under assignment by
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The views expressed in this report
are not necessarily those of the
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SUMMARY

This report is concerned with several aspects of the water resources of the Lower Mekong Basin. The river gaugings and rating equations are reviewed at ten mainstream gauging stations. An assessment of the quality of daily flow data at these ten sites is provided. One station, Pakse, in Laos has flow data of excellent quality. Suitable techniques for quantifying the dry season flow regime of the Mekong and its tributaries have been identified. Benchmark flow statistics describing the current dry season flow regime of the Mekong and its tributaries have been calculated. A preliminary method for estimating dry season flow characteristics at sites with no gauging stations, based on catchment area, annual average rainfall and soil type is provided. Changes in the dry season flow regime have been identified on all tributaries with large upstream reservoirs; dry season flows have been increased at the expense of wet season flows. Similar, but smaller, changes in the dry season flows of the Mekong below the Nam Ngum confluence have been noticed. In terms of annual rainfall, there has been no significant climate fluctuation in the basin. There is insufficient evidence at present to identify changes due to land use change. However reductions in average flows have been identified on some catchments which have irrigation development upstream. A simple technique to monitor the dry season flows in the future and assist with the detection of change has been provided and tested on known changes in the past. A time series model has been used to extend the flow record at Kratie using observed daily flow data for Pakse. A simple regression model has been developed to explain the flows in Tonle Sap in terms of the discharge at Kratie and the storage in the Great Lake. Synthetic flows generated using the model have been used to give indicative estimates of the flows into the delta. Computer software has been provided to update this study when more data becomes available in the future, and to include additional stations in the analysis. A computer program has been developed to estimate areal monthly and annual rainfall from 1950 for any catchment within the Lower Mekong Basin on a 40km x 40km grid.

Table of Contents

Appendices

(Separate Volume)

List of Tables

List of Figures

Glossary

a	Constant in regression equation
AAR.RMP	Average Annual rainfall map
ADF	Average Daily Flow
$AM(D)_T$	Annual minimum; duration D days, return period T years
AREA	Area
AR1950.RMP	Annual rainfall map 1950
b	Constant in regression equation
fse	Factorial standard error
HYDATA	Hydrological database and analysis system
MAM(D)	Mean Annual Minimum; duration D days
MAR	Mean Annual Runoff
MAR12.RMP	Mean monthly rainfall map, December (month = 12)
MR19501.RMP	Monthly rainfall map, January 1950 (month = 1)
MINITAB	Statistical analysis package
P(i)	Exceedance probabilities
Q(75)	75 percentile flow
Q(75%)	Q(75) expressed as a percentage of the ADF
Q(i)	Annual minimum flow series
Qk	Daily flow at Kratie
Qts	Daily flow in the Tonle Sap
R^2	Square of the correlation coefficient
RAINS	Rainfall information system
Sgl	Storage in the Great Lake
se	Standard error of estimate
SOIL	Soil index
UTM	Universal Transverse Mercator map projection
W(i)	Plotting position (Weibull)

Preface

The Lower Mekong Basin Water Balance Study was initiated as part of a continuing study aimed at monitoring the effects on the overall flow regime of man-made developments within the basin. The present study follows on from previous phases of the Water Balance Study funded by the Overseas Development Administration (ODA) of the United Kingdom Government. The previous phases of the study were carried out by the Institute of Hydrology, Wallingford, UK and are fully reported elsewhere (Institute of Hydrology, 1982 and Institute of Hydrology, 1984).

At its 20th session, held in Bangkok from 30th July to 4th August 1984, the Mekong Committee approved the project proposal in the document entitled "Water balance study: report on Phase II and proposal for Phase III" (MKG/R. 473/Rev.1). The objectives of Phase III were defined as:

(1) To determine a framework for continuous monitoring of the flow regime in the Lower Mekong basin under which the combined effect of existing and ongoing developments may be quantified.

(2) To review and gather essential data for the effective modelling of the planned development projects to enable assessment, during project planning and/or appraisal, of the likely effect on the downstream flow.

This report covers part of the work programme agreed for Phase III. In particular the following, more detailed, objectives were defined ("Water Balance Study, Phase III (Basinwide) - Hydrologic Studies", MKG/R. 87039 - June 1987) as the basis of the activities leading to the current report:

Immediate objectives

(1) To provide reliable rating curves for mainstream gauging stations.

(2) To identify and evaluate from the historic records the hydrologic characteristics that best describe the river's flow regime

Long term objectives

(1) To provide consistent and reliable measures of hydrologic characteristics throughout the basin.

(2) To establish regular procedures for evaluating most recently acquired data in the light of historic records.

(3) To establish a system of monitoring flow characteristics such that any future changes in the flow regime can be detected at an early stage.

This study was undertaken by three hydrologists from the Institute of Hydrology in co-operation with staff of the Mekong Secretariat, Bangkok, Thailand. The project started in January 1988 and was completed in August 1988. One IH staff member, Dr C S Green was based in Bangkok for the duration of the study and was assisted during advisory visits by Mr B S Piper (project supervisor) and Dr A Gustard (consultant in low flows).

This final report has been kept as short as possible to enable the reader to obtain a good understanding of the work undertaken. Appendices supplement this main report and amplify the more technical aspects for the reader concerned in detail with specific parts of the study.

In addition to producing this report, the project has provided the Mekong Secretariat with computer software to enable the flow regime of the mainstream and tributaries to be monitored in the future. This software is personal computer (PC) based and centres on the hydrological database and analysis package HYDATA (Institute of Hydrology, 1987). In addition to HYDATA, a program has been written to estimate areal rainfall anywhere in the Lower Mekong Basin from 1950 onwards. Although written with this study in mind, it should have benefits to other projects requiring estimates of monthly rainfall over any particular area.

The present study builds both on the analytical work of Phases I and II of the Water Balance investigations and the results of the recent programme of mainstream river gauging.

1. INTRODUCTION

The activities of the project required to meet the objectives defined in the Preface were:

(1) Review the river gaugings on the mainstream Mekong made since 1987 and determine any changes in rating equations.

(2) Identify techniques of hydrological analysis suitable for assessing the dry season flow regime of the lower Mekong and its tributaries.

(3) Apply these techniques to the data from the rivers of the region and produce "benchmark" flow statistics which describe the current dry season flow regime of each river.

(4) Identify any changes in dry season flow regime of the rivers studied.

(5) Provide techniques for use in the future to identify changes in the dry season flow regime.

(6) Provide an estimate of dry season flow indices for the mainstream Mekong at the inflow to the delta.

Additional activities added during the course of the project were:

(7) Undertake a comprehensive review of the river gaugings at all mainstream sites together with an assessment of the quality of flow data at these sites.

(8) Carry out a regional study of dry season flow characteristics to understand their variation between river basins.

(9) Produce dry season flow estimation procedures for sites with no flow records.

(10) Determine if the year to year variability of dry season flows was correlated with preceding wet season rainfall.

(11) Investigate climatic variability in the basin in terms of annual rainfall total.

Effective monitoring of the water resources of a river basin requires that accurate measurements of rainfall and streamflow are made on a regular basis at key points within the river system. Flow records based on uncertain rating curves cannot provide the basis for sound planning or development decisions. However the accuracy of some of the recent flow data for the mainstream Mekong has been uncertain since the interruption of the routine river gauging programme in 1975. In 1987 new current meters were provided by ODA, and the river gauging programme was restarted. These latest discharge measurements prompted the thorough review of gauging measurements and updating of rating curves that was a major part of this study.

The analysis of recent river gaugings and comparison with past river gaugings and rating equations has not only resulted in re-definition of the rating equations for many important mainstream sites, but also provided an insight into the quality of flow data at these locations. This has important implications for all users of flow data on the Mekong. (Section 3 of the main report and Appendix C.)

The techniques for measuring dry season flows were selected to provide a range of indices which would adequately describe the current flow regime of the Mekong and its tributaries. These statistics have been calculated for 44 mainstream and tributary gauging stations in the Lower Mekong Basin and provide the benchmark against which future changes can be measured. Stations were selected on the basis of the accuracy of low flow measurement and the length of record. In fact two stations on the main Mekong river were rejected following the rating review. Elsewhere, selection was based on the results of discussions with Mekong Secretariat staff. Changes in the dry season flow regime have been identified in rivers with major regulating reservoirs. To a lesser extent changes have also occurred in the downstream reaches of the mainstream Mekong, again as a result of reservoir regulation on the tributaries. At the time of this study there were no dams on the mainstream either in the Lower or Upper Basins of the Mekong. (Section 4 of the main report.)

This approach provides information at gauged locations. However by relating flow statistics from these 44 stations to the characteristics of their upstream catchment areas it was possible to provide a regional summary of the variability of dry season flows and to develop a design method for estimating dry season flows on ungauged, unregulated rivers. For ungauged, unregulated catchments dry season flows may now be estimated from catchment area, catchment annual average rainfall and soil type. These estimation methods do not give such an accurate estimate of low flow indices as do values calculated from recorded flow data. However they are very useful as a guideline for the many situations where flow data are not available. (Section 4.4 of the main report and Appendix B.)

From the analysis of the flow data it became clear that there had been historical changes to the sub catchments' flow regime at a number of stations. These changes were most apparent on tributaries downstream of major regulating reservoirs. A comparison of flows before and after impoundment enabled the scale of these changes to be quantified. Although smaller in comparison to average flow, changes have also been identified on the Mekong below the Nam Ngum confluence.

In all cases of regulation, both on the mainstream and tributaries, the effect has been to increase dry season flows. Average flows have been reduced slightly on regulated rivers, presumably due to irrigation and evaporation losses. High flows have been reduced after regulation. These effects are much as would have been expected from regulation; the main surprise is the increase in dry season flows on lower reaches of the Mekong itself.

An attempt was made to determine if annual minimum flows on certain catchments could be correlated with preceding wet season rainfall. If such a correlation were to exist, the relationship could be used to predict annual minima from past rainfall. First this would be useful in a real time basis for drought forecasting. Second, after the dry season had finished, observed dry season flow could then be compared with the predicted dry season flow. After a number of years of consistent over or under prediction, this would point to a change in dry season flow regime of the river. Although it appeared that average flow over the year could be reasonably well estimated from annual or seasonal rainfall, the correlations between rainfall and following dry season flows were too low to be of any predictive use. (Section 4.5.4 of the main report.)

Climatic variability is now being recognised as a phenomenon which should be considered with the design of water resource schemes. From the point of view of water resources the most important aspect of climatic change is change in the rainfall regime. This study has looked at the annual total rainfall over the period 1950 to 1986 for the Lower Mekong Basin as a whole, northeast Thailand, north Thailand, Laos, the Mekong delta in Vietnam and Kampuchea. This part of the study has shown that there appears to have been no consistent increase or decrease in annual rainfall over any region. (Section 4.5.3 of the main report.)

In 1987 there were no dams on the main river; however it is understood that plans for the implementation of hydropower reservoirs in the Upper Mekong Basin (Lancang) are being considered by the Peoples Republic of China. The first dam at Manwan is currently under construction with an installed generating capacity of 1250 MW. After completion of a second dam at Xiaowan, the installed capacity at Manwan will be increased to 1500 MW (Kunming Hydro-electric Investigation and Design Institute, 1985).

The flow into the delta just downstream of Phnom Penh is made up of two components, namely the main Mekong and a contribution from the Great Lake through the Tonle Sap. The catchment area down to Kratie is about 85% of the combined catchment area at the confluence of the Mekong and the Tonle Sap. The flow records at Kratie are thus particularly important. Regular observations of water level and discharge at Kratie were interrupted in 1969, so a simple time-series model was used to reconstitute the daily flow record since then.

A preliminary desk study, based on existing information available at the Secretariat, was carried out to investigate the behaviour of the Great Lake and the flows in the Tonle Sap. A multiple regression model was used to explain the flow in the Tonle Sap in terms of the flow at Kratie and the storage in the Great Lake. A time-series of daily flows into the delta from 1924 to 1972 (when observations of lake levels ceased) was reconstituted using the derived regression equations to give indicative estimates of the flow regime. (Section 5 of the main report and Appendix A.4.)

2. HYDROLOGICAL DATA

2.1 HYDATA

The Mekong Secretariat maintains a large database of hydrological and meteorological data for the Lower Mekong Basin. Many of these data are published in annual yearbooks (Mekong Secretariat, 1962-1986)

This study required the analysis of a large volume of hydrological and meteorological data. Had time permitted, it would have been possible to write specific software for this task and install this on the Mekong Secretariat's main VAX computer. These programs could then have read data directly from the Hydrologic and Meteorological Database (HMDB) on the VAX (Mekong Secretariat, 1986).

However the development and testing of software is a time consuming task. In the interests of efficiency, it was decided to make use of a software package incorporating all the analysis programs required. The package chosen was HYDATA (Institute of Hydrology, 1987) which has been developed over many years and is in use in many countries throughout the world. An additional advantage of this approach was that the package could be enhanced in the future with minimum effort when additional facilities became available.

HYDATA is a PC based package and remains with the Mekong Secretariat where staff have been trained in its use. It may now be used to help with future hydrological studies, assist with day to day data processing and extend the techniques of analysis reported here to other sites. Being a PC based system, HYDATA has the advantage of portability. Any hydrometric organisation in the countries of the Interim Committee should therefore be able to undertake the techniques of analysis described in this report.

Much of the data for this study was transferred to HYDATA on the project PC from the HMDB system on the VAX computer. HYDATA provided a "front end" by offering easy to use graphical and hydrological analysis programs to a subset of stations. The linking of the project PC to the VAX computer, and the mechanism for data transfer proved to be both easy to set up and quick to execute.

The station numbering system used by the Mekong Secretariat with HMDB (Mekong Secretariat, 1986) has been adopted for use with HYDATA and for this report.

Appendix A describes the installation and training connected with HYDATA at the Mekong Secretariat.

2.2 River gaugings and rating equations

The programme of river gauging on the mainstream, interrupted in 1975, was re-established in 1987. In 1987 ODA provided new current meters for some sites to coincide with the new programme. Therefore one objective of this project was to review the rating equations on mainstream sites, making use of the new gaugings.

Since 1960, when the programme of river gauging was originally established on the mainstream Mekong, many thousands of river gaugings have been undertaken. This represents about 25 man years of work in the field. Although these gaugings had been used to develop rating equations at the various sites from that date, only a few gaugings had been published (in 1960 and 1961). In order to ascertain the importance of continued river gauging at each site and to obtain a better understanding of the quality of flow data at these sites, the scope of the rating review was extended with this additional objective.

The rating review considered data from ten important sites on the Mekong as listed in Table 2.1 and shown on Figure 2.1.

Rating review stations

Number	*Station*	*Number of Gaugings*	*Number of Ratings*
10501	Chiang Saen	697	10
11201	Luang Prabang	294	8
11901	Vientiane	242	11
11903	Chiang Khan	652	10
11904	Pa Mong dam site	367	7
12001	Nong Khai	674	10
13101	Nakhon Phanom	668	15
13402	Mukdahan	1031	17
13801	Kong Chiam	601	10
13901	Pakse	201	5
Total		5427	103

Table 2.1

All available river gaugings from various sources were entered onto HYDATA by hand for these ten sites. However gaugings made at Nong Khai between 1982 and 1985, and at Mukdahan in 1983 and 1984 were not available in time to be included in analysis.

HYDATA was then used to fit rating equations on an annual basis, which is the practice at the Mekong Secretariat. These gaugings and ratings were used together with the published water level and daily flow data to assess the accuracy of data at these sites for periods when the river was gauged and for periods when it was not.

The results of this part of the study, outlined in Section 3 of this report, are discussed more fully in Appendix C.

Location map of gauging stations

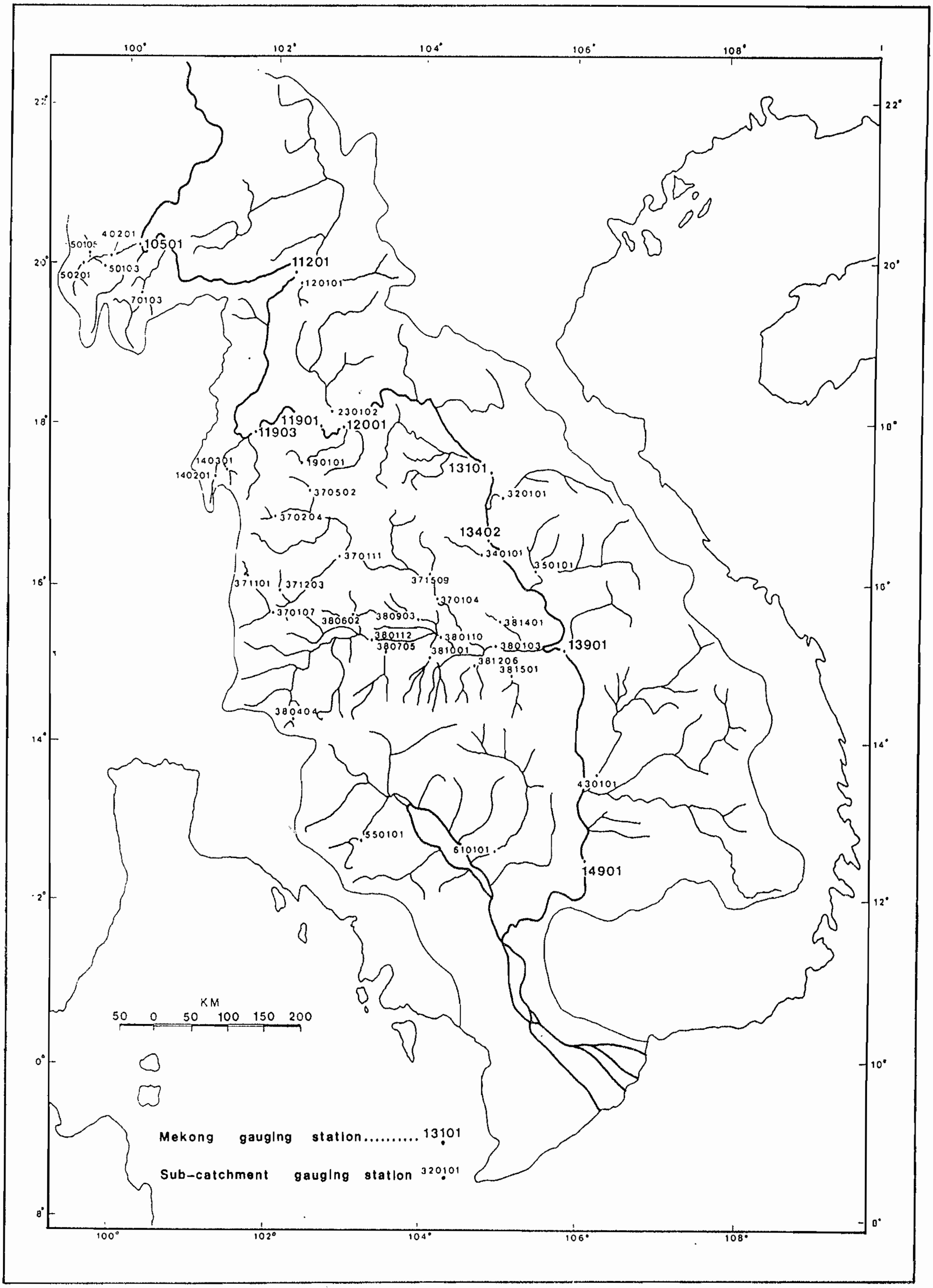

Figure 2.1

2.3 Flow data

The analysis of dry season flows required daily mean flow data from a number of stations throughout the Lower Mekong Basin. The stations were chosen to give as good geographical coverage as possible, to have at least seven years of daily mean flow data and to have data of at least reasonable quality, particularly at low flows. The selection of stations on the mainstream Mekong was based on the results of the rating review (Appendix C). The selection of stations on the tributaries was based on discussions with staff at the Mekong Secretariat.

Table 2.2 lists the 44 stations selected together with their length of record and catchment areas. Figure 2.1 shows the location of these stations together with their catchment boundaries.

Some of the data before 1960 on the mainstream has been generated by correlation techniques using records at adjacent stations (US Army Engineer Division, 1968). Although it is not clear which stations and periods have data based on correlation, these data have been accepted in this study as a worthwhile addition to the data set. Correlations between stations on the Mekong is good, so it is likely this early data is of reasonable quality.

Most of these data was provided by the Mekong Secretariat, but data for a few stations was made available by the Royal Irrigation Department in Bangkok.

Daily flow stations

Station Number	Station name	Basin Area km^2	Start Year	End Year	Yrs. Data
10501	Mekong at Chiang Saen	189000	1960	1987	28
11201	Mekong at Luang Prabang	268000	1950	1987	38
11901	Mekong at Vientiane	299000	1913	1987	75
11903	Mekong at Chiang Khan	292000	1967	1987	21
12001	Mekong at Nong Khai	302000	1969	1987	19
13101	Mekong at Nakhon Phanom	373000	1924	1987	64
13402	Mekong at Mukdahan	391000	1923	1987	65
13901	Mekong at Pakse	545000	1923	1987	65
14901	Mekong at Kratie	646000	1924	1971	48
40201	Nam Mae Kham - Ban Huai Yano Mai	203	1975	1987	13
50103	Mae Kok at Dam Site	5870	1968	1987	20
50105	Mae Kok at Ban Tha Ton	2980	1970	1987	17
50201	Mae Fang at Ban Tha Mai Liam	1800	1970	1987	18
70103	Nam Mae Ing at Thoeng	5700	1969	1987	19
120101	Nam Khan at Ban Mixay (Ban Mout)	6100	1961	1987	27
140201	Nam Man at Dan Sai	401	1967	1987	21
140301	Nam San at dam site	703	1966	1987	22
190101	Huai Mong at Ban Na Ang(Ban Phu)	1307	1957	1987	31
230102	Nam Ngum at Tha Ngon	16500	1963	1985	23
320101	Se Bang Fai at Se Bang Fai	8560	1961	1985	25
340101	Huai Bang I at Ban Kham Soi	702	1964	1978	25
350101	Se Bang Hieng at Ban Keng Done	14900	1961	1977	17
370104	Nam Chi at Yasothon	43100	1953	1987	35
370107	Nam Chi at Ban Khai	6835	1968	1987	20
370111	Nam Chi at Ban Tha Phra	13171	1958	1987	30
370204	Nam Pong at Ban Pha Nok Khao E29	945	1970	1987	18
370502	Huai Phaniang at Ban Wang Mun	1260	1978	1987	10
371101	Huai Rai at Ban Non Kiang	1370	1975	1987	13
371203	Huai Pa Thao at Ban Tao Ton	326	1976	1987	12
371509	Nam Yang at Ban Na Thom	3240	1979	1987	9
380103	Nam Mun at Ubon	104000	1951	1987	37
380110	Nam Mun at Rasi Salai	44275	1965	1987	23
380112	Nam Mun at Satuk	28275	1964	1987	24
380404	Lam Chae at Ban Mak Krat	498	1977	1987	11
380602	Lam Phang Chu at Ban Hua Saphan	1094	1979	1985	7
380705	Lam Chi at Ban Lum Din	4630	1979	1987	9
380903	Lam Sieo Yai - Ban Ku Phra Ko Na	3230	1979	1987	9
381001	Huai Thap Than-Ban Huai Thap Tan	2030	1972	1982	11
381206	Huai Khayung at Ban Huai Khayung	2900	1979	1987	9
381401	Lam Se Bok at Ban Tha Bo Baeng	2132	1979	1985	7
381501	Lam Dom Yai at Det Udom	3340	1963	1981	19
430101	Se Kong at Ban Khmuon	29600	1961	1970	10
550101	Stung Sangker at Treng	2135	1963	1973	11
610101	Stung Sen at Kompong Thom	14000	1961	1970	10

Table 2.2

2.4 Rainfall data

Rainfall information was required in the study for the following purposes :

(1) Rainfall over the whole Lower Mekong Basin was needed for the regional study relating dry season flow indices to catchment characteristics.

(2) Average seasonal rainfall over the whole basin (defined in various ways) for the same purpose as (1).

(3) Rainfall over the catchment between Pakse and the delta was required for the hydrological model extending flow data to the delta.

(4) Annual and seasonal rainfall were required for the part of the study relating annual minimum flows to preceding wet season rainfall.

(5) The study of annual rainfall series were required for evaluating fluctuations in climate over the whole Lower Mekong Basin, northeast Thailand, north Thailand, Laos, the Mekong delta in Vietnam and Kampuchea.

These many uses of rainfall data demanded estimates of rainfall over a large area (600,000 km^2) and over a long time period. Consequently an areal rainfall estimation program was developed for the region, capable of predicting monthly or annual rainfall for any catchment within the Lower Mekong Basin. This program uses monthly rainfall data stored on HYDATA to produce estimates of rainfall on a 40km x 40km grid. The 40km grid size was chosen as a compromise between computer disk space required to store maps of monthly rainfall and adequate resolution for the purposes of this study. The computer program used for this part of the study was called RAINS (Rainfall Information System) and is described fully in Appendix A.

In addition to the ability to estimate areal rainfall, RAINS has simple Geographic Information System (GIS) capabilities, such as drawing, analysing and performing arithmetic operations on maps. In this capacity RAINS was also used in this study to handle basinwide information on soils. This is described in Section 2.5.

In order to give as wide a geographical and time coverage of areal rainfall as possible, monthly rainfall from 116 raingauges were transferred to HYDATA. Tables 2.3(a-c) list the rainfall stations used in the study together with their location, elevation and period of record. The period of record lists, in decades, whether data are available, partially available or complete. Figure 2.2 shows the location of these raingauges within the basin.

It was hoped that there would be sufficient information for the areal rainfall procedure to derive basinwide monthly rainfall from 1910 to date, however there was insufficient data in the period 1910-1949 to make this possible. Consequently basinwide estimates of monthly and annual rainfall have been produced for this study over the period 1950-1986.

Long term annual average rainfall (1950-1980) on the 40km x 40km basinwide grid is shown in Figure 2.3.

Rainfall stations

Number & Country	*Name*	*Lat.* °N	*Long.* °E	*Elvn.* m	*Record Period* — *Decade* 12345678
90502 v	Soc Trang (Khanh Hung)	9:36	105:58	3.2	-+--++-.
90503 v	Camau (An Xuyen)	9:10	105:10	2.0	....-+-.
90601 v	Tra Vinh (Vinh Binh)	9:56	106:20	4.0	---.---.
100307 k	Kompong Som	10:38	103:35	13.0	......--
100408 k	Takeo (Ville)	10:59	104:48	6.0	.....+.-
100503 v	Sa Dec	10:18	105:45	2.0	-+-.-+--
100504 v	Rach Gia	10: 0	105:53	3.0	--..-+-.
100505 v	Chau Doc	10:42	105: 7	6.0	.--..---
100603 v	Ho Chi Minh Ville(Aerodrome)	10:47	106:42	11.0	--.-++-.
100605 v	My Tho	10:21	106:22	2.0	.--.-+-.
110201 t	Khlong Yai	11:47	102:53	4.0	....-++-
110403 k	Phnom Penh	11:33	104:51	10.0	.....---
110503 k	Svay Rieng	11: 5	105:47	6.0	.....+--
120201 t	Trat	12:15	102:33	3.0	....-++-
120202 k	Pailin	12:52	102:37	170.0	.....+-.
120203 t	Chanthaburi	12:36	102: 7	5.0	....-++-
120204 t	Pong Nam Ron	12:51	102:17	180.0	....-++-
120213 k	Rattanak Mondal	12:49	102:37	170.0	.......-
120304 k	Dap Bat	12:30	103:50	19.0	.....-..
120401 k	Kompong Chhnang	12:15	104:40	6.0	.....---
120403 k	Krakor	12:31	104:11	5.0	.....+-.
120404 k	Kompong Thom	12:42	104:54	13.0	.....---
120504 k	Kompong Cham	12: 0	105:27	16.0	.....+--
120603 k	Kratie	12:29	106: 2	23.0	.....+.-
120606 k	Snuol	12: 4	106:25	180.0	.....+-.
120801 v	Buon Me Thuot	12:36	108: 5	461.0	.--.----
130202 k	Sisophon	13:36	102:58	16.0	.....--.
130204 t	Aranyaprathet	13:42	102:35	44.0	....-++-
130301 k	Banan	13:57	103: 9	19.0	.......-
130305 k	Battambang	13: 6	103:12	18.0	.....---
130405 k	Kompong Kdei	13: 7	104:18	13.0	.....--.
130501 k	Stung Streng	13:31	105:58	54.0	.....-..
130603 k	Lomphat	13:30	106:59	97.0	.....-..
140201 t	Nang Rong	14:35	102:48	183.0	.....-+-
140202 t	Chok Chai	14:44	102:15	192.0	......--
140205 t	Korat	14:58	102: 5	181.0	....+++-
140302 t	Surin	14:53	103:30	145.0	....+++-
140501 l	Muong Khong	14: 7	105:50	87.0	.....---
140503 l	Phiafay	14:48	105:56	100.0	..-..--.
140505 l	Pathoumphon	14:46	105:58	96.0	......--

Country code:

k = Kampuchea
l = Laos
t = Thailand
v = Vietnam

Record Period:
Decade 1 (1910-19)
Decade 2 (1920-29) etc
. = no data
- = partial record
+ = complete record

Table 2.3a

Rainfall stations

Number & Country		Name	Lat. °N	Long. °E	Elvn. m	Record Period Decade 12345678
140601	t	Det Udom	14:53	105: 4	125.0	.....-+-
140602	k	Voeun Sai	14: 0	106:46	220.0	.....-..
140703	v	Pleiku	14: 1	107:54	758.0	.-+.----
140704	v	Kontum (Lasan)	14:22	107:54	536.0	.-+-.---
150101	t	Chatturat	15:31	101:51	190.0	.....---
150102	t	Chaiyaphum	15:48	102: 2	190.0	....-++-
150202	t	Phon	15:47	102:37	175.0	.....++-
150301	t	Buriram	15: 0	103: 6	155.0	....-+--
150306	t	Phayakkaphumphisai	15:29	103:12	135.0	.....-+-
150308	t	Tha Tum	15:19	103:41	127.0	......--
150401	t	Ubon	15:15	104:52	127.0	....+++-
150404	t	Sisaket	15: 6	104:21	124.0	....-++-
150407	t	Rasi Salai	15:20	104:10	120.0	.....-+-
150503	t	Khong Chiam	15:22	105:28	90.0	......--
150504	l	Pakse	15: 7	105:47	93.0	.-+--++-
150507	t	Ban Nong Mek	15: 4	105:18	154.0	.....-+-
150601	l	Paksong	15:11	106:14	1270.	.---.---
150602	l	Saravane	15:43	106:26	170.0	.---.--.
160102	t	Phetchabun	16:25	101: 8	114.0	......+-
160104	t	Ban Song Khon	16:38	101:48	110.0	......--
160105	t	Ban Si Than	16:53	101:53	260.0	......--
160106	t	Phu Kradung	16:51	101:53	1289.	......--
160202	t	Khon Kaen	16:26	102:50	157.0	....+++-
160207	t	Chum Phae	16:29	102: 7	220.0	.....+--
160301	t	Roi Et	16: 3	103:41	140.0	....-++-
160302	t	Kalasin	16:26	103:31	142.0	....-+--
160303	t	Maha Sarakham	16:10	103:18	150.0	....-++-
160309	t	Kosum Phisai	16:15	103: 4	150.0	......--
160401	t	Mukdahan	16:32	104:43	138.0	....+++-
160403	t	That Phanom	16:58	104:43	130.0	.....-+-
160405	l	Savannakhet	16:33	104:45	155.0	.-----+-
160407	t	Kuchinarai	16:30	104: 3	166.0	.....-+-
160408	t	Ban Kham Pa Lai	16:43	104:38	147.0	......--
160502	l	Seno	16:40	105: 0	184.0	....-+--
160503	t	Khemarat	16: 2	105:13	139.0	.....-+-
160505	l	Keng Kok	16:26	105:12	126.0	..-..--.
170101	t	Loei	17:27	101:44	251.0	....-++-
170102	t	Wang Saphung	17:15	101:48	247.0	.....-+-
170104	t	Dan Sai	17:17	101: 9	330.0	.....-+-
170105	t	Chiang Khan	17:49	101:41	213.0	.....-+-

Country code:

k = Kampuchea
l = Laos
t = Thailand
v = Vietnam

Record Period:
Decade 1 (1910-19)
Decade 2 (1920-29) etc
. = no data
- = partial record
+ = complete record

Table 2.3b

Rainfall stations

Number & Country	Name	Lat. °:'N	Long. °:'E	Elvn. m	Record Period Decade 12345678
170107 t	Nam San Dam Site	17:28	101:15	815.0	.....-+-
170201 t	Tha Bo	17:54	102:35	173.0	.....-+-
170202 t	Udon Thani	17:23	102:48	178.0	....+++-
170203 l	Vientiane	17:57	102:31	170.0	......--
170206 t	Nong Khai	17:52	102:43	173.0	....-++-
170303 t	Wanon Niwat	17:39	103:46	160.0	.....---
170305 t	Sawang Daen Din	17:25	103:28	170.0	.....-+-
170401 t	Sakon Nakhon	17: 9	104: 8	160.0	....-++-
170403 t	Nakhon Phanom	17:25	104:47	140.0	....-++-
170406 t	Ban Phaeng	17:56	104:13	148.0	.....-+-
180001 t	Nan	18:47	100:47	201.0	.....-+-
180101 l	Paklay	18:12	101:24	220.0	.-+-.---
180201 l	Ban Keun	18:25	102:33	168.0	.....---
180202 l	Tha Ngon	18:10	102:40	170.0	.....-+-
180203 l	Ban Maknao	18: 1	102:58	161.0	.....---
180207 l	Vang Vieng	18:56	102:27	215.0	.---.---
180208 t	Ban Pha Tang	18: 2	102:23	174.0	......--
180210 l	Phong Hong	18:28	102:24	179.0	......--
180301 t	Phon Phisai	17:58	103: 5	160.0	.....-+-
180303 l	Paksane	18:24	103:38	159.0	.---.-+-
180305 t	Ban Tha Kok Daeng	18: 2	103:30	145.0	.....-+-
180401 l	Nam Thone	18: 4	104:15	150.0	.....--.
180402 l	Pak Ca Dinh	18:21	104: 1	300.0	.....--.
189901 t	Lampang	18:17	99:31	243.0	....-++-
189903 t	Chiang Mai	18:47	98:59	313.0	....-++-
190001 t	Thoeng	19:37	100:14	396.0	.....-+-
190008 t	Khao Ing Rod	19:26	100: 4	368.0	......--
190103 l	Sayaboury	19:12	101:44	300.0	.....---
190202 l	Luang Prabang	19:53	102: 8	304.0	.--.-++-
199901 t	Fang	19:53	99:14	470.0	....-+--
199904 t	Phayao	19: 8	99:54	395.0	....-+--
199907 t	Chiang Rai	19:55	99:50	416.0	....-++-
199910 t	Mae Kok Dam Site	19:57	99:54	391.0	.....-+-
200001 t	Chiang Khong	20:12	100:25	361.0	.....-+-
200002 t	Chiang Saen	20:16	100: 6	369.0	.....-+-
209902 t	Ban Mae Ai	20: 2	99:18	460.0	......--

Country code:	Record Period:
k = Kampuchea l = Laos t = Thailand v = Vietnam	Decade 1 (1910-19) Decade 2 (1920-29) etc . = no data - = partial record + = complete record

Table 2.3c

Location of raingauges

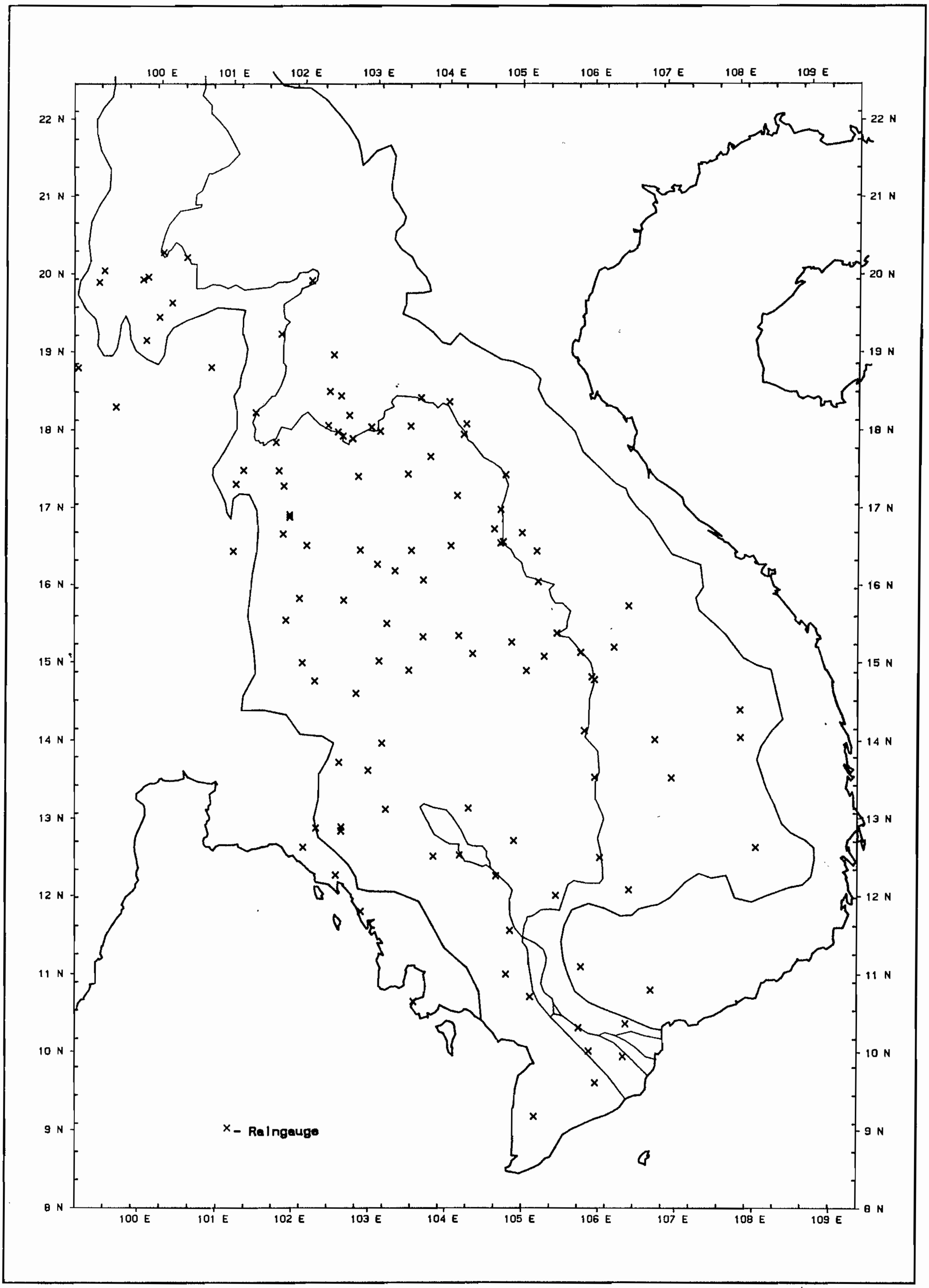

Figure 2.2

Annual average rainfall

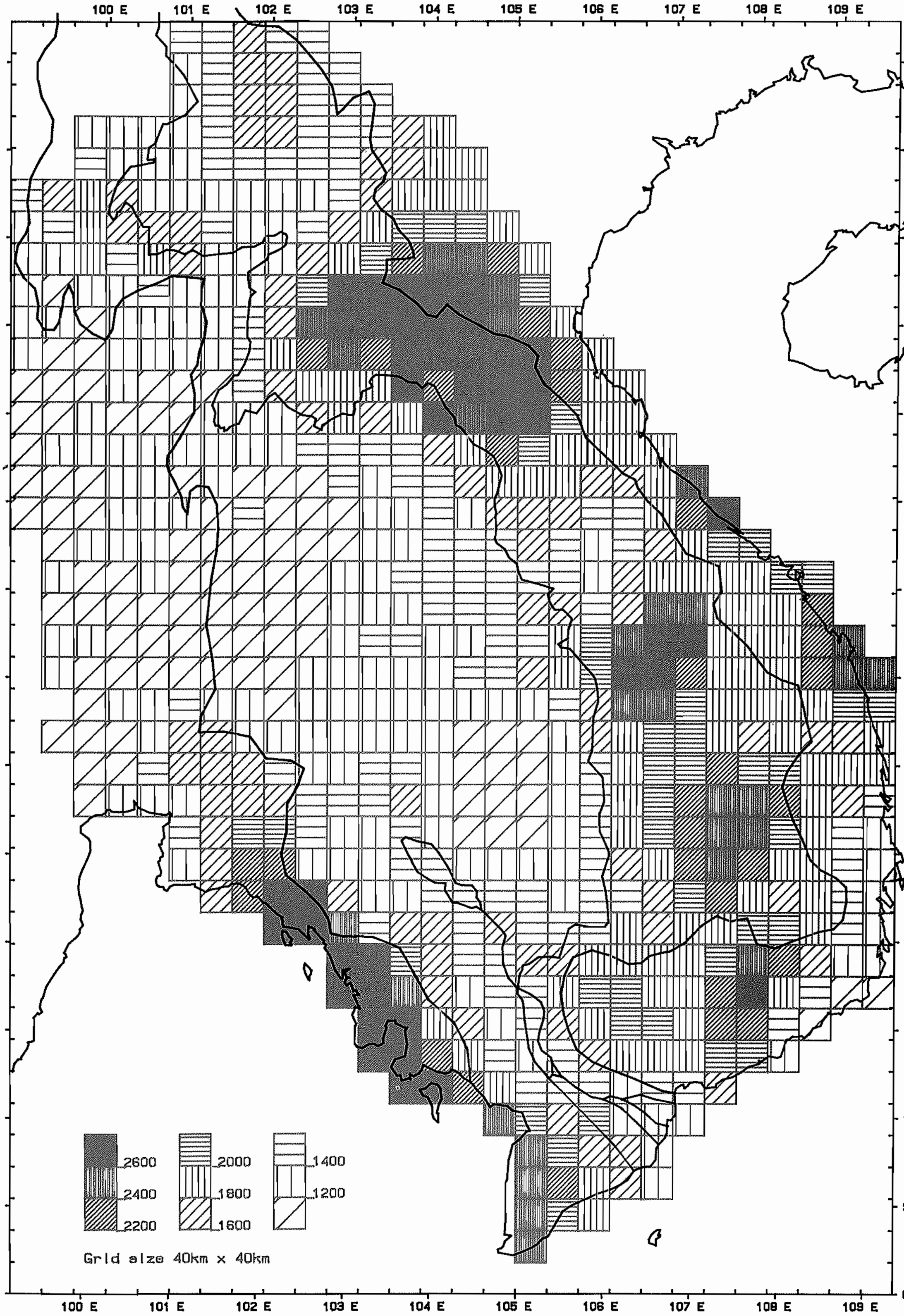

Figure 2.3

2.5 Soil map

A soil index was derived for the region to evaluate whether dry season flows are related to basin soil type. The index was derived using a method developed jointly by the UK Soil Survey and Land Research Centre, and the Institute of Hydrology based on the 1:1,000,000 Pedo-geomorphological map of the Lower Mekong Basin (Mekong Secretariat, 1977). This map uses the FAO-UNESCO nomenclature for soil classification. The 32 map units were allocated into one of nine groups (Table 2.4), so that each group had similar hydrological characteristics. The main criteria for allocating soils to a particular group were the hydromorphic properties of the soil profile, which indicated the extent of seasonal saturation, the soil depth, organic content and soil structure.

Values of the index were calculated for each catchment. A 40km x 40km grid was overlaid on the soil map and the percentage of each of the nine soil groups in each grid square was estimated. The 40km x 40km grid was chosen for compatibility with the areal rainfall grid described in Section 2.4. The computer program RAINS (Section 2.4) was then used to calculate the percentage of each soil type in each basin. As a result of the distribution of soil types within the study catchments a number of soil groups were not represented in the basins resulting in only groups 2, 3, 5, and 7 having a significant percentage. Regression analysis was used to relate dry season flow statistics to the percentage cover of these four soil groups and to combinations of the groups. The results indicated that groups 5 and 2 (very shallow soils and soils showing evidence of seasonal saturation) produce a lower, dry season flow response than the more permeable group 7 soils. The percentage of the catchment with soil group 7 was used as a soil index in developing flow estimation procedures. The index is based on a preliminary interpretation of the 1:1,000,000 soil map of the Lower Mekong Basin and the analysis uses a very coarse grid of 40km x 40km and thus the index should be regarded as provisional. Figure 2.4 shows the value of the soil index for each of the grid squares in the Lower Mekong Basin.

Hydrological soil groups

Hydrological Soil Group	Map Units (1)	Dominant Characteristics
1	29	Peat soils
2	10	Hard coherent rock within 10 cm
3	20	Moderately permeable with discontinuities, hard or concretionary 'lateritic' material and no hydromorphic properties within 100 cm of the surface
4	13	Clay soil with strong shrink/ swell properties
5	1 2 3 4 5 6 7 8 14 15 17 22 23 x xxx	Alluvial deposits and gleyed soils with seasonal saturation
6	9	Moderately permeable, gleyed soils with a peaty or organic rich topsoil, discontinuous hard or concretionary lateritic material and seasonal saturation
7	16 18 19 21 24 25 26 27 28 xx	Medium textured, permeable, with no hydromorphic properties within 100 cm
8	11	Coarse textured - permeable with no hydromorphic properties within 100 cm
9	12	Shallow, calcareous over (fissured?) limestone

Note (1) Numeric classes and 'x' symbols are presented on the Pedo-geomorphological map of the Lower Mekong Basin (Mekong Secretariat, 1977)

Table 2.4

Soil Index

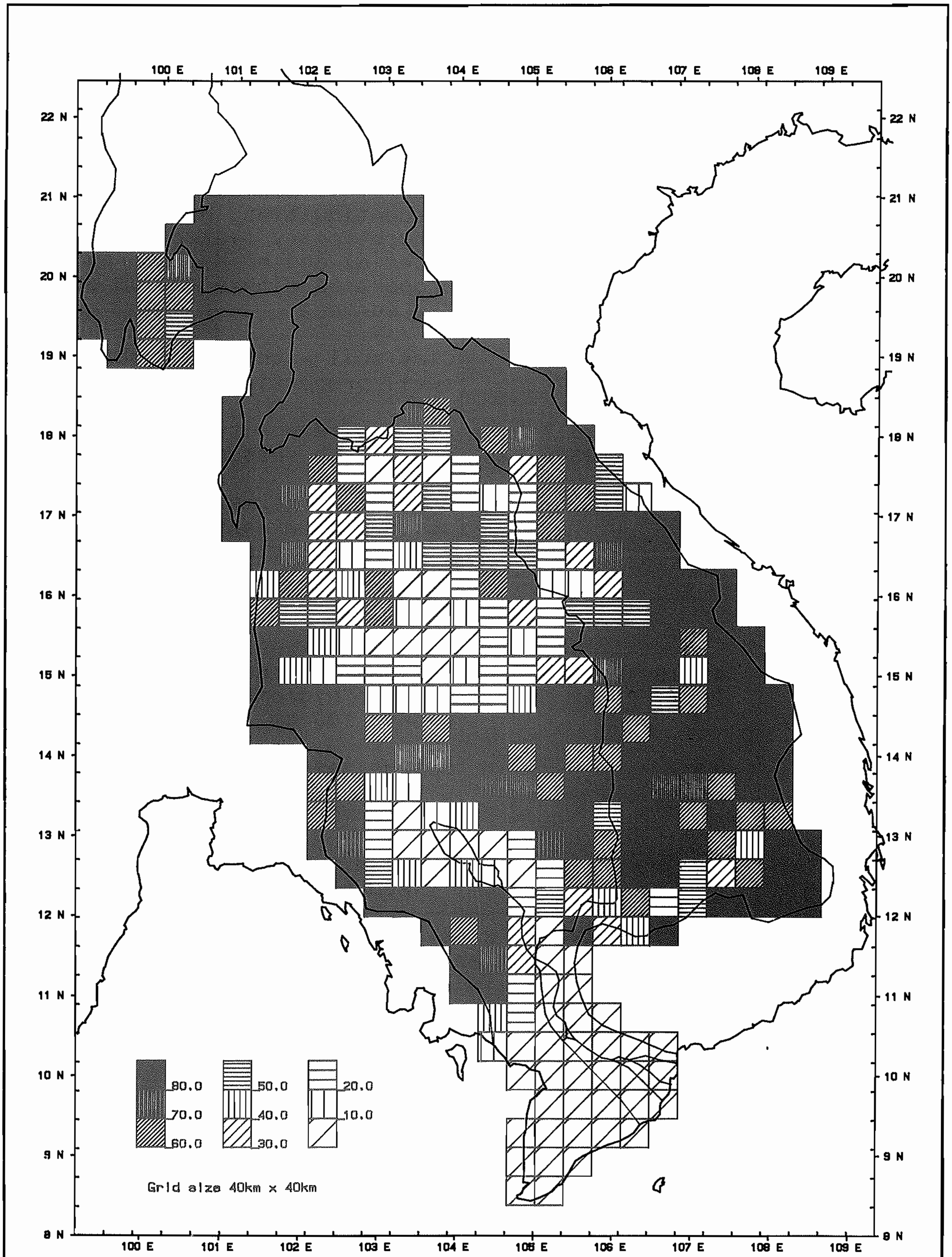

Figure 2.4

3. RATING REVIEW

3.1 Introduction

The original objective of the rating review was to assess the river gaugings carried out on the mainstream Mekong using the new current meter equipment purchased for the Mekong Secretariat by ODA in 1987. The programme of gauging the main river started in 1960 was halted in 1975 before being restarted in 1987. The revised ratings derived in this study are given in Appendix C.

During the course of this work it became clear that in the past many thousand river gaugings had been made on the Mekong since the programme of river gauging was first established in 1960. Although these gaugings had been used for fitting rating equations at the time, they had subsequently not been used. It was considered a useful addition to this study to collect details of all these gaugings from various sources and publish these in a data appendix to this report. Appendix C of this report therefore contains river gauging data for the ten important sites on the mainstream given in Table 2.1. Furthermore these gaugings are now available on HYDATA at the Mekong Secretariat for future use.

The rating review is presented in detail in Appendix C and the results are summarised below.

3.2 Summary of results

Having collected these gaugings and entered them onto HYDATA it was then possible to undertake an analysis to determine how stable the rating equations were at each site and hence the value of continuing the gauging programme. The results of this part of the study showed that, on average, the error in daily flow data increased by 66% for periods when stations are not gauged. This has illustrated the importance of a continuous programme of river gauging. The restart of the programme of river gauging on the mainstream after a 10 year break must therefore be welcomed as must the timely provision of new current meters by ODA.

Having obtained estimates of error in the daily flow data for periods when each site was gauged it was then possible to rank the stations in order of data quality. Table 3.1 shows these results for three types of application of flow data. The first application under "All" flow conditions is for general use of flow data, such as determining average discharge at a site. The second application is for users interested primarily in low flows, such as navigation and irrigation. The third application is for high flows which should be of interest to users of data for flood forecasting and flood estimation.

In general the results show the mainstream data to be of reasonable to high quality. One station, Pakse, has data of exceptionally high quality and as such should be considered as the most important gauging station on the Lower Mekong.

Table 3.1 shows that errors in daily data at low flows are greater than 20% for two stations, Nakhon Phanom and Kong Chiam. Consequently these two stations were excluded from the analysis of dry season flows described in this report. Table 3.1 may also be used to determine policy for future programmes of gauging on the mainstream. Stations with low errors may not need gauging so often and stations with high errors might be abandoned in favour of a more suitable site in the vicinity.

Rating curves are derived on an annual basis on the Mekong. For periods when the river is not gauged the most recently derived annual rating curve is used to calculate discharges. Since the ratings at each site vary in an apparent random manor with time, the use of an "average" rating for periods when gaugings are not possible is recommended. Long term rating equations for each site, based on all river gaugings, have been derived and are given in Appendix C. Since major shifts in rating occur during the flood season, it is recommended that rating equations be fitted from peak stage one year to peak stage the next, rather than on a calendar year basis.

This rating review led to some important recommendations concerning river gauging and fitting rating equations:

(1) Every effort should be made to continue the gauging programme on the Mekong.

(2) The data from Pakse are of the highest quality. It is therefore important to ensure the continuous return of stage data from this station.

(3) Long term rating equations should be used during periods when no gaugings are being made.

(4) The database of gaugings and ratings should be maintained at the ten mainstream sites and be updated when new gaugings are available.

(5) The analysis should be extended to other major sites of interest in the Lower Mekong to provide guidelines on data quality at more sites.

(6) The long term rating equations should be revised every five years using gaugings from the previous ten years in which gaugings have been made.

(7) Rating curves should run from the peak flow in one season to the peak flow in the next.

Stations ranked in order of data quality

Flow condition	Error	Number	Name
All	6%	13901	Pakse
	8%	11903	Chiang Khan
	10%	11201	Luang Prabang
	10%	12001	Nong Khai
	11%	10501	Chiang Saen
	11%	11901	Vientiane
	13%	11904	Pa Mong dam site
	15%	13402	Mukdahan
	17%	13101	Nakhon Phanom
	19%	13801	Khong Chiam
Low	7%	13901	Pakse
	11%	10501	Chiang Saen
	11%	12001	Nong Khai
	11%	11903	Chiang Khan
	11%	11201	Luang Prabang
	16%	11901	Vientiane
	18%	11904	Pa Mong dam site
	18%	13402	Mukdahan
	22%	13101	Nakhon Phanom
	25%	13801	Khong Chiam
High	3%	13901	Pakse
	6%	11903	Chiang Khan
	7%	11901	Vientiane
	8%	13402	Mukdahan
	10%	13801	Khong Chiam
	10%	13101	Nakhon Phanom
	11%	12001	Nong Khai
	11%	11904	Pa Mong dam site
	11%	11201	Luang Prabang
	11%	10501	Chiang Saen

Table 3.1

4. DRY SEASON FLOW ANALYSIS

4.1 Flow measures

4.1.1 Introduction

The main objective of the study was to provide a consistent analysis of river flows in the Lower Mekong Basin so that benchmark flow statistics can be established and used to evaluate any future changes to the hydrological regime. The term "flow measures" is used in this report for describing the way in which the flow regime of a river may be summarised. Three such measures have been calculated from the time series of mean daily flows: the mean discharge, the flow duration curve and the low flow frequency curve.

4.1.2 Mean flow

The mean flow is perhaps the most fundamental variable to describe historical flows, to assess changes in river flows and to compare the hydrology of different catchments. Expressed in cubic metres per second (m^3s^{-1}), the mean flow is controlled both by the area of the catchment, the nature of the catchment and the climate. Comparisons between stations and between rainfall and runoff are therefore simplified if the mean discharge is expressed as the average annual runoff over the catchment in millimetres (mm). Changes to the mean runoff will usually be the result of the variability of climate (particularly rainfall), changes in land use (which may influence the rate of losses from evaporation and transpiration) or artificial control of the river (nett imports or exports of water).

4.1.3 Flow duration curve

The cumulative frequency distribution of daily mean flows is a convenient measure for describing the complete range of flows from the dry to flood season. This is referred to as a flow duration curve. Figure 4.1 shows an example of the flow duration curve for the Mekong gauged at Pakse for the period before regulation on the tributaries (1923-1965). The curve is derived from daily data by assigning daily discharges to class intervals and counting the number of days within each class interval. The proportion of the total number of days above the lower limit of any class interval is then calculated and plotted against the lower limit of the interval. A normal probability scale is used for the frequency axis and a logarithmic scale for the discharge axis. These transformations assist in estimating discharges for given frequencies from the curve and if the logarithms of the daily discharges were distributed normally then the curves would plot as straight lines.

Flow duration curve for Pakse (1923-65)

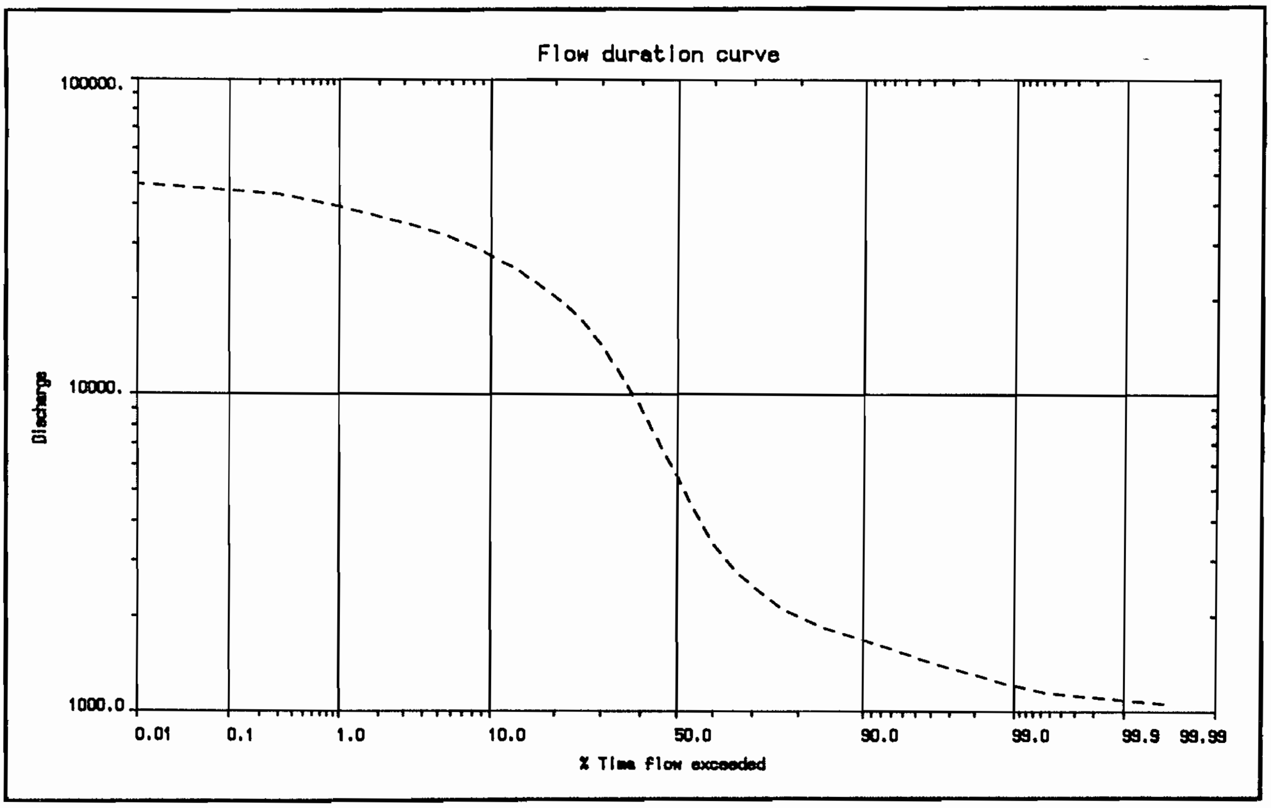

Figure 4.1

Low flow frequency curve for Pakse (1923-65)

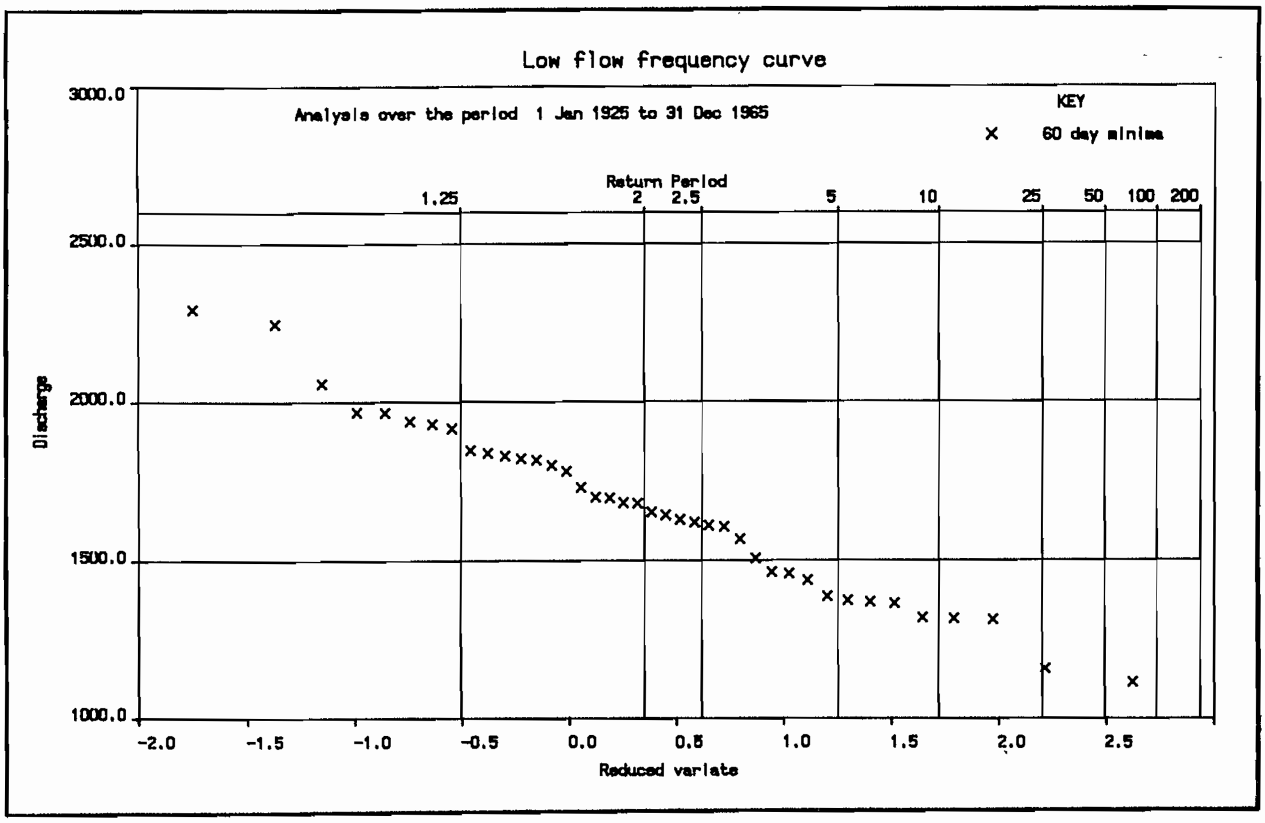

Figure 4.2

To assist in making comparisons between stations, and at the same station over different time periods, it is helpful to estimate "flow indices" from the flow duration curve. HYDATA was used to calculate seven different indices, defined as the discharge exceeded for 95, 90, 75, 50, 25, 10 and 5 percent of the time. These statistics provide a good description for water resource purposes of the entire flow range. They are used to estimate the proportion of time that a particular discharge will be exceeded. Conversely they also provide an estimate of the proportion of time that the flow will be less than a given discharge. For example the 75 percentile discharge is exceeded on average for 274 (365 x 0.75) days, or conversely on all but 91 (365 - 274) days in the year the discharge will be lower. The flow duration curve is thus the appropriate flow measure to use for a wide range of design problems requiring information on the average number of days in the year when a particular threshold discharge will not be met. Design problems may be expressed (and answered) in terms either of "what is the discharge with a given percentile exceedance", or "what is the percentile exceedance for a given discharge".

In the same way that there is no single design standard that is suitable for all flood design problems there is no single flow duration curve percentile that is appropriate for every dry season design problem. The appropriate percentile will depend on the "frequency of failure to meet the design discharge" which can be accepted. This frequency or "level of service" will be dependant on the particular scheme, for example, hydropower, irrigation, navigation, industrial abstraction, dilution of effluent, environmental improvement and the scale and national or local importance of the scheme. It may be considered appropriate to maintain the target abstraction rate for a high proportion of the time for urban supply or a major irrigation scheme; lower reliability might be appropriate for a smaller scheme of only local importance. It may also be appropriate to derive flow duration curves for particular seasons of the year according to the particular application. For example, if the group of months when irrigation is required for a particular crop can be identified, then the discharge for a given frequency during this period may be calculated using HYDATA. The frequency of failure is then specific to the growing season of the crop and is thus more appropriate than using the entire flow record.

4.1.4 Low flow frequency curve

While the flow duration curve is concerned with the proportion of time that a flow is exceeded, the flow frequency curve shows the proportion of years, or equivalently, the average interval between years (return period), in which the river flows are below a given discharge. Figure 4.2 illustrates the curve for the Mekong river gauged at Pakse for the period before regulation on the tributaries (1923-1965). The procedure for constructing the curve uses the Weibull distribution and is as follows:

(1) Find the lowest flow, Q(i), in each year of the N years of record for the duration of interest, D.

(2) Rank them from highest to lowest such that the highest rank, i=1, is given to the **largest** annual minimum, and i=N is given to the **smallest** annual minimum.

(3) Calculate the exceedance probability, P(i):

$$P(i) = (i - 0.44) / (N + 0.12)$$

(3) To each ranked flow, Q(i), assign a plotting position, W(i), to each ranking from:

$$W(i) = 4 [1 - \{ - \ln P(i)\}^{0.25}]$$

(4) Plot the annual minimum discharge, Q(i), against the plotting position, W(i).

The procedure is described in detail in the Low Flow Studies Report (Institute of Hydrology, 1980). For the study's 44 stations eye-fitted lines were drawn through the set of points produced by this method. For most stations a straight line provided a good fit to the data, indicating that the Weibull distribution is suitable for describing the annual minimum data in the Lower Mekong Basin.

The flow frequency curve has similar applications to the flow duration curve. However, because the frequency is expressed in terms of return period in years, it is more suitable for describing rare events with return periods of 10 or 25 years. It is important to note that the 90% exceedance probability on the flow duration curve is a much more common event than the 90 % exceedance probability (10 year return period) on the flow frequency curve.

Figure 4.2 shows the flow frequency plot for the 60 day annual minima. However the curve can be drawn for minima of any consecutive D day period. The appropriate duration to use will be determined by the specific design problem. Thus for navigation it may be appropriate to analyse the lowest 10 days in the year to provide estimates of the 10 day annual minima with a given return period but for irrigation requirements it may be more appropriate to consider longer duration minima of 30 or 60 consecutive days.

4.2 Selecting design dry season flows

For any particular water resource scheme there are a wide range of flow statistics which can be used for design purposes. In addition to deciding whether the flow duration (FDC) or flow frequency curve (FFC) is the most appropriate method of analysis, it is necessary to determine the frequency of interest. Furthermore, in the case of the flow frequency curve, the appropriate duration must also be selected; and in the case of the flow duration curve it may be useful to consider seasonal analysis. The selected flow statistic will thus depend on the specific scheme, for example hydropower, irrigation, navigation or effluent dilution, and upon the importance or scale of the scheme. It is therefore inappropriate to recommend a single design standard for all possible schemes; however the step by step procedure given in Table 4.1 will assist in determining the appropriate flow index to select.

Choosing a design method

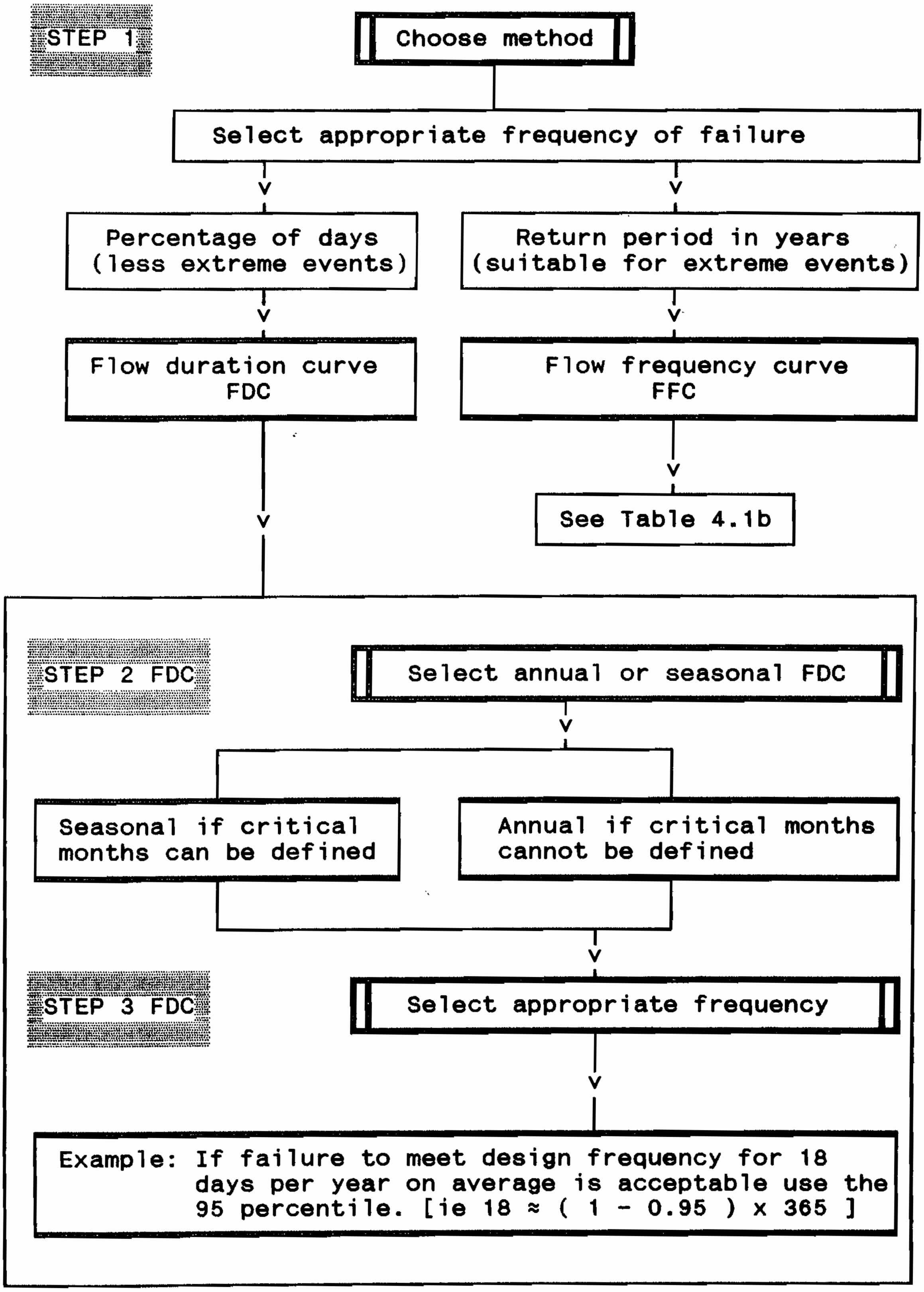

Table 4.1a

Choosing a design method

Continued from Table 4.1a

STEP 2 FFC

Select appropriate duration

Note : 1 day duration will be the lowest discharge recorded in the year. Longer durations will be calculated from the mean of D consecutive days

Select critical duration for your purpose

STEP 3 FFC

Select return period

Note : 25 year return low flow means this annual minimum, over the duration selected above, will not be exceeded once in 25 years

Table 4.1b

4.3 Benchmark flow statistics

Section 4.1 describes a number of flow statistics which may be calculated from a series of daily mean flow data. Although it is not appropriate to recommend key design standards for a wide range of applications it is possible to recommend flow indices which provide a useful summary of the flow regimes encountered in the Lower Mekong Basin. The selected indices are:-

(1) MAR, the mean annual runoff expressed as a depth in mm over the catchment area (shown in Figure 4.3).

(2) Q(P), seven percentiles from the flow duration curve expressed in m^3s^{-1} : 95, 90, 75, 50, 25, 10, 5.

(3) MAM(D), the mean annual D day minima in m^3s^{-1}, for five different durations of 10, 30, 60, 120, 180 days.

(4) $AM(60)_T$, the 60 day annual minima of T year return period, for 4 different return periods of 2, 5, 10, 25 years, with discharge expressed as a ratio of the 60 day mean annual minima.

Table 4.2 lists each of these indices for the natural flow series (excluding the period when the river was regulated), together with the catchment area, start and end year of the analysis, the number of years of data, the number of years from which the mean annual minima was calculated (annual values were not calculated if there were more than 20 days missing in the year) and the average flow in m^3s^{-1}.

From Table 4.2 and Figure 4.3 it can be seen that the annual runoff ranges from 146 mm from the driest catchment (station 370111) to 1605 at the wettest (station 320101). There is a wide range in both MAM(D) and Q(P) reflecting the wide variation in both the size and climate of the catchments.

In order to make comparisons between catchments easier, it is helpful to express these flow statistics as a percentage of the average flow. These values are shown on Figures 4.4 for Q(75) and on Figure 4.5 for MAM(60) which display consistent trends of both indices, with generally lower values in northeast Thailand and Kampuchea and higher dry season flows in northern Thailand and Laos. There is also a consistent trend down the main Mekong river with the dry season flows expressed in m^3s^{-1} steadily increasing down the Mekong. However, when standardised by the average flow, the upstream stations on the Mekong are similar to the nearby tributary basins with MAM(60) equal to 30% of the mean flow and Q75 equal to 37% of the mean flow. In contrast at the downstream station of Kratie the MAM(60) and Q(75) are 14% and 19% of the mean flow respectively. This reduction is caused by the tributary inflows having lower dry season flows (expressed as a percentage of the mean flow) than the upper Mekong.

Benchmark statistics for natural catchments

Number	Name	Area km²	Start year	End year	No. yrs.	MAM yrs.	ADF m^3s^{-1}	MAR mm	Mean Annual Minimum (MAM) - m^3s^{-1} Duration - Days 10	30	60	120	180	Ratio to MAM(60) Return period - Years 2	5	10	25	Flow Duration - m^3s^{-1} Percentiles 95%	90%	75%	50%	25%	10%	5%
10501	Mekong at Chiang Saen	189000.	1960	1987	28	26	2744.	458.	741.8	773.0	818.3	915.1	1079.	1.011	0.910	0.855	0.808	748.	825.	1014.	1755.	3873.	6009.	7383.
11201	Mekong at Luang Prabang	268000.	1950	1987	38	36	3860.	455.	936.2	976.5	1037.	1174.	1418.	1.011	0.882	0.821	0.753	913.	1029.	1292.	2325.	5473.	9131.	11184.
11901	Mekong at Vientiane	299000.	1913	1987	75	73	4583.	484.	1070.	1119.	1174.	1312.	1571.	1.011	0.882	0.814	0.740	1041.	1166.	1447.	2646.	6565.	11260.	13627.
11903	Mekong at Chiang Khan	292000.	1967	1987	21	19	4254.	460.	948.5	983.5	1045.	1203.	1580.	1.011	0.910	0.848	0.794	958.	1049.	1357.	2662.	6228.	9920.	12153.
12001	Mekong at Nong Khai	302000.	1969	1987	19	17	4674.	488.	1065.	1111.	1186.	1353.	1647.	1.005	0.930	0.889	0.855	1081.	1188.	1498.	2812.	6671.	11103.	13601.
13101r	Mekong at Nakhon Phanom	373000.	1924	1970	47	46	7732.	654.	1284.	1346.	1428.	1640.	2062.	1.005	0.862	0.794	0.719	1268.	1427.	1855.	4048.	12269.	20091.	23638.
13402r	Mekong at Mukdahan	391000.	1923	1970	48	46	8435.	681.	1359.	1422.	1505.	1728.	2184.	1.005	0.862	0.801	0.726	1341.	1514.	1970.	4439.	13560.	21955.	25862.
13901r	Mekong at Pakse	545000.	1923	1965	43	41	10550.	611.	1509.	1577.	1664.	1928.	2493.	1.005	0.869	0.881	0.726	1477.	1679.	2200.	5477.	17422.	27525.	32505.
14901	Mekong at Kratie	646000.	1924	1965	42	41	14130.	690.	1846.	1920.	2029.	2399.	3194.	1.005	0.882	0.821	0.753	1837.	2027.	2742.	7018.	23207.	37256.	44001.
40201	Nam Mae Khan - Ban Huai Yano Mai	203.0	1975	1987	13	11	5.035	783.	1.166	1.291	1.433	1.734	2.090	1.011	0.767	0.638	0.509	1.030	1.238	1.838	3.259	6.391	10.510	14.044
50103	Mae Kok at Ban Site	5870.0	1968	1987	20	18	116.6	627.	22.88	25.67	28.47	35.11	44.35	1.011	0.808	0.706	0.590	23.03	27.79	39.81	72.93	161.21	263.98	342.60
50105	Mae Kok at Ban Tha Ton	2980.0	1970	1987	17	16	71.36	756.	17.04	19.08	20.91	25.01	30.38	1.011	0.835	0.744	0.652	17.19	20.08	28.11	47.69	95.80	154.01	199.64
50201	Mae Fang at Ban Tha Mai Liam	1800.0	1970	1987	18	16	27.25	478.	2.765	3.382	4.112	5.697	8.246	0.937	0.658	0.509	0.353	2.481	3.412	6.061	14.97	41.27	69.10	85.32
70103	Nam Mae Ing at Thoeng	5700.0	1969	1987	19	17	65.22	361.	1.603	1.984	2.626	4.490	7.462	0.910	0.645	0.509	0.360	1.452	2.048	4.565	17.33	79.14	208.26	297.59
120101	Nam Khan at Ban Mixay (Ban Mout)	6100.0	1961	1987	27	23	99.88	517.	18.48	20.88	23.33	27.21	32.30	0.971	0.740	0.624	0.495	15.96	19.38	29.08	49.11	114.04	243.16	357.80
140201	Nam Nan at Ban Sai	401.0	1967	1987	21	19	5.595	440.	0.285	0.343	0.413	0.570	0.930	1.011	0.740	0.604	0.455	0.286	0.374	0.644	2.165	6.028	14.757	22.40
140301	Nam San at dam site	703.0	1966	1987	22	20	8.238	370.	0.367	0.499	0.634	0.889	1.380	1.011	0.781	0.658	0.529	0.412	0.558	0.971	2.650	9.038	22.021	34.82
190101	Huai Mong at Ban Na Ang(Ban Phu)	1307.0	1957	1987	31	25	9.207	222.	0.076	0.090	0.115	0.169	0.281	0.550	0.000	0.000	0.000	0.000	0.018	0.116	0.692	4.399	26.810	51.29
230102r	Nam Ngum at Tha Ngon	16500.	1963	1970	8	*	755.7	1445.	*	*	*	*	*	*	*	*	*	84.43	92.95	123.4	281.6	1049.	2296.	2799.
320101	Se Bang Fai at Se Bang Fai	8560.0	1961	1985	25	22	435.4	1605.	20.90	22.92	24.24	26.99	33.97	0.984	0.862	0.801	0.733	20.86	23.36	29.92	67.76	509.5	1476.	2175.
340101	Huai Bang I at Ban Kham Soi	702.0	1964	1978	25	13	9.100	409.	0.160	0.214	0.276	0.436	0.666	0.828	0.360	0.122	0.000	0.061	0.131	0.386	1.278	6.447	23.96	47.47
350101	Se Bang Hieng at Ban Keng Done	19400.	1961	1977	17	14	508.2	827.	23.80	27.33	31.56	41.91	63.28	0.991	0.767	0.645	0.523	24.17	32.02	49.87	131.7	506.6	1429.	2311.
370104r	Nam Chi at Yasothon	43100.	1953	1965	13	12	249.8	183.	4.789	5.324	6.366	8.731	18.59	0.916	0.624	0.468	0.312	4.642	6.476	11.06	57.18	392.7	813.9	989.8
370107	Nam Chi at Ban Khai	6835.0	1968	1987	20	18	37.66	174.	0.630	1.031	1.418	2.184	3.804	0.903	0.584	0.428	0.258	0.651	1.047	2.445	7.104	30.46	87.63	126.2
370111	Nam Chi at Ban Tha Phra	13171.	1958	1987	30	28	61.07	146.	0.845	1.139	1.817	3.024	6.402	0.814	0.488	0.258	0.061	0.550	1.083	2.711	10.09	42.65	182.9	301.2
370204	Nam Pong at Ban Pha Nok Khao E29	945.0	1970	1987	18	11	23.75	793.	7.118	7.604	8.402	9.979	11.97	0.149	0.048	0.000	0.000	0.299	0.613	1.311	6.118	33.47	64.80	95.35
370502	Huai Phaniang at Ban Nang Mun	1260.0	1978	1987	10	*	8.149	204.	*	*	*	*	*	*	*	*	*	0.000	0.000	0.012	1.006	6.985	28.90	48.08
371101	Huai Rai at Ban Non Kiang	1370.0	1975	1987	13	10	14.30	329.	0.480	0.584	0.697	0.972	1.920	1.005	0.801	0.692	0.584	0.511	0.671	1.163	3.692	14.38	41.33	64.94
371203	Huai Pa Thao at Ban Tao Ton	326.0	1976	1987	12	10	4.062	393.	0.214	0.282	0.343	0.467	0.749	0.957	0.638	0.468	0.299	0.194	0.251	0.449	1.032	3.437	10.61	18.27
371509	Nam Yang at Ban Na Thom	3240.0	1979	1987	9	*	35.70	348.	*	*	*	*	*	*	*	*	*	0.302	0.779	1.850	5.075	28.67	113.8	201.1
380103r	Nam Mun at Ubon	104000.	1951	1965	15	10	677.9	206.	10.27	11.91	14.62	20.64	46.58	0.923	0.645	0.502	0.360	11.77	16.16	33.70	246.1	1068.	2063.	2592.
380110r	Nam Mun at Rasi Salai	44275.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
380112r	Nam Mun at Satuk	28275.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
380404	Lam Chae at Ban Nak Krat	498.0	1977	1987	11	*	5.841	370.	*	*	*	*	*	*	*	*	*	0.031	0.082	0.290	1.090	8.250	15.68	22.07
380602	Lam Phang Chu at Ban Nua Saphan	1094.0	1979	1985	7	*	7.656	221.	*	*	*	*	*	*	*	*	*	0.000	0.000	0.010	0.639	4.732	17.31	30.94
380705	Lam Chi at Ban Lum Din	4630.0	1979	1987	9	*	29.47	201.	*	*	*	*	*	*	*	*	*	0.137	0.259	0.922	4.063	29.18	88.97	170.9
380903	Lam Sieo Yai - Ban Ku Phra Ko Na	3230.0	1979	1987	9	*	18.04	176.	*	*	*	*	*	*	*	*	*	0.130	0.277	1.195	3.701	11.97	56.10	116.7
381001	Huai Thap Than-Ban Huai Thap Tan	2030.0	1972	1982	11	*	20.35	316.	*	*	*	*	*	*	*	*	*	0.061	0.128	0.314	0.810	7.248	66.42	141.9
381206	Huai Khayung at Ban Huai Khayung	2900.0	1979	1987	9	*	37.18	405.	*	*	*	*	*	*	*	*	*	0.516	0.777	1.465	7.370	43.96	119.2	183.7
381401	Lam Se Bok at Ban Tha Bo Baeng	2132.0	1979	1985	7	*	46.96	695.	*	*	*	*	*	*	*	*	*	0.033	0.157	0.490	4.427	51.08	150.8	228.1
381501	Lam Dom Yai at Det Udom	3340.0	1963	1981	19	16	44.35	419.	0.353	0.479	0.650	1.029	1.870	0.719	0.482	0.360	0.231	0.281	0.437	1.208	6.041	50.85	143.1	215.8
430101	Se Kong at Ban Khamon	29680.	1961	1970	10	*	1346.	1435.	*	*	*	*	*	*	*	*	*	183.6	215.0	293.7	527.3	1619.	3832.	5233.
550101	Stung Sangker at Treng	2135.0	1963	1973	11	*	69.63	1029.	*	*	*	*	*	*	*	*	*	2.854	3.517	6.319	20.22	81.39	182.4	268.3
610101	Stung Sen at Kompong Thom	14000.	1961	1970	10	*	185.2	417.	*	*	*	*	*	*	*	*	*	4.969	5.719	7.944	33.98	288.3	677.2	793.3

"r" after station number indicates that the catchment is now regulated - refer to Table 4.3 for current benchmark flow statistics

* indicates no information available

Table 4.2

Benchmark statistics for regulated catchments

Number	Name	Area km2	Start year	End year	No. yrs.	MAM yrs.	ADF m^3s^{-1}	MAR mm	Mean Annual Minimum (MAM) - m^3s^{-1} Duration - Days 10	30	60	120	180	- Ratio to MAM(60) Return period - Years 2	5	10	25	Flow Duration - m^3s^{-1} Percentiles 95%	90%	75%	50%	25%	10%	5%
10501	Mekong at Chiang Saen	189000.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11201	Mekong at Luang Prabang	268000.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11901	Mekong at Vientiane	299000.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11903	Mekong at Chiang Khan	292000.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12001	Mekong at Nong Khai	302000.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13101	Mekong at Nakhon Phanom	373000.	1979	1987	9	7	6744.	571.	1414.	1478.	1577.	1821.	2242.	0.996	0.847	0.772	0.691	1393.	1559.	2022.	3823.	10285.	17299.	20015.
13402	Mekong at Mukdahan	391000.	1979	1987	9	7	7271.	587.	1417.	1483.	1576.	1794.	2226.	1.003	0.921	0.881	0.833	1469.	1603.	1985.	3869.	11414.	19135.	21862.
13901	Mekong at Pakse	545000.	1979	1987	9	7	9764.	565.	1784.	1844.	1963.	2217.	2781.	1.009	0.928	0.888	0.847	1810.	1968.	2425.	5016.	15166.	25247.	29140.
14901	Mekong at Kratie	646000.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
40201	Nam Mae Kham - Ban Huai Yano Mai	203.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
50103	Mae Kok at Dam Site	5870.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
50105	Mae Kok at Ban Tha Ton	2980.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
50201	Mae Fang at Ban Tha Mai Liam	1800.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
70103	Nam Mae Ing at Thoeng	5700.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
120101	Nam Khan at Ban Mixay (Ban Mout)	6100.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
140201	Nam Nan at Ban Sai	401.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
140301	Nam San at dam site	703.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
190101	Huai Mong at Ban Na Ang(Ban Phu)	1307.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
230102	Nam Ngum at Tha Ngon	16500.	1979	1985	7	4	738.4	1411.	232.5	258.7	276.9	297.4	314.5	0.999	0.894	0.833	0.779	251.0	279.7	333.2	420.0	892.4	1772.7	2215.
320101	Se Bang Fai at Se Bang Fai	8560.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
340101	Huai Bang I at Ban Kham Soi	702.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
350101	Se Bang Hieng at Ban Keng Done	19400.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
370104	Nam Chi at Yasothon	43100.	1969	1987	19	17	179.2	131.	28.27	33.05	38.51	48.05	58.97	0.991	0.523	0.278	0.034	11.89	21.40	46.26	80.39	209.5	499.9	708.6
370107	Nam Chi at Ban Khai	6835.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
370111	Nam Chi at Ban Tha Phra	13171.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
370204	Nam Pong at Ban Pha Nok Khao E29	945.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
370502	Huai Phaniang at Ban Nang Mum	1260.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
371101	Huai Rai at Ban Non Kiang	1370.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
371203	Huai Pa Thao at Ban Tao Ton	326.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
371509	Nam Yang at Ban Na Thom	3240.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
380103	Nam Mun at Ubon	104000.	1971	1987	17	15	660.3	200.	66.99	72.13	77.79	88.61	114.1	0.964	0.781	0.686	0.584	61.62	69.97	93.42	195.6	907.0	2026.	2539.
380110	Nam Mun at Rasi Salai	44275.	1971	1987	17	15	216.7	154.	2.475	3.168	3.949	6.046	12.17	0.801	0.597	0.489	0.380	2.151	2.894	6.941	26.57	214.9	707.6	1061.
380112	Nam Mun at Satuk	28275.	1971	1987	17	13	75.32	84.	1.052	1.218	1.473	2.225	4.708	0.869	0.244	0.000	0.000	0.626	1.148	3.187	9.925	59.52	224.1	389.1
380404	Lam Chae at Ban Mak Krat	498.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
380602	Lam Phang Chu at Ban Hua Saphan	1094.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
380705	Lam Chi at Ban Lum Din	4630.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
380903	Lam Sieo Yai - Ban Ku Phra Ko Na	3230.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
381001	Huai Thap Than-Ban Huai Thap Tan	2030.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
381206	Huai Khayung at Ban Huai Khayung	2900.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
381401	Lam Se Bok at Ban Tha Bo Baeng	2132.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
381501	Lam Dom Yai at Det Udom	3340.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
430101	Se Kong at Ban Kheuon	29600.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
550101	Stung Sangker at Treng	2135.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
610101	Stung Sen at Kompong Thom	14000.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

* indicates no information

Table 4.3

Annual runoff in millimetres

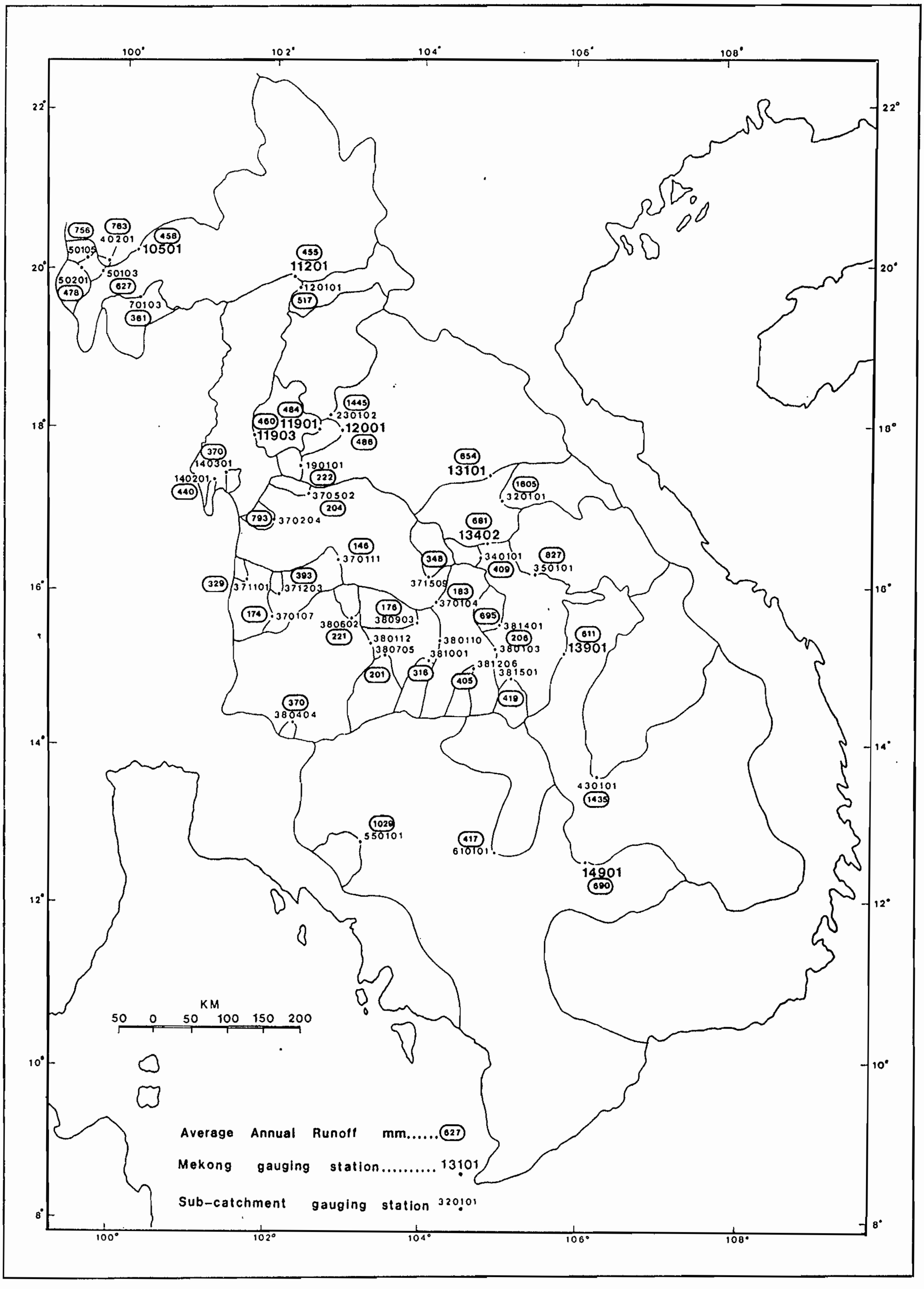

Figure 4.3

Distribution of Q75%

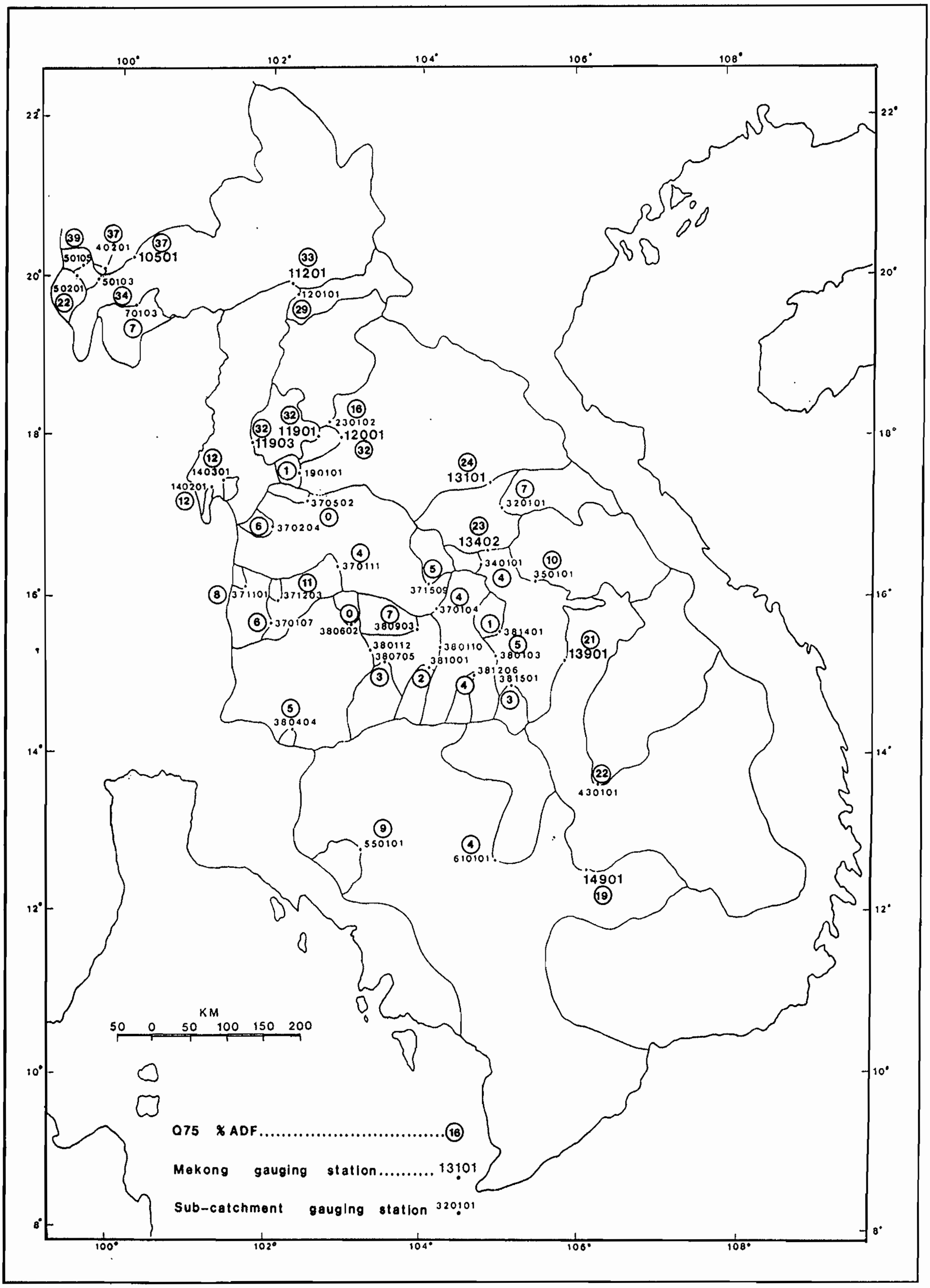

Figure 4.4

Distribution of MAM(60)%

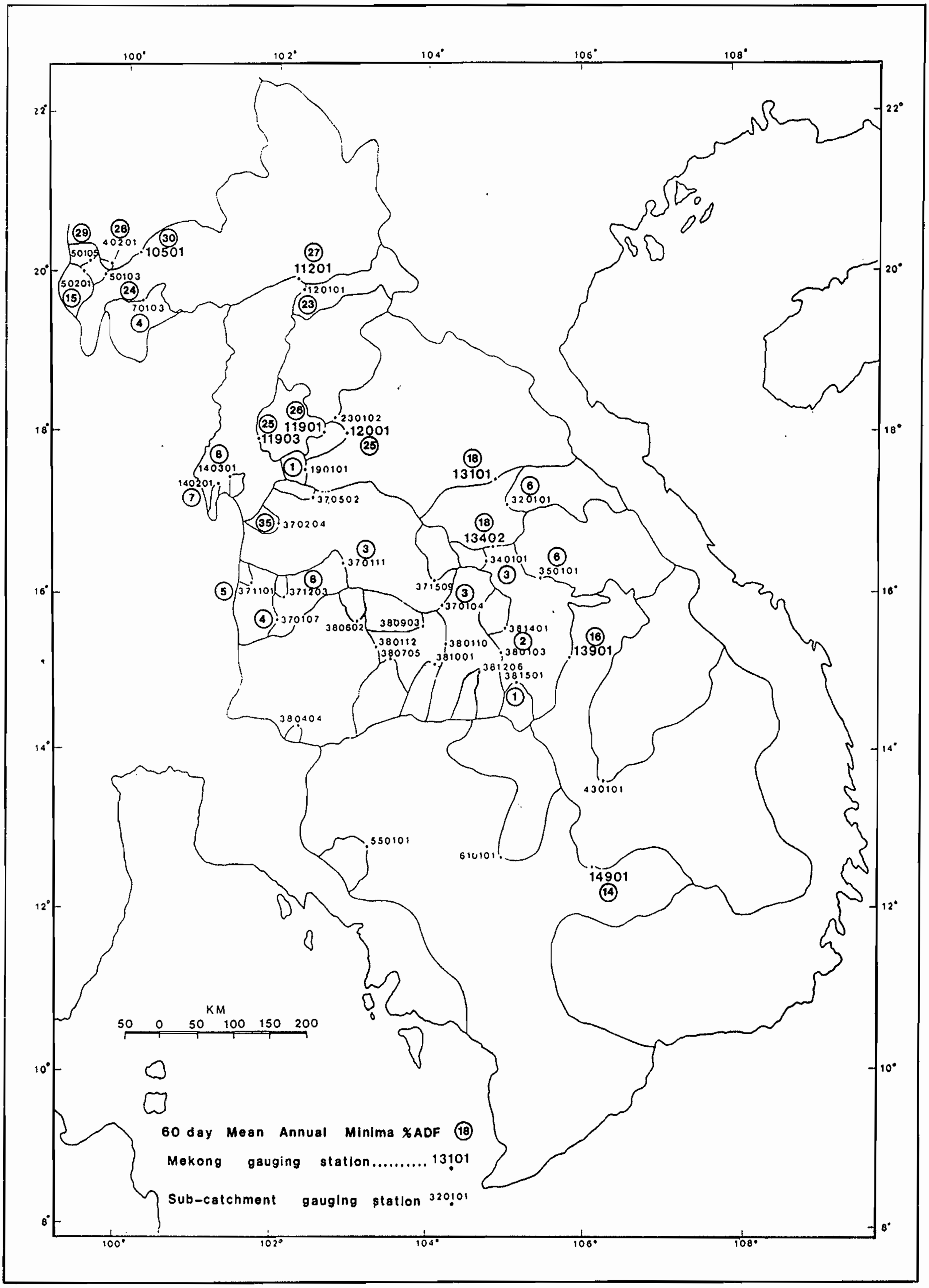

Figure 4.5

The ratio of the 60 day, T year return period, discharge to the mean annual 60 day minimum may be used to estimate the more extreme dry weather flow conditions. Table 4.2 shows consistent ratios on the main Mekong sites, but a greater variability elsewhere.

It is recommended that the flow indices shown on Table 4.2 are used as benchmark flow statistics for those stations indicated as being unregulated. Table 4.3 should be used for catchments which are now regulated. Thus significant departures, perhaps consistently above or below the mean MAM(D) and Q(P) values over a period of 5 years could be used as a threshold for carrying out a more detailed investigation of the nature and causes of the change. In general, if any changes are restricted to isolated catchments then the reason for change will be related to water resource development or land use change. However, if the change is more widespread then the change will be related to climatic fluctuation. It is important to note that as hydrological time series become longer, previous records will be broken and thus the occurrence of the most extreme event on record is not in itself an indication of a significant change in the regime. Procedures for evaluating the causes of a change in the dry season flow regime are described in Section 4.5.

4.4 Dry season flow estimation procedure

The benchmark flow statistics are useful both for detecting change and for providing dry season flow statistics to assist with the design of water resource schemes. For the latter application these values can only be used for design studies at or close to the sites of the gauging station.

A preliminary investigation was carried out to determine the feasibility of estimating dry season flows at sites without flow data from the characteristics of the upstream catchment area. These estimation equations, produced as a result of this study, are for use on the tributaries and not the main Mekong river. This is because the Mekong itself is well gauged. The data used in this part of the study thus exclude the main Mekong stations and the regulated flow records of tributary stations.

Section 4.1 describes how, for each flow measure such as the flow duration curve, a single "dry season flow index" was calculated. For example, how the 75 percentile was derived from the flow duration curve Q(75). Multiple regression analysis was used to relate these indices (Table 4.2) to the catchment characteristics described in Appendix C. The statistical package MINITAB, which has facilities for transformation, correlation, regression, analysis of residuals and standard plotting routines, was used for this analysis. The most useful predictive variables were catchment area, annual average rainfall and soil type. Details of the estimation procedure are described in Appendix B. The equations presented are of a preliminary nature and could be improved by using a finer resolution grid for the derivation of catchment characteristics, more flow records and further development of the design procedure. Also the error of estimation associated with some of the equations is quite high. Nevertheless the equations are a very useful as guideline for the many situations where flow data are not available.

4.5 Historical changes in dry season flows

4.5.1 Introduction

The dry season flow measures were used to identify changes in the flow regimes over time. This was done by examining mean annual runoff, annual values of the 60 day annual minima and by comparing flow duration curves over different periods. An initial inspection of the data indicated that the main changes were due to regulation of the river flow following the development of irrigation and hydropower reservoirs. An analysis of the natural flow records was also carried out to identify, firstly, whether there had been any change in the natural dry season flows and secondly, to relate dry season flows to seasonal rainfall.

4.5.2 Regulation

Table 4.4 gives details of the major reservoirs in the Lower Mekong Basin:

Details of major reservoirs

Name	Completion Year	Catchment Area km^2
Nam Ngum (Stage 1 30 MW total)	1971	8460
Nam Ngum (Stage 2 110 MW total)	1978	8460
Nam Ngum (Stage 3 150 MW total)	1985	8460
Nam Pong/Ubol Ratana (25 MW)	1966	11980
Lam Pao	1968	5960
Lam Dom Noi (24 MW)	1971	2097
Lam Nam Oon	1973	1100
Lam Takhong	1970	1430
Lam Phra Plerng	1967	807
Chulabhorn Dam (40 MW)	1972	545
Nam Pung Dam	1965	296

Table 4.4

Although Nam Ngum has been installed in three stages, Stage 2 was the most important development at this site when the installed generating capacity was increased from 30 MW to 110 MW and a reservoir of substantial storage was constructed. Although Stage 1 undoubtedly had some effect on the flows in the Nam Ngum itself, the reservoir storage capacity was not great so would have had a small, if not insignificant, influence on the flows in Mekong. Stage 3 involved an increase in installed generating capacity, with no further increase in storage. From the point of view of flows in the Mekong below the confluence of the Nam Ngum, Stage 2 completion in 1978 was therefore the most significant event. Since 1978 no major dams have been completed in the basin. The assessment of the effect of regulation on the Mekong below the Nam Ngum confluence therefore considers the natural record to include all data before 1966, and the status quo of current regulation to have been established in 1979. The mainstream stations affected are those downstream of Nong Khai.

Six flow records were identified as being downstream of one or more of these reservoirs with a sufficient length of record before and after impoundment to enable a comparison of the two regimes to be made. Table 4.5, based on information already presented in Tables 4.2 and 4.3, gives the percentage change in the flow indices due to regulation at these six sites.

Change in flow indices after regulation

Flow index	Station 13101	13402	13901	230102	370104	380103
MAR	-13%	-14%	-8%	-2%	-28%	-3%
MAM(10)	+10%	+4%	+18%	*	+490%	+552%
MAM(30)	+10%	+4%	+17%	*	+520%	+505%
MAM(60)	+10%	+5%	+18%	*	+505%	+432%
MAM(120)	+11%	+4%	+15%	*	+450%	+329%
MAM(180)	+9%	+2%	+12%	*	+217%	+145%
$AM(60)_2$	+9%	+5%	+18%	*	+554%	+455%
$AM(60)_5$	+9%	+12%	+26%	*	+407%	+544%
$AM(60)_{10}$	+7%	+15%	+31%	*	+259%	+627%
$AM(60)_{25}$	+6%	+20%	+38%	*	-34%	+763%
Q95	+10%	+10%	+23%	+197%	+156%	+423%
Q90	+9%	+6%	+17%	+201%	+230%	+332%
Q75	+9%	+1%	+10%	+170%	+318%	+177%
Q50	-6%	-13%	-8%	+49%	+46%	-21%
Q25	-16%	-16%	-13%	-15%	-47%	-15%
Q10	-14%	-13%	-8%	-23%	-39%	-2%
Q5	-15%	-15%	-10%	-21%	-28%	-2%

* indicates insufficient data for annual minima calculation for station 230102

Station Number	Station name
13101	Mekong at Nakhon Phanom
13402	Mekong at Mukdahan
13901	Mekong at Pakse
230102	Nam Ngum at Tha Ngon
370104	Nam Chi at Yasothon
380103	Nam Mun at Ubon

Table 4.5

The results of Table 4.5 show:

(1) A decrease in the mean flow (MAR, the mean annual runoff) at all sites. The total annual flow at all sites has therefore been reduced. This is to be expected since there will always be some losses as a result of reservoir operation, whether they are just evaporation from the reservoir surface in the case of hydropower or combined with the much higher losses due to the consumptive use of water in irrigation schemes.

(2) At all sites the mean annual minimum (MAM) discharges have been increased for all durations. This again is an effect which can be explained by the conventional operation of dams, storing water in the wet season for controlled release throughout the year. Where major irrigation schemes abstract or divert the regulated flow from a reservoir, the effect may not be so clear. The gauge at Yasothon on the Nam Chi (370104) is located downstream of the large scale irrigation schemes at Nam Pong/Nong Wai and Lam Pao. There is also extensive pumped irrigation upstream of the gauge. Whilst the MAM for 370104 have increased after regulation, MAR shows a high percentage reduction. This is probably due to increased consumptive use of water on the irrigation schemes. If irrigation efficiencies are improved in the future, there would be less water draining back into the river channels, and there would be a tendency for the MAM to fall.

(3) The annual minima at different return periods have, in general, shown an increase for the same reason. The reduction in $AM(60)_{25}$ for Nam Chi at Yasothon is probably the result of estimation error at the high return period.

(4) Similarly discharges for given flow percentiles from the flow duration curve have increased at low flows (at or below Q75), and decreased in the higher flow range (at or above Q25).

(5) High flows have been reduced at all sites as indicated by the reduction of discharges at or above Q25. Again, this is an expected result of any dam operation.

These results confirm the expected effect of regulation on downstream river flows for all tributaries with enough data to make the comparison. However the most surprising result is the effect of reservoir operation on the Mekong itself. Pakse, which has excellent flow data (Section 3.2), shows an 18% increase in the 60 day mean annual minimum, MAM(60), and a 10% increase in Q75 with an overall loss in annual runoff volume of 8%.

4.5.3 Climate

Other than regulation, discussed above, it is possible for the flow regime in a catchment to change due to a climatic variability. Unlike regulation, where there is a definite commissioning date, climatic changes are gradual, and happen slowly over many years. For this reason, and the fact that changes due to climate are small compared to the natural variability from year to year, they are more difficult to identify than changes due to regulation.

Climatic change is a complex subject and can manifest itself in many different ways. In this study we are concerned with water resources and concentrated on the dominant variable in that field, rainfall. Although there are many different ways in which the rainfall or year to year variability of rainfall can change (Parker and Folland, 1988), we have considered the simplest, annual total rainfall.

In order to see if there has been a change in the Lower Mekong Basin in recent years, annual total rainfall over the following areas was estimated using the computer program RAINS described in Section 2.4:

(1) The northern part of Thailand inside the Mekong basin.

(2) The northeast of Thailand inside the Mekong basin.

(3) Laos inside the Lower Mekong Basin.

(4) Kampuchea inside the Lower Mekong Basin.

(5) The Mekong delta in Vietnam.

(6) The whole of the Lower Mekong Basin.

Figure 4.6(a-f) shows these annual rainfall totals plotted as a time series from 1950 to 1986 for each region with the mean annual rainfall identified. From this figure it is clear that there has been no substantial change in annual rainfall over this period of time in any region. Long term climatic trends, measured in terms of annual total rainfall, are not apparent over the basin and therefore will not affect river flows.

4.5.4 Land use and irrigation

The remaining possibilities for change in flow regime are change in land use and increases in irrigation demand. Like climate discussed above, these factors are normally small compared to the effect of a major dam, they happen gradually over a period of time and are masked by the natural year to year variability of dry season flows.

In 1982, the first phase of the UK supported water balance studies (Institute of Hydrology, 1982), the effect of land use change on water resources was studied; it was concluded that there was insufficient evidence to identify changes in flow regime. Now, in 1988, more information on the change in land use over time is becoming available in a convenient computer compatible form at the Mekong Secretariat. Land use information is being transferred onto the Geographic Information System called ARC-INFO. This programme of work is expected to take another one or two years. When complete, this should form an excellent database from which land use change can be quantified. Also by that time there will be another 7 - 8 years of flow data at each site to assist with the study. It would then be possible to establish more rigorously any links between changes in land use and flow regime.

The actual consumptive use of water on an irrigation scheme should, in theory, be easy to estimate. Increases in area lead to increased use, and hence a decrease in dry season flows when crop demands are highest. In practice however, it is difficult to calculate actual consumptive use.

Annual rainfall time series (1950-86)

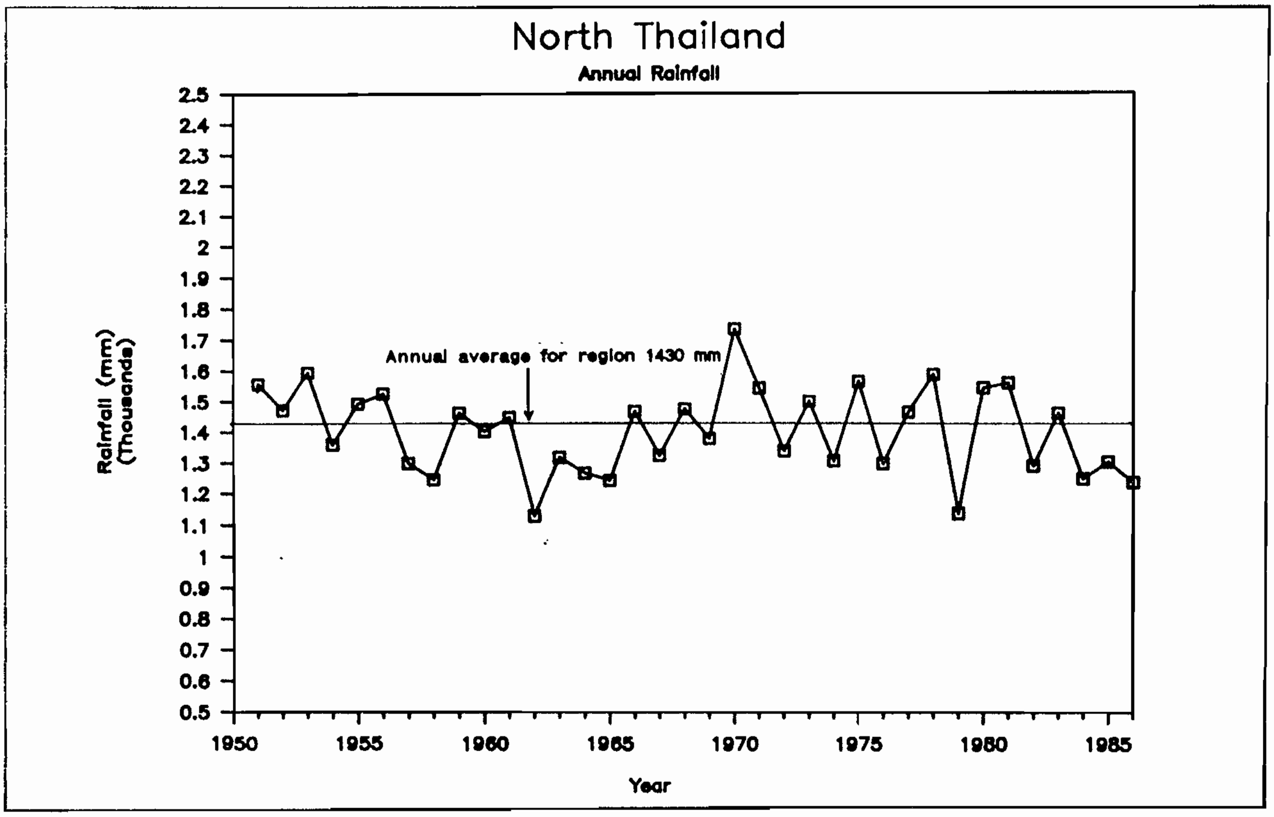

Figure 4.6a

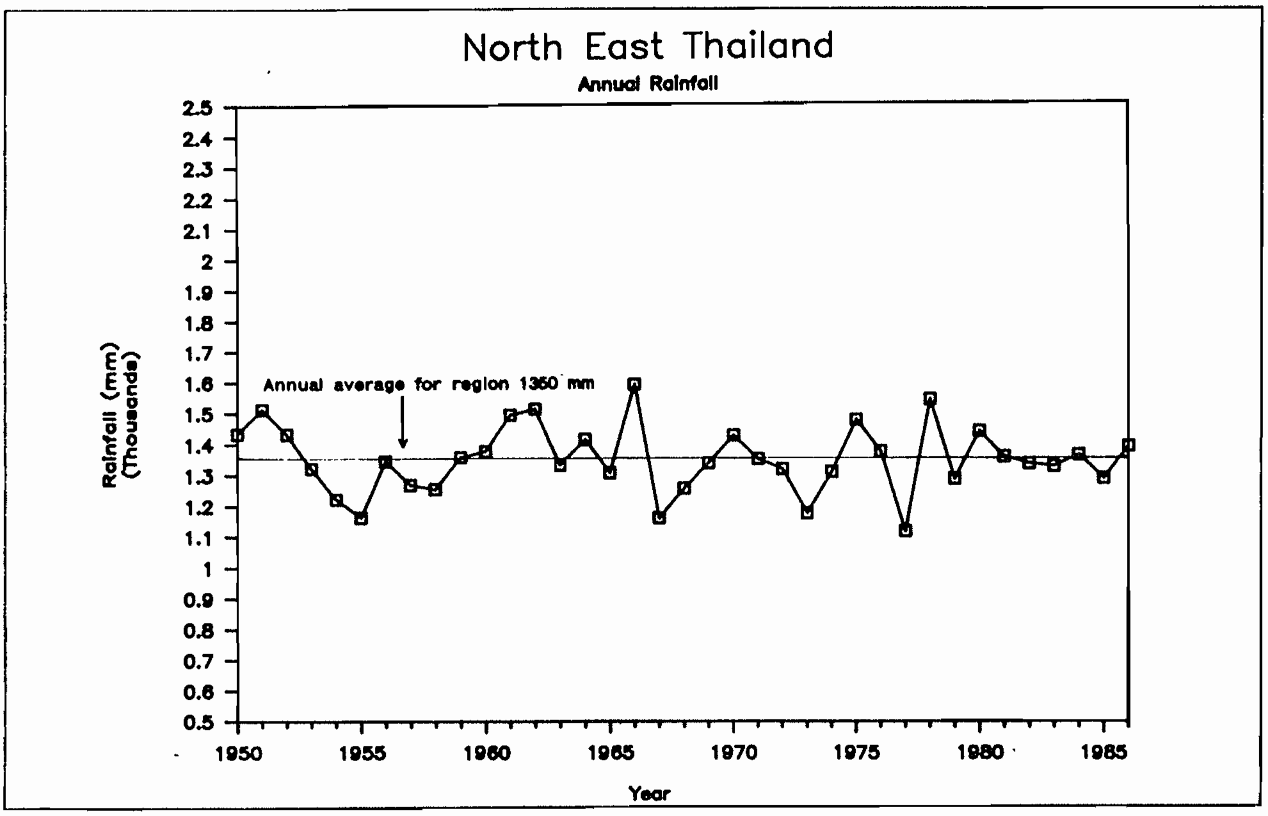

Figure 4.6b

Annual rainfall time series (1950-86)

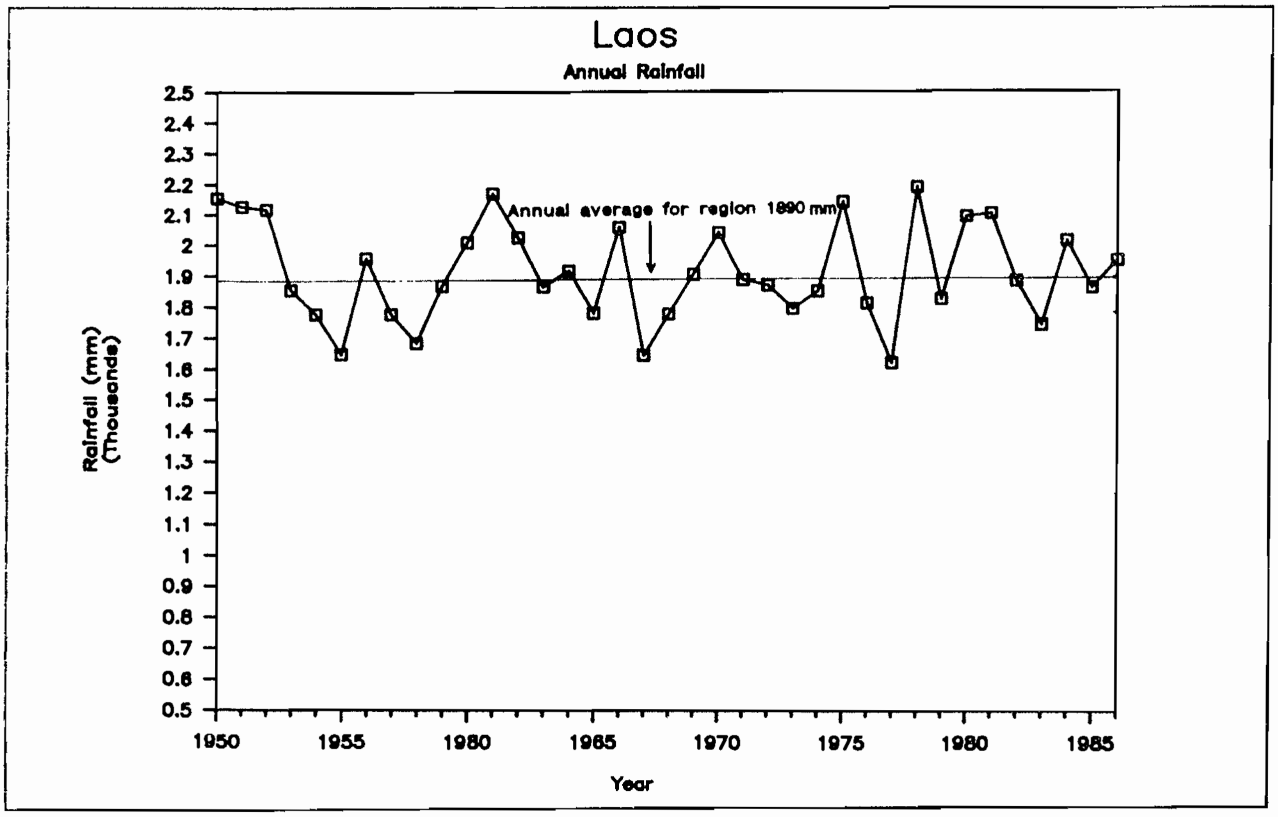

Figure 4.6c

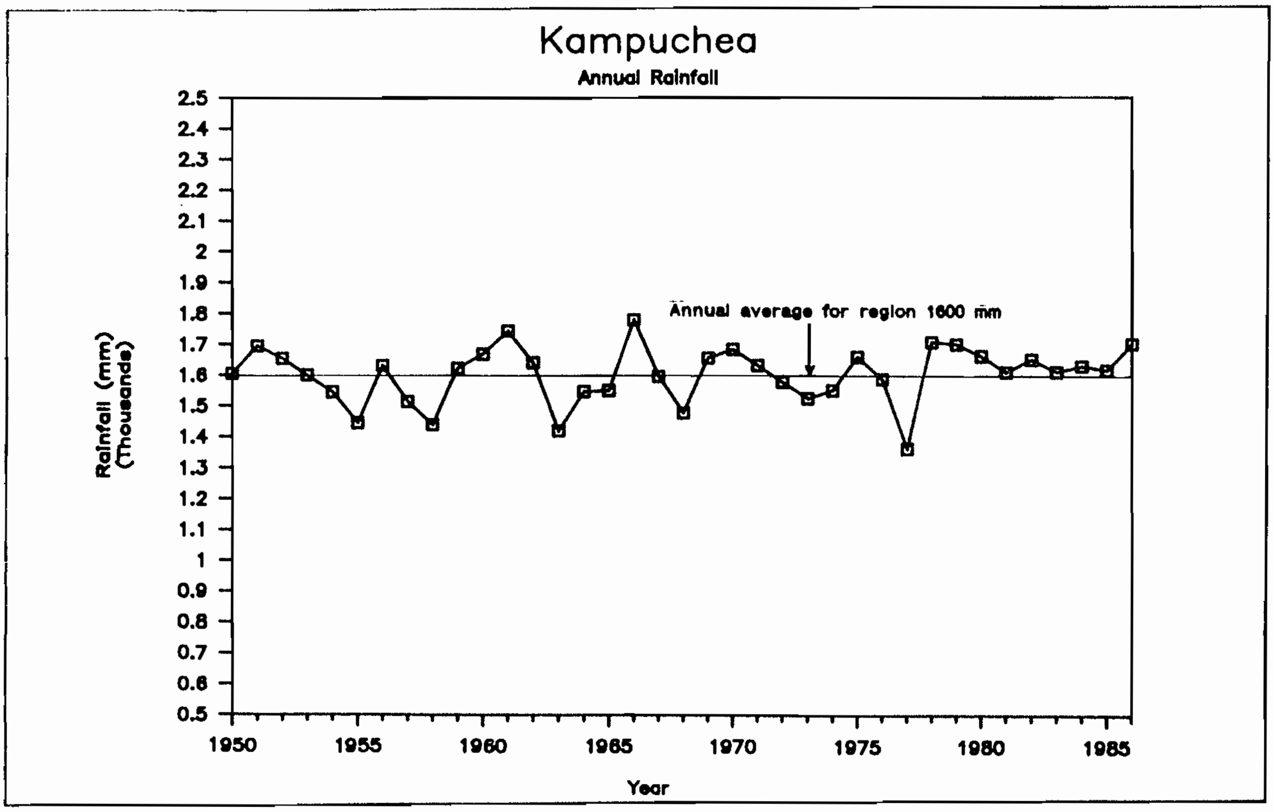

Figure 4.6d

Annual rainfall time series (1950-86)

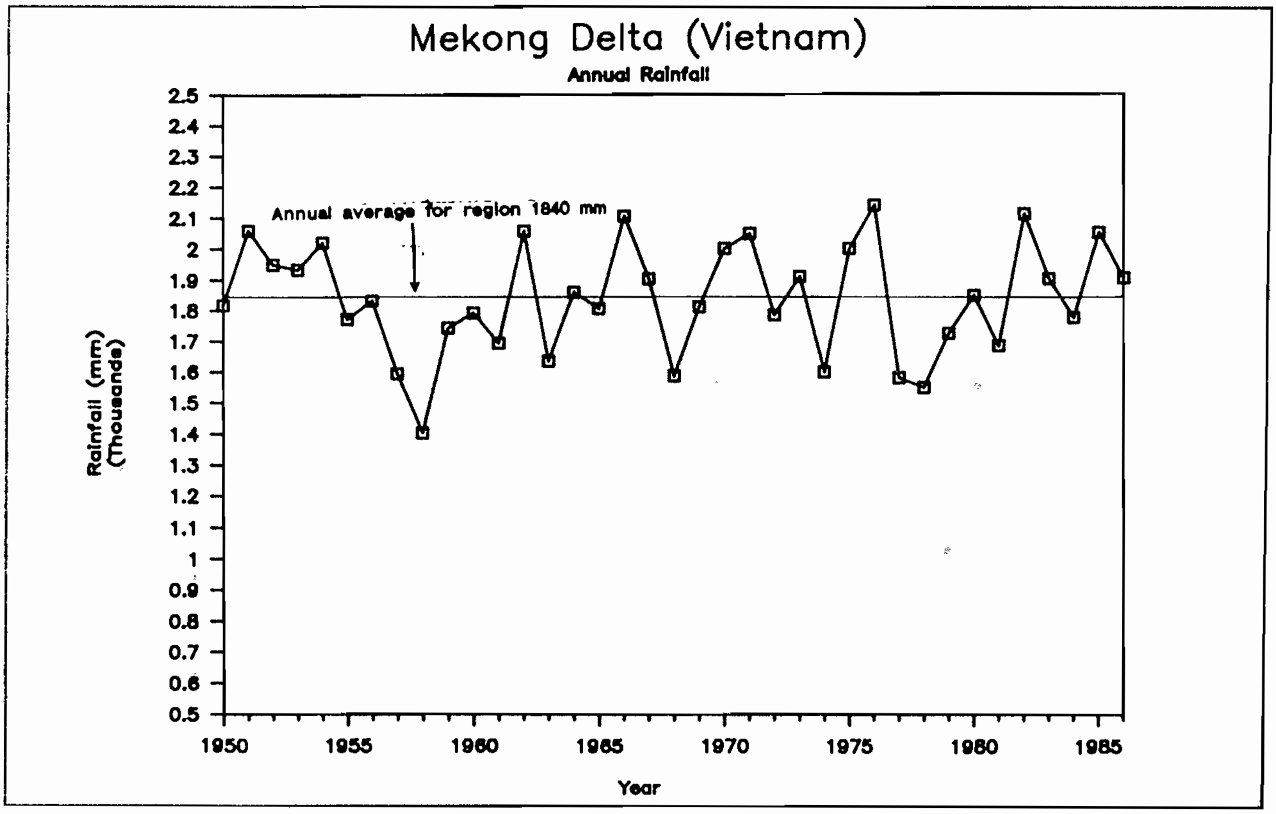

Figure 4.6e

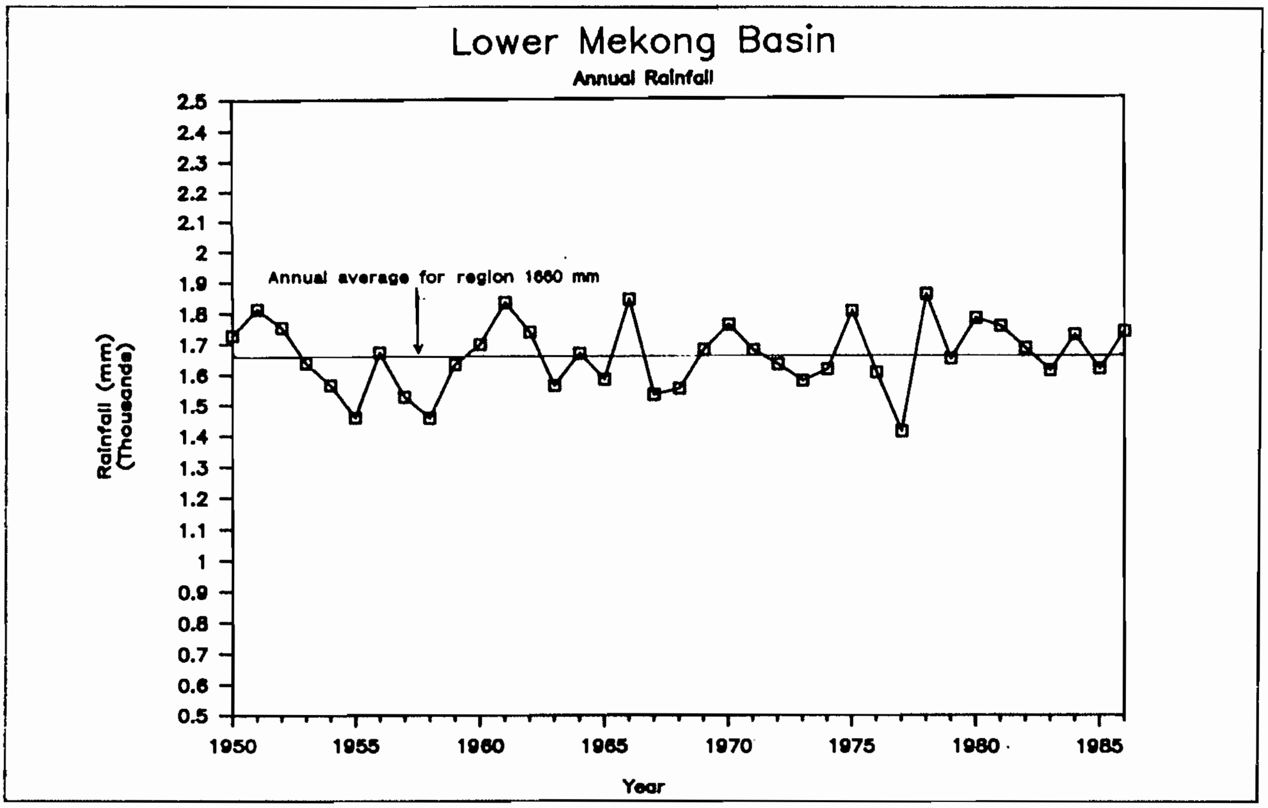

Figure 4.6f

The locations and irrigable area of the main types of irrigation scheme are well documented. The actual consumptive demands of these schemes are more difficult to quantify, as in practice few measurements of scheme performance are made. Scheme demands can be estimated using appropriate basin simulation models, but this requires knowledge of scheme operation, cropping patterns, application efficiencies and so on.

Without easy access to such quantative information of land use and irrigation demands, one simple but subjective way to look for change in behaviour of dry season flows is to examine the time series of annual minima. If there is a tendency for annual minima to increase with time, then this should be apparent from an inspection of this time series. In order that trends over different types of catchment could be studied, the catchments were divided into four groups given in Table 4.6 below:

Catchment grouping

Group number	Description	Stations
1	Tributary - regulated	230102 370104 380103 380110 380112
2	Mekong - regulated	13101 13402 13901 14901
3	Mekong - natural	10501 11201 11901 11903 12001
4	Tributary - natural	All remaining stations

Table 4.6

For each station the 60 day duration annual minimum series was standardised by its mean giving a non-dimensional time series of ratios of annual minimum in each year to the mean. Series from each station could then be compared directly without being influenced by the size of catchment. Furthermore, the non-dimensionality enabled average annual minima time series to be derived for each of the four groups; these are shown in Figures 4.7(a-d).

Figure 4.7a, for stations in Group 1, clearly shows the increase in annual minima resulting from regulation. The start of major reservoir construction in the early 1960's is also evident.

Figure 4.7b, for stations in Group 2, shows a steady increase in annual minima since the late 1960's for Mekong stations affected by regulation. However, when compared with the long historic sequence available at these sites, the recent increase in annual minima due to regulation is of the same order as has occurred naturally in the past.

Grouped annual minima

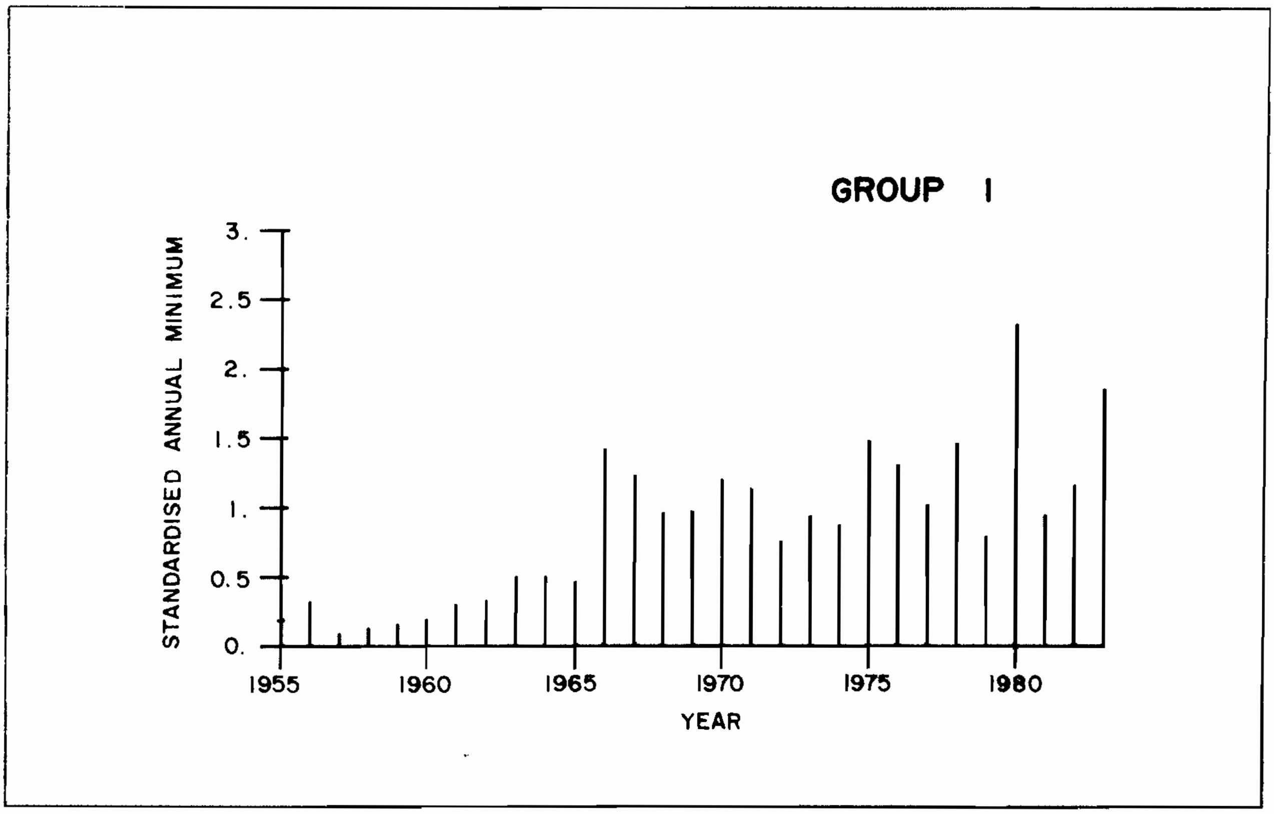

Figure 4.7a

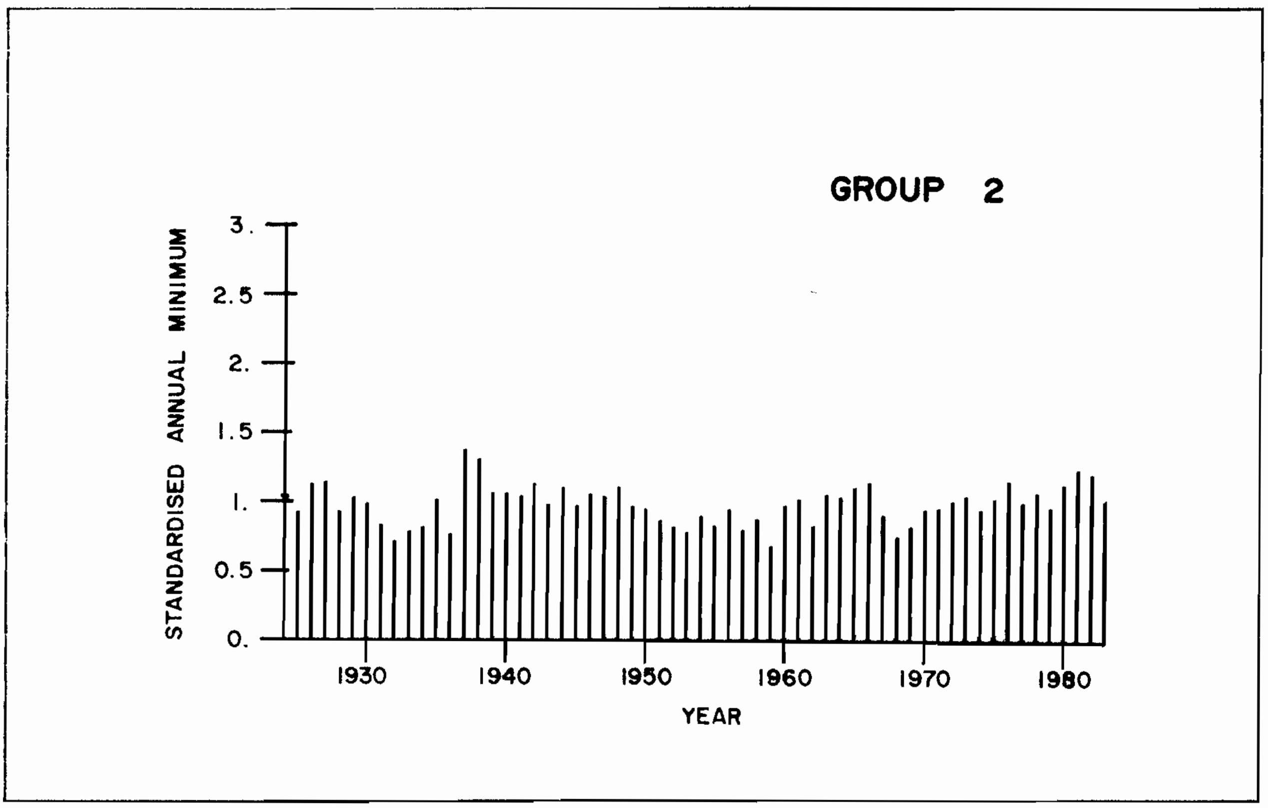

Figure 4.7b

Figure 4.7c, for stations in Group 3, and Figure 4.7d (Group 4), show no sustained change in annual minima on natural tributary and natural mainstream catchments.

Similar time series of standardised annual minima were produced for individual stations rather than groups of stations to investigate change on individual catchments. In general these plots indicated that stations within a group behaved very much as the group itself. The variation of annual minima with time for individual stations was, as might be expected, greater than for the group as a whole.

The main problem with detecting change due to land use and pumped irrigation is that the natural variation of annual minima from year to year is greater than the more subtle change in flow regime introduced by a gradual change in land use or pumped irrigation. However if some of the natural variation in annual minima from year to year could be explained by climatic factors then this would help in identifying changes due to land use or pumped irrigation.

Rainfall on the catchment during the preceding wet season was considered to be one possible factor which might affect the following dry season annual minimum. This hypothesis was tested on three different catchments:

(1) Station 320101, the Se Bang Fai at Se Bang Fai. This station is located in a relatively wet area in Laos (mean annual rainfall 1820 mm).

(2) Station 370111, the Nam Chi at Ban Tha Phra. This station is located in the relatively dry area of northeast Thailand (mean annual rainfall 1140 mm).

(3) The Mekong between station 11901, Vientiane, and station 13901, Pakse (mean annual rainfall 1680 mm). Here the annual minima was calculated as the Pakse annual minimum minus the Vientiane annual minimum.

The computer program RAINS, described in Section 2.4, was used to estimate monthly rainfall over these three catchments for the period of record of annual minima (starting in 1950 for the Vientiane-Pakse basin). In each case, although there was a reasonable correlation between seasonal rainfall and seasonal runoff, there were insignificant correlations between rainfall and annual minima. Various combinations of rainfall were tried; preceding year annual total, seasonal rainfall based on different months in the preceding wet season and rainfall during the current dry season. Unfortunately no significant and consistent correlation could be found between annual minima and any of the rainfall measures described. The conclusion drawn from this part of the study was that annual minima cannot be satisfactorily predicted from these rainfall measures.

Consequently it appears that changes in dry season flows due to land use and pumped irrigation schemes can only be detected from a long time series of annual minima and looking for a significant departure above the mean annual minimum. Although, as discussed above, the study of annual minima was able to identify the major changes due to regulation. There was insufficient evidence to detect changes due to land use or pumped irrigation, either on the four groups considered, or on stations individually. Nevertheless Section 4.6 below describes a simple procedure which may be used on any catchment to assist with the detection of change in dry season flow regime in the future.

Grouped annual minima

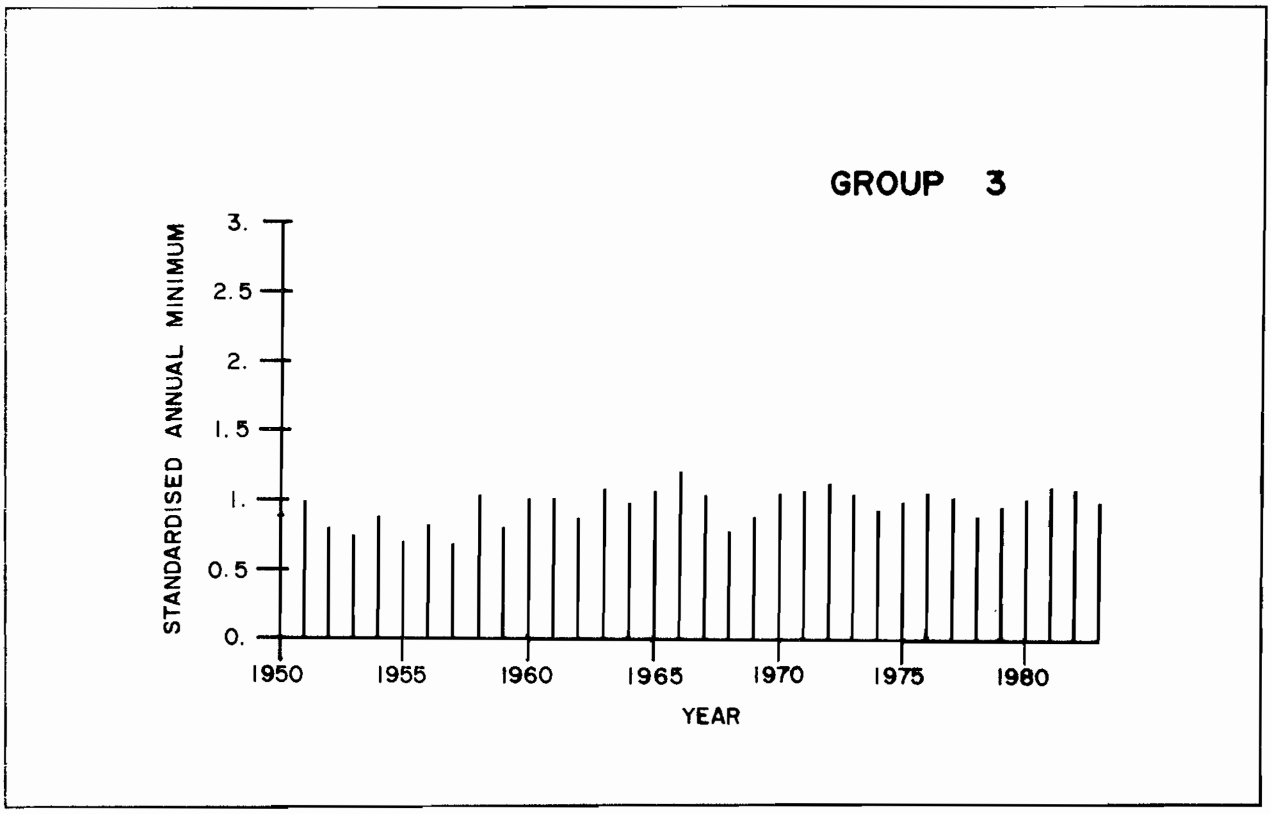

Figure 4.7c

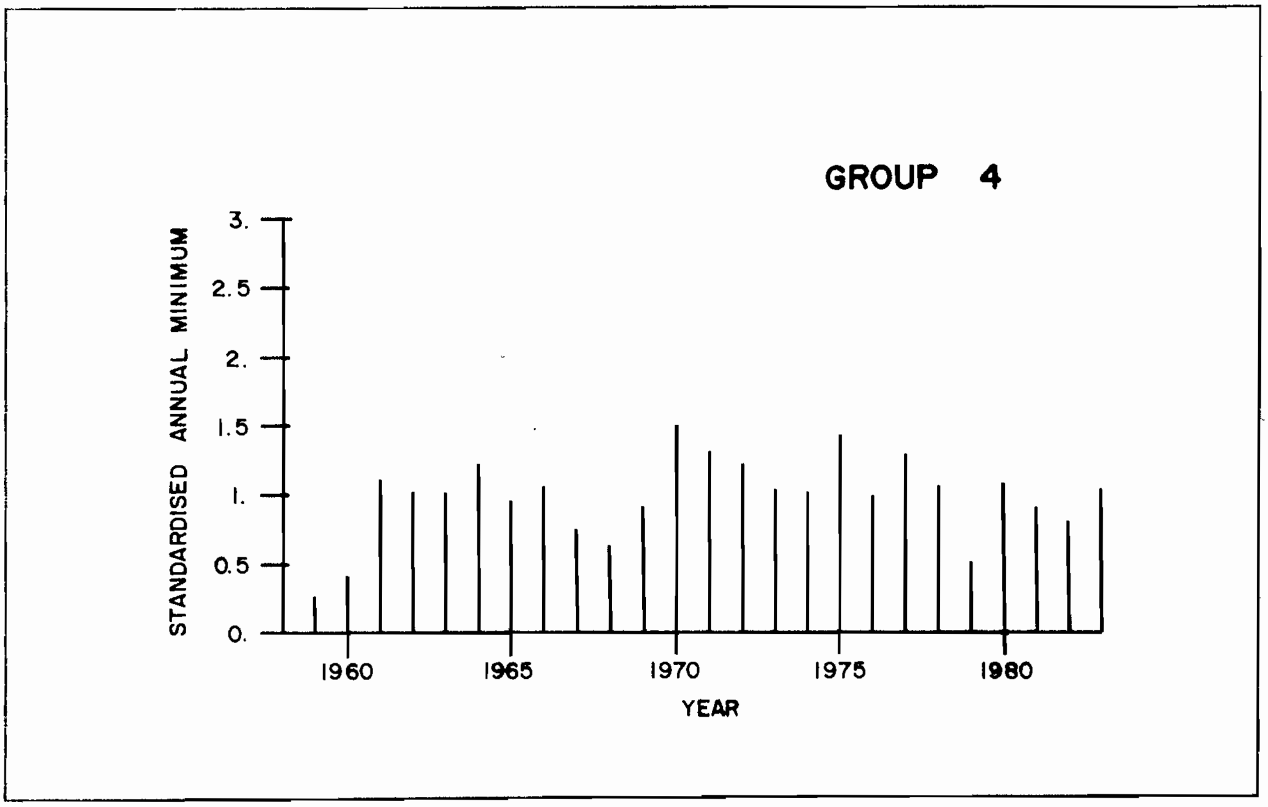

Figure 4.7d

4.6 Detecting future change.

Section 4.5 concluded that there has been a change in dry season flow regime on those catchments affected by major reservoirs upstream. To date there has been no apparent change due to climate in terms of annual rainfall and there is insufficient evidence at present to determine the effect of land use change and pumped irrigation on river flows.

This section describes a procedure which may be used in the future to assist with the recognition of change. This simple method is based upon the procedure described in Section 4.5.4, where the 60 day duration annual minimum time series is standardised by the mean. This standardised time series is then plotted and subjective judgement used to identify change. In this way catchments may be considered individually, grouped as in Table 4.6 or grouped in other ways such as those catchments which have experienced the same land use change.

Benchmark dry season flow statistics have been established for all stations considered in this study (Section 4.3). It is proposed that future change be measured against these. Table 4.7 gives the benchmark MAM(60) statistic for all catchments with sufficient data, using the new regulated value of MAM(60) where appropriate. Table 4.7 also gives the start year of the current flow regime and indicates whether it is still a natural catchment or whether it is regulated. For natural catchments the start year is the beginning of the hydrological record; in the case of catchments which are now regulated it is the year after the most recent major dam construction.

The procedure for investigation of change on any catchment is based on the 60 day duration annual minimum series and is as follows:

(1) Derive the 60 day annual minimum series in m^3s^{-1} from the start year given in Table 4.7 to the current year. The annual minima should be found in the water year starting on 1st September and running through to 31st August of the following year.

(2) Standardise this annual minimum series by dividing each minimum with the benchmark mean annual minimum given in Table 4.7.

(3) Plot this series of standardised annual minima and look for a trend.

(4) A trend may be more easily identified by plotting the cumulative departure from the mean annual minimum as a time series.

(5) Since standardised annual minima have been used, catchments may be grouped to look for a change over particular types of catchment, for example those experiencing similar changes in land use.

A computer program, CHANGE, has been written to carry out this analysis and plotting. CHANGE is described in Appendix A.

Benchmark MAM(60)'s and start year

Station Number	Station name	Benchmark MAM(60) $m^3 s^{-1}$	Benchmark Year	
10501	Mekong at Chiang Saen	818.	1960	N
11201	Mekong at Luang Prabang	1037.	1950	N
11901	Mekong at Vientiane	1174.	1913	N
11903	Mekong at Chiang Khan	1045.	1967	N
12001	Mekong at Nong Khai	1186.	1969	N
13101	Mekong at Nakhon Phanom	1577.	1979	R
13402	Mekong at Mukdahan	1576.	1979	R
13901	Mekong at Pakse	1963.	1979	R
14901	Mekong at Kratie	# 2470.	1979	R
40201	Nam Mae Kham - Ban Huai Yano Mai	1.43	1975	N
50103	Mae Kok at Dam Site	28.5	1968	N
50105	Mae Kok at Ban Tha Ton	20.9	1970	N
50201	Mae Fang at Ban Tha Mai Liam	4.11	1970	N
70103	Nam Mae Ing at Thoeng	2.63	1969	N
120101	Nam Khan at Ban Mixay (Ban Mout)	23.3	1961	N
140201	Nam Man at Dan Sai	0.41	1967	N
140301	Nam San at dam site	0.634	1966	N
190101	Huai Mong at Ban Na Ang(Ban Phu)	0.115	1957	N
230102	Nam Ngum at Tha Ngon	*	1979	R
320101	Se Bang Fai at Se Bang Fai	24.2	1961	N
340101	Huai Bang I at Ban Kham Soi	0.276	1964	N
350101	Se Bang Hieng at Ban Keng Done	31.6	1961	N
370104	Nam Chi at Yasothon	38.5	1969	R
370107	Nam Chi at Ban Khai	1.42	1968	N
370111	Nam Chi at Ban Tha Phra	1.82	1958	N
370204	Nam Pong at Ban Pha Nok Khao E29	8.40	1970	N
370502	Huai Phaniang at Ban Wang Mun	*	1978	N
371101	Huai Rai at Ban Non Kiang	0.697	1975	N
371203	Huai Pa Thao at Ban Tao Ton	0.343	1976	N
371509	Nam Yang at Ban Na Thom	*	1979	N
380103	Nam Mun at Ubon	77.8	1971	R
380110	Nam Mun at Rasi Salai	3.95	1971	R
380112	Nam Mun at Satuk	1.47	1971	R
380404	Lam Chae at Ban Mak Krat	*	1977	N
380602	Lam Phang Chu at Ban Hua Saphan	*	1979	N
380705	Lam Chi at Ban Lum Din	*	1979	N
380903	Lam Sieo Yai - Ban Ku Phra Ko Na	*	1979	N
381001	Huai Thap Than-Ban Huai Thap Tan	*	1972	N
381206	Huai Khayung at Ban Huai Khayung	*	1979	N
381401	Lam Se Bok at Ban Tha Bo Baeng	*	1979	N
381501	Lam Dom Yai at Det Udom	0.650	1963	N
430101	Se Kong at Ban Khmuon	*	1961	N
550101	Stung Sangker at Treng	*	1963	N
610101	Stung Sen at Kompong Thom	*	1961	N

R = Currently regulated N = Currently natural
# = estimated using model (Section 5)
* = insufficient record to define MAM(60) at present

Table 4.7

Table 4.8 shows this annual minima analysis for Chiang Saen and Figure 4.8 shows the results plotted as recommended. Since the annual minima are standardised, the annual minima will plot with a mean value of 1 up to the most recent year available to this study. Similarly the cumulative departure from the mean will return to zero at this date (in Table 4.8 the cumulative departure from the mean does not return exactly to zero because the standardising MAM(60) has been rounded to three figures - 818 m^3s^{-1}). In the future, when each new year of data becomes available, this plot and similar plots for other stations, should be updated. The plot of cumulative departure from the mean may be interpreted as follows:

(1) Horizontal or near horizontal sections of the graph indicated no change.

(2) Sections of the plot with a descending slope indicate a trend showing a reduction in annual minima with time.

(3) Sections of the plot with an ascending slope indicate a trend showing an increase in annual minima with time.

(4) Future trends should only be inferred after studying the historic section of the plot to determine the natural variability of the river.

Plots similar to Figure 4.8 were produced for all stations with sufficient data listed in Table 4.7. For many stations there appears to be no positive increase or decrease in dry season flows with time. For the remaining stations there could be a trend, but the length of record is insufficient to indicate whether the trend is real or just part of the natural variability of river flow. These plots have been left with the Mekong Secretariat and it is recommended that they be updated and reviewed for change on an annual basis.

If Table 4.8 and Figure 4.8 are updated as recommended, this should provide the first indication of a change in dry season flow regime on the Mekong as a result of the Manwan hydropower project in the People's Republic of China (Section 1.).

An interesting test of this method was to apply it retrospectively to stations which have been identified as undergoing a change in dry season flow regime. Section 4.5.2 identified changes in rivers affected by major irrigation schemes upstream and changes in the Mekong downstream of the Nam Ngum confluence.

Figure 4.9 shows the method applied to data from the Nam Chi at Yasothon which was regulated in 1965. Annual minima have been standardised by the natural MAM(60) derived in the period before regulation. Note the large jump in 60 day annual minimum flows after 1965 and the sudden rise in cumulative departure from the mean. The abrupt change in dry season flow regime is clearly illustrated.

Similarly Figure 4.10 shows the method applied to the Mekong at Pakse with the annual minima standardised by the natural MAM(60) derived from the period before regulation on the tributaries in 1965. Here the increase in 60 day annual minima after 1965 is not so obvious as for the Chi at Yasothon, but the plot of cumulative departure from the mean demonstrates this trend quite clearly. The regulation at Nam Ngum is mainly responsible for this change. Note however that there was a substantial increase in departure from the mean in the 1940's; it is only with the 20 years of data now available from 1965 that the recent increase in dry season flows has been identified as a real change at Pakse and not just part of the natural variability of the river.

Annual minimum analysis - Chiang Saen

Station number : 10501
Station name : Mekong at Chiang Saen
Mean annual minimum : 818 $m^3 s^{-1}$

Year	Annual minimum (cumecs)	Annual minimum (standardised)	Cumulative departure from the mean
1960	774.000	0.946	-0.054
1961	748.017	0.914	-0.139
1962	644.017	0.787	-0.352
1963	817.817	1.000	-0.352
1964	723.200	0.884	-0.468
1965	825.450	1.009	-0.459
1966	936.700	1.145	-0.314
1967	936.333	1.145	-0.169
1968	640.983	0.784	-0.386
1969	740.000	0.905	-0.481
1970	919.167	1.124	-0.357
1971	901.367	1.102	-0.255
1972	962.633	1.177	-0.079
1973	855.317	1.046	-0.033
1974	815.917	0.997	-0.036
1975	816.783	0.999	-0.037
1976	854.000	1.044	0.007
1977	804.467	0.983	-0.010
1978	706.433	0.864	-0.146
1979	845.833	1.034	-0.112
1980	832.217	1.017	-0.095
1981	852.517	1.042	-0.052
1982	816.933	0.999	-0.054
1983	867.067	1.060	0.006
1984	772.217	0.944	-0.050
1985	867.250	1.060	0.011
1986			
1987			
1988			
1989			
1990			

Table 4.8

Standardised annual minima - Mekong at Chiang Saen

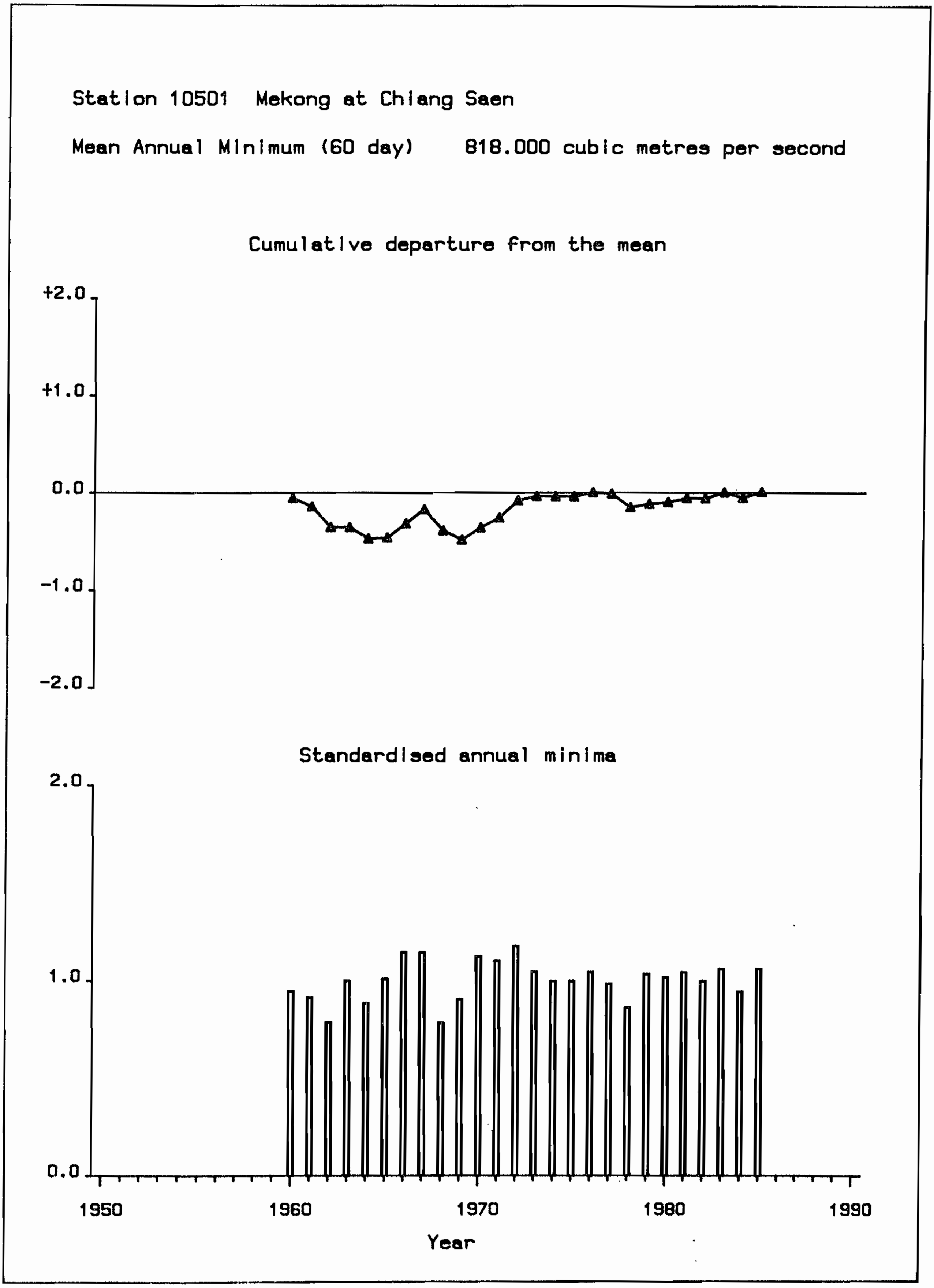

Figure 4.8

Standardised annual minima - Nam Chi at Yasothon

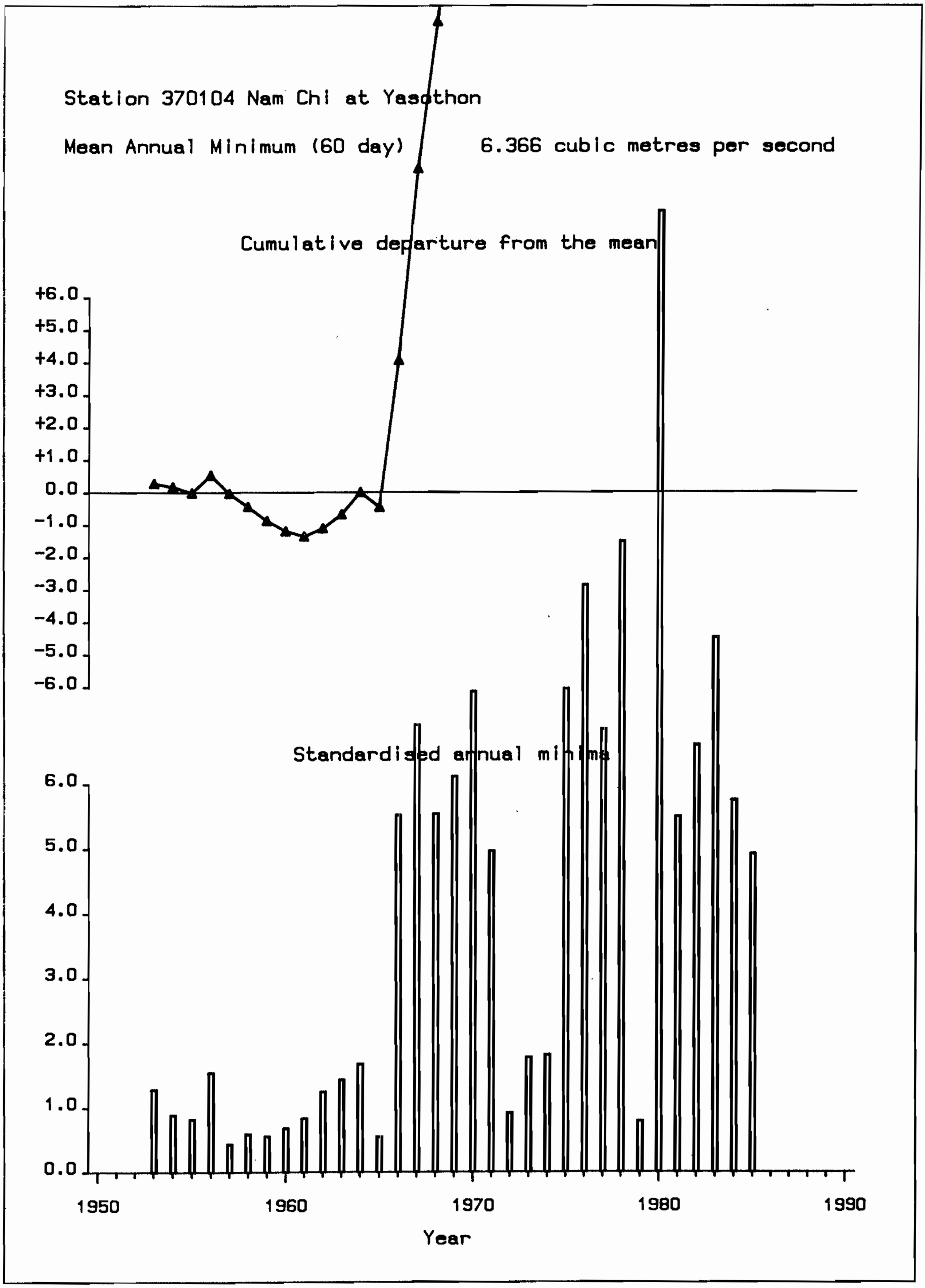

Figure 4.9

Standardised annual minima - Mekong at Pakse

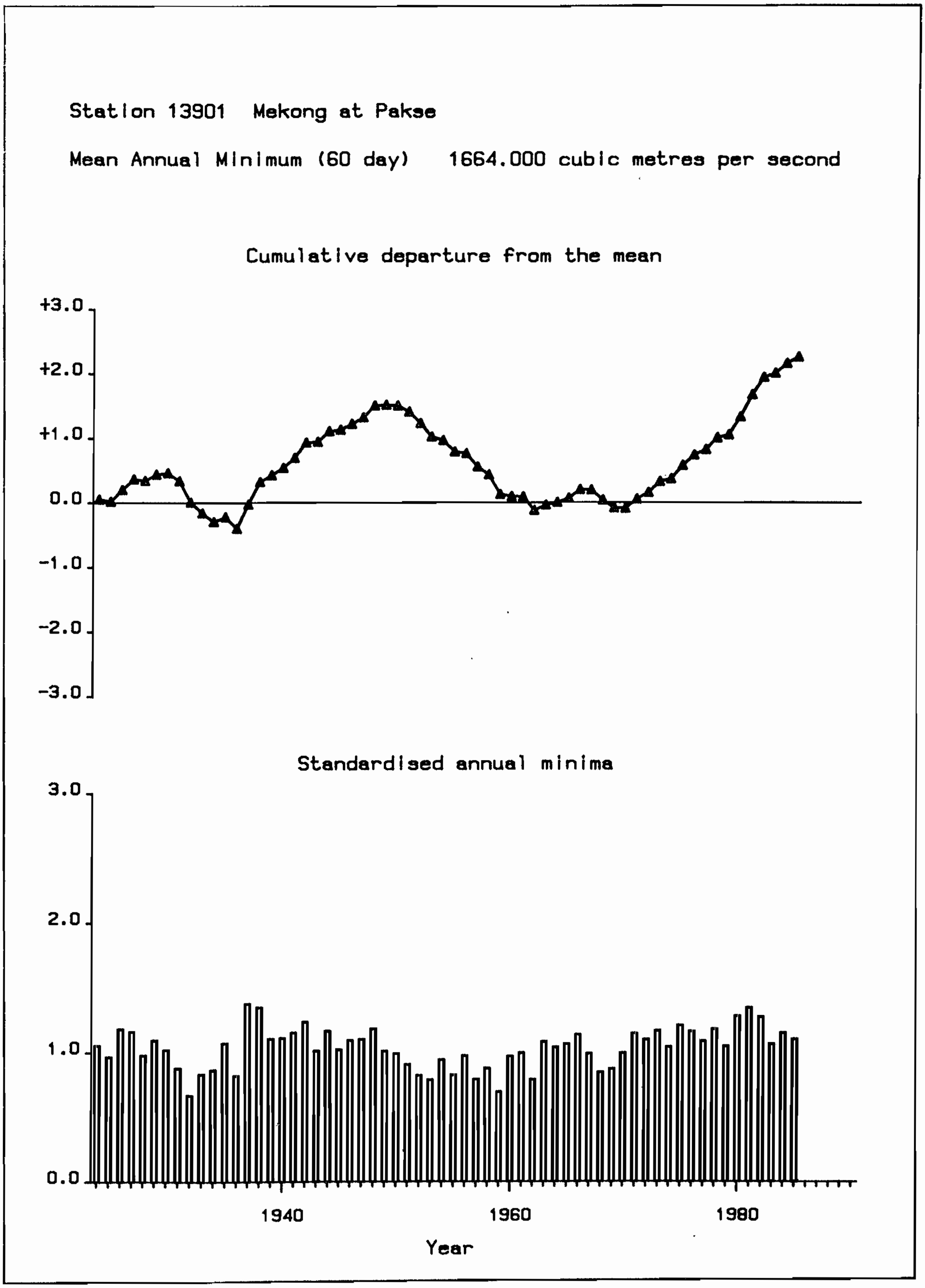

Figure 4.10

Pakse to delta model - location of stations

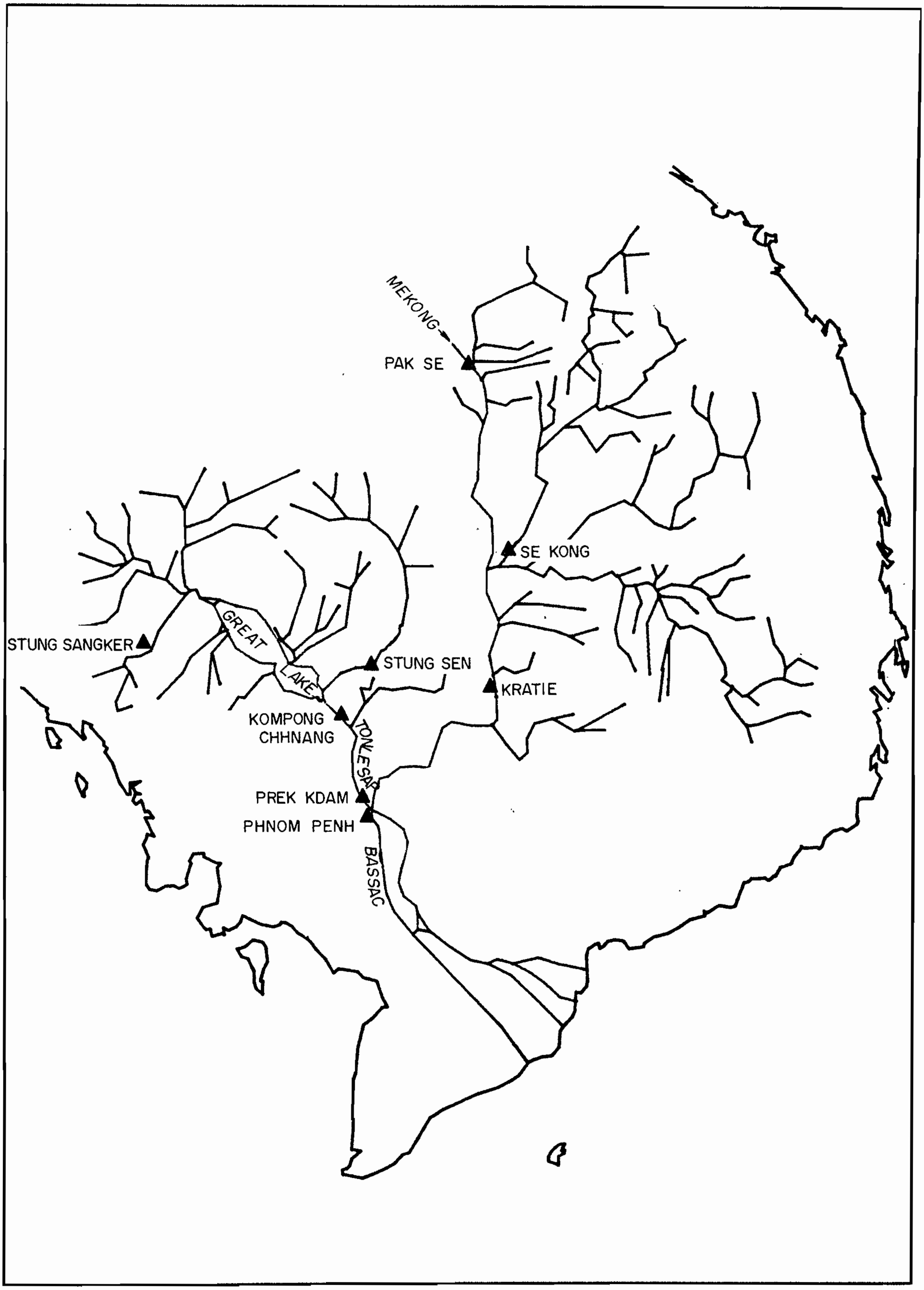

Figure 5.1

5. INFLOWS TO THE DELTA

5.1 Background

The inflows to the Mekong delta are made up of two components; flows from the Mekong upstream of Phnom Penh and flows from the catchment of the Great Lake via the Tonle Sap (Figure 5.1). Just downstream of Phnom Penh the river splits into the Mekong and the Bassac. The hydraulics of the confluence of these watercourses at Quatre Bras are extremely complicated as a result of tidal influences, the low elevation and slopes of the rivers and sedimentation in the river channels.

The Great Lake demonstrates unique behaviour; when the Mekong rises, the flow in the Tonle Sap changes direction and Mekong water flows into the lake. Towards the end of the wet season as the recession in the Mekong proceedes, the flow in the Tonle Sap again changes direction and water from the lake contributes to the flow into the delta.

A full understanding of these complex phenomena is hindered by lack of data, particularly in recent years. However given the importance of quantifying the flows into the delta a preliminary desk study into the behaviour of the Great Lake was carried out using existing information. The objective of this work was to identify simple models that could be used to generate a sequence of inflows to the delta. This synthetic record would then be subject to the dry season flow analysis described in Section 4. Full details of the models are given in Appendix A; a short description of the data available, the models derived and the results of the simulations are given here.

5.2 Available data

5.2.1 Rainfall

The availability of monthly rainfall data is given in Section 2.4. Time series of monthly data for the period 1950-1986 can be derived for any catchment or sub-catchment in the basin.

5.2.2 Streamflow

A summary of the availability of daily streamflow records on HMDB and HYDATA for the Mekong downstream of Pakse is given in Table 5.1. The intermediate catchment between the gauges at Pakse and Kratie is 101,00 km^2, and although part of this catchment is gauged on the Se Kong at Ban Khmuon, no records are available for the period since 1970.

Daily flow stations for Pakse - delta model

Station Number	*Station name*	*Basin Area km²*	*Start Year*	*End Year*	*Yrs. Data*
13901	Mekong at Pakse	545000	1923	1987	65
14901	Mekong at Kratie	646000	1924	1971	48
20102	Tonle Sap at Prek Kdam	84400	1960	1973	14
430101	Se Kong at Ban Khmuon	29600	1961	1970	10
550101	Stung Sangker at Treng	2135	1963	1973	11
610101	Stung Sen at Kompong Thom	14000	1961	1970	10

Table 5.1

Daily records for only two of the tributary catchments feeding the Great Lake are available; these cover about 20% of the contributing catchment area and include the period from the early 1960's up to 1973. Records for the flow in the Tonle Sap are also available for most of this period.

Flows in the Tonle Sap are based on stage readings taken at Prek Kdam; these had been converted to discharge using a set of rating equations that depend on the difference in water level between the Tonle Sap and the Mekong at Phnom Penh. Continuous flow records are available for most of the 1960's.

5.2.3 Lake storage

Records of daily lake water level are available on HMDB for the period 1924 up to 1969; data for some short periods in the early 1980's have recently become available. The relationship between lake water level and storage and surface area has been studied in detail (SOGREAH, 1966). The published curves refer to lake level measured at Kompong Luong du Lac, however the daily water level records available on HMDB and HYDATA are for a gauge at Kompong Chhnang. Unfortunately no long-term water level records for Kompong Luong du Lac could be located.

In order to derive a long series of lake storage, a simple relationship between the water level at the two sites was derived using data from Carbonnel and Guiscafre (1964). Identified shifts in gauge datum were taken into account, and a continuous record of daily lake storage was derived for the period 1924 up to 1969. The recent water level data from the 1980's are not continuous, and the level of the gauge datum is in doubt; for this reason these most recent data were not used in the analysis.

5.3 Kratie flow model

The catchment of the Mekong at Kratie makes up about 85% of the combined catchment area of the Mekong and Tonle Sap just downstream of Phnom Penh. Flows records at Kratie are thus particularly important for the analysis of dry season inflows to the delta.

Reliable flows records for Kratie stopped at the end of 1969, so it was necessary to reconstitute the flows since then. A simple time series model was derived to explain Kratie flows in terms of the flow upstream at Pakse. A different relationship for the dry and the wet seasons was derived, given by the following equations:

Wet season -

$$Qk_t = 1.375 \times Qp_{t-1} \qquad m^3s^{-1}$$

Dry season -

$$Qk_t = 1.256 \times Qp_{t-1} \qquad m^3s^{-1}$$

where,

Qk_t is the flow at Kratie on day t,
Qp_{t-1} is the flow at Pakse on day t-1,

This very simple model was fitted for the period 1961 to 1964, and then tested on data for 1965 to 1968. Plots of observed against predicted flows are given in Figure 5.2 and 5.3. The model was then used to extend the daily flow record at Kratie for the period since 1969.

5.4 Great Lake model

The purpose of this model was to estimate a long-term time series of daily flows in the Tonle Sap; these could then be added to the corresponding flows at Kratie to give an indication of the inflows to the delta. It was decided to derive a simple model using multiple regression analysis as continuous records of lake storage and Kratie flows were available from 1924. Insufficient rainfall and tributary flow data were available to make a water balance approach possible.

It was found that the flow in the Tonle Sap (measured in either direction, with positive values flowing away from the lake) could be explained simply in terms of the flow at Kratie and the storage in the lake. A slightly better fit was achieved by dividing the year up into two parts; the start of one part was chosen when the recession at Kratie was well under way, and the other when the flow in the Tonle Sap changes direction in the early part of the year.

The model has the form

$$Qts = a + (b \times Qk) + (c \times Sgl) \qquad \text{million } m^3$$

where,

Qts is the flow in the Tonle Sap (+ve towards the delta)
Qk is the flow at Kratie
Sgl is the storage in the Great Lake
a, b and c are parameters found by regression with different values for the two parts of the year.

Model calibration

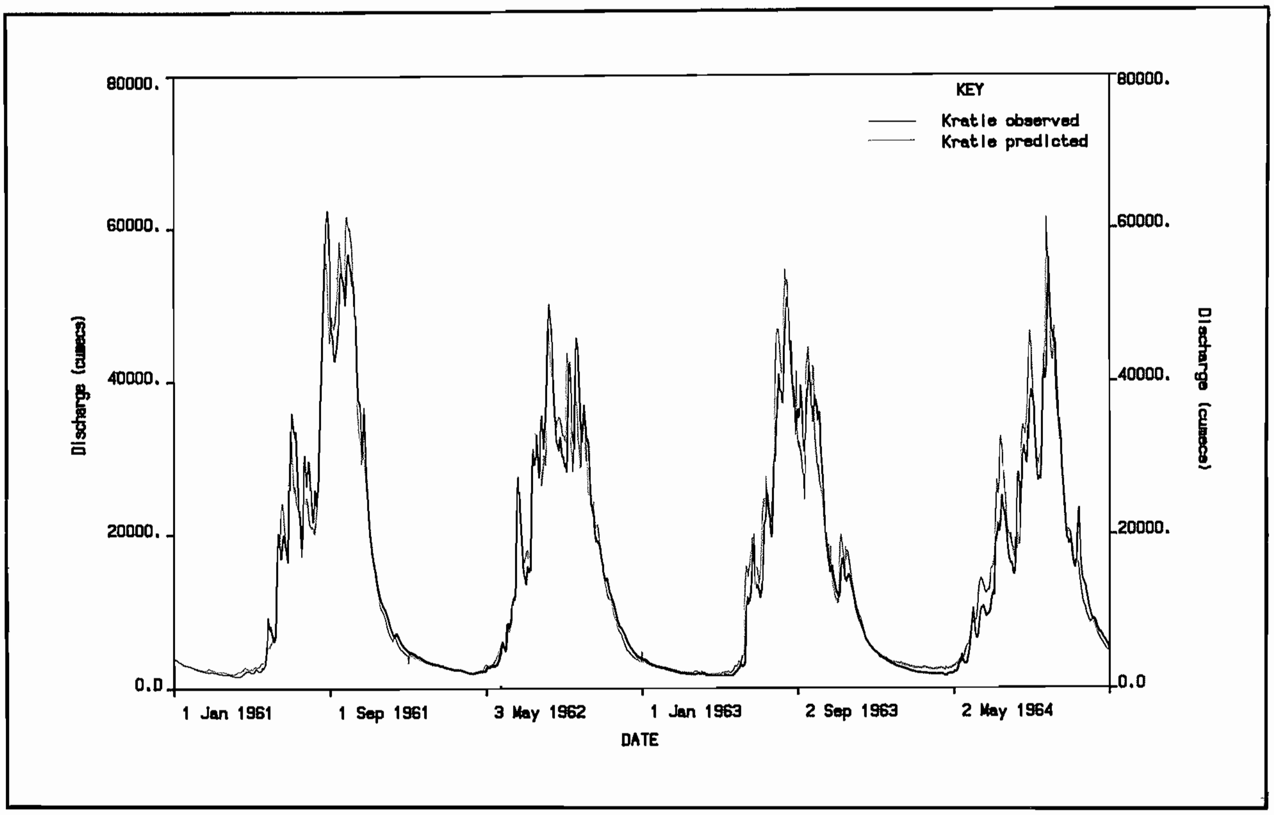

Figure 5.2

Model testing

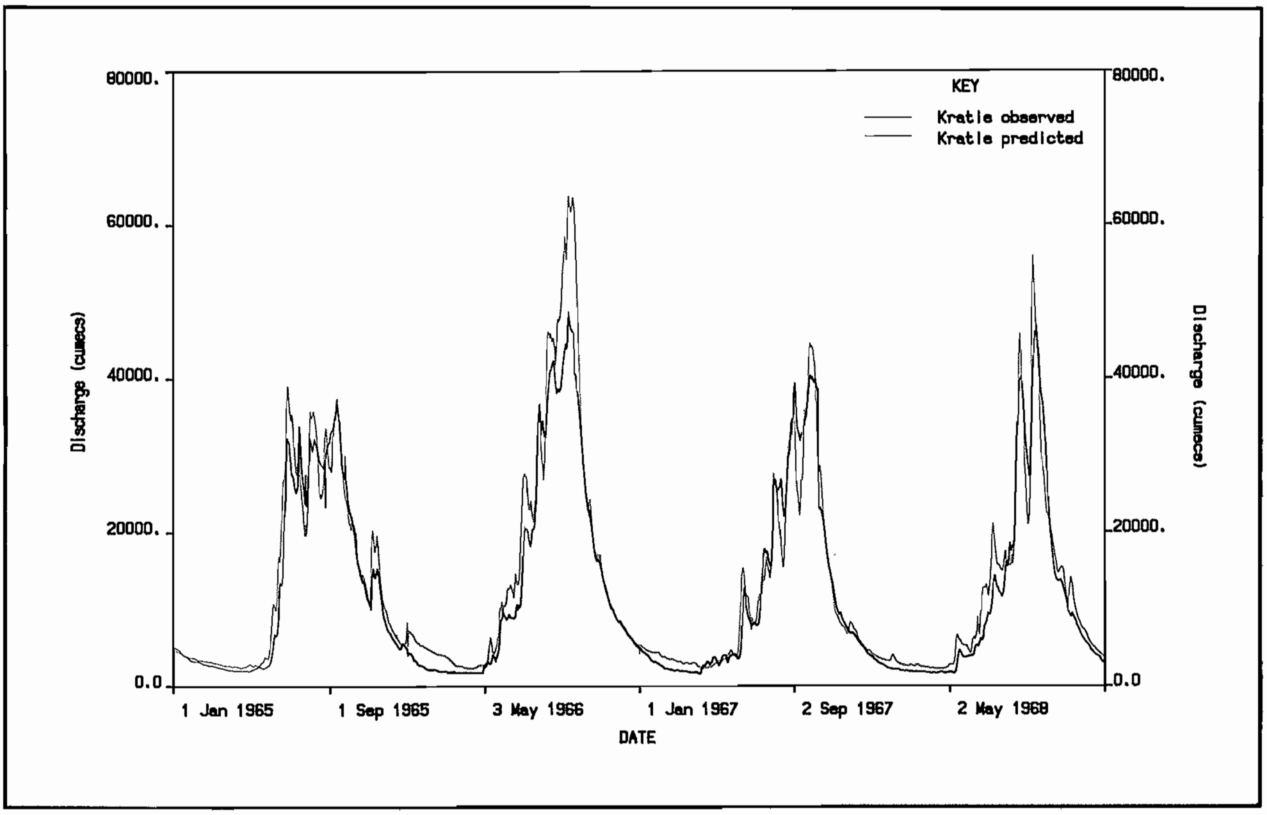

Figure 5.3

The regression analysis gave R^2 values of 78% and 86% respectively for each part of the data set.

A plot of the observed and predicted flows is given in Figure 5.4. The plot shows that the general pattern and magnitude of flows in the Tonle Sap can be reproduced by this relatively simple model.

Flows into the delta at an imaginary gauging station (number 999000 on HYDATA) were then estimated by adding the Kratie flow and the Tonle Sap flow together. This new time series, estimated for the period from 1924 to 1960 and observed for the period 1961 up to 1969, were then transferred to HYDATA for analysis.

Tonle Sap model calibration

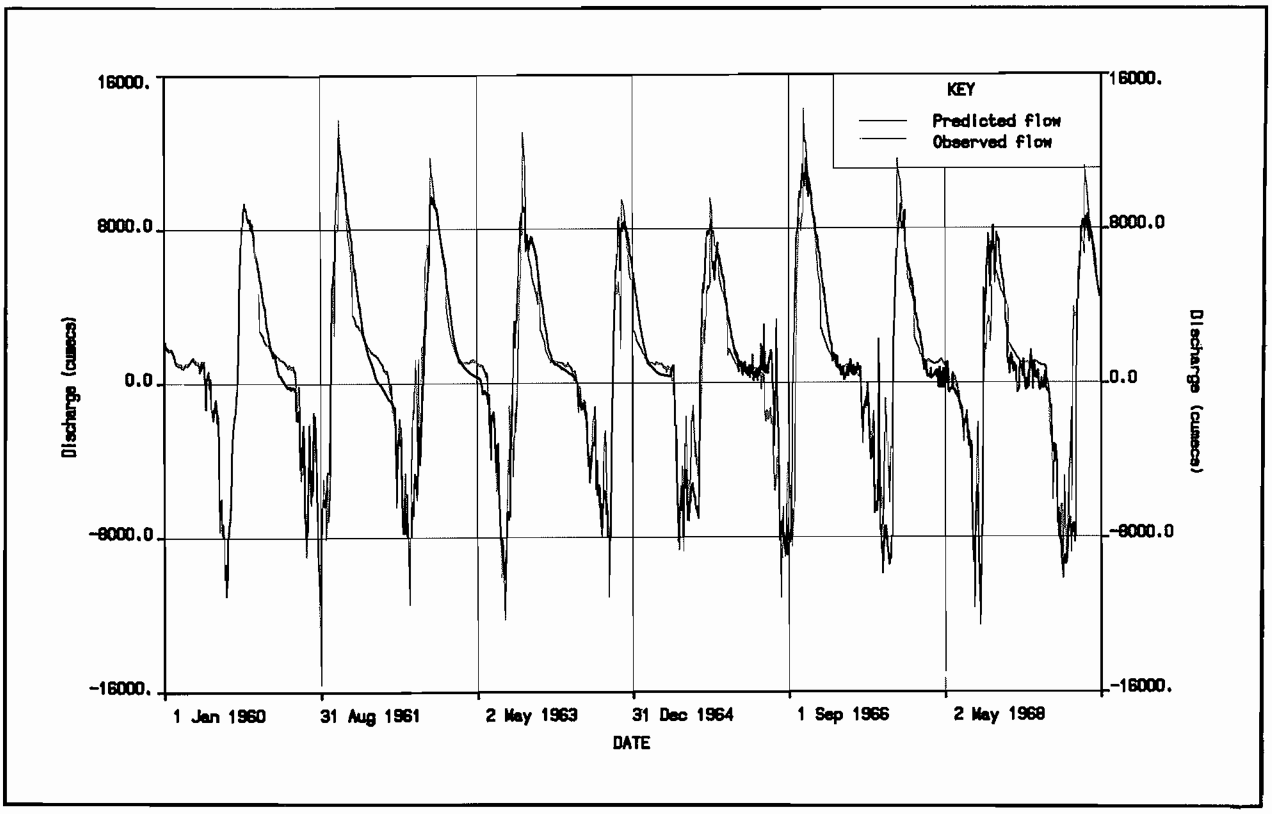

Figure 5.4

5.5 Dry season flow characteristics

The reconstituted flow records at Kratie and station 999000 estimated by the models described above were then analysed according to the procedures given in Section 4. By extending the Kratie record up to 1986 it was possible to derive dry season flow characteristics for the period of regulation. Because the lake storage records do not extend into the period of regulation, only natural flow characteristics for the delta flows have been derived. The results of the analysis are given in Table 5.2; the results for the Mekong at Pakse are included for comparison. As to be expected, the percentage changes in flow indices for Kratie between the natural and regulated periods are very similar to those observed at Pakse.

Comparison of flow indices

	Station				
	14901			13901	999000
Flow index	Natural	Regulated	Change	Change	Natural
MAR	690 mm	666 mm	-4%	-8%	648 mm
MAM(10)	1846	2240	+21%	+18%	2702
MAM(30)	1920	2316	+21%	+17%	2783
MAM(60)	2029	2470	+22%	+18%	2902
MAM(120)	2399	2820	+18%	+15%	3402
MAM(180)	3194	3590	+12%	+12%	4871
$AM(60)_2$	2039	2508	+23%	+18%	2951
$AM(60)_5$	1790	2317	+29%	+26%	2679
$AM(60)_{10}$	1666	2210	+33%	+31%	2545
$AM(60)_{25}$	1528	2110	+38%	+38%	2409
Q95	1837	2286	+25%	+23%	2717
Q90	2027	2509	+24%	+17%	2949
Q75	2742	3225	+18%	+10%	3821
Q50	7018	7387	+5%	-8%	10656
Q25	23207	21356	-8%	-13%	24445
Q10	37256	34965	-6%	-8%	33738
Q5	44001	40211	-8%	-10%	38684
Units $m^3 s^{-1}$ except where stated differently					

Station Number	Station name
13901	Mekong at Pakse
14901	Mekong at Kratie (in regulated period flows generated by model)
999000	Delta inflows in natural period (from model)

Table 5.2

The annual minima flow indices for station 999000 show an increase over those at Kratie due to the runoff from the intermediate catchment area of over 85,000 km^2, and the overall regulating effect of the Great Lake. The consequence of part of the wet season flows of the Mekong being stored in the lake is illustrated by the reduction of the low percentile flows (Q25, Q10 and Q5) taken from the flow duration curve.

A plot of the annual minima for Kratie standardised by the natural MAM(60) for the period before regulation is given as Figure 5.5. Like Figure 4.10 (Mekong at Pakse) this plot also shows the persistent effects of upstream regulation for the period since 1965

The correlation between MAM(60) at Kratie and MAM(60) for the delta inflows is 0.67. The dry season flows into the delta are therefore only partly dependent on the dry season flows at Kratie. The Great Lake storage is therefore also an important factor in affecting the dry season flows. Although it has been demonstrated that since 1965 the Kratie MAM(60) have risen due to upstream regulation on the tributaries, reliable information on the Great Lake level, and hence storage, are not available since 1969. It therefore not possible to say for certain whether the inflows to the delta have increased since 1965 in line with the Mekong since there is no information on the other component, lake storage.

It should be remembered that the increase in dry season flows in the Mekong has been at the expense of a reduction in average flow and flood flows. Since the flood flows are an important component of the Great Lake recharge, it is possible that the Great Lake is no longer filling to the same level. If this were the case, the contribution from the Great Lake to dry season flows to the delta would be reduced. As soon as information becomes available from Kampuchea, it is important that this analysis is updated.

5.6 Discussion

The analysis described above has illustrated that it is possible to model the behaviour of the Great Lake and the flow in the Tonle Sap using simple statistical models, without having to model the physical processes in detail. However because of the limitations of the observed data used in this part of the analysis and the extensive use of generated data, the results presented should only be taken as indicative. Hydrological measurements to validate the assumptions made for this analysis should be restarted as soon as is realistically feasible.

Standardised annual minima - Mekong at Kratie

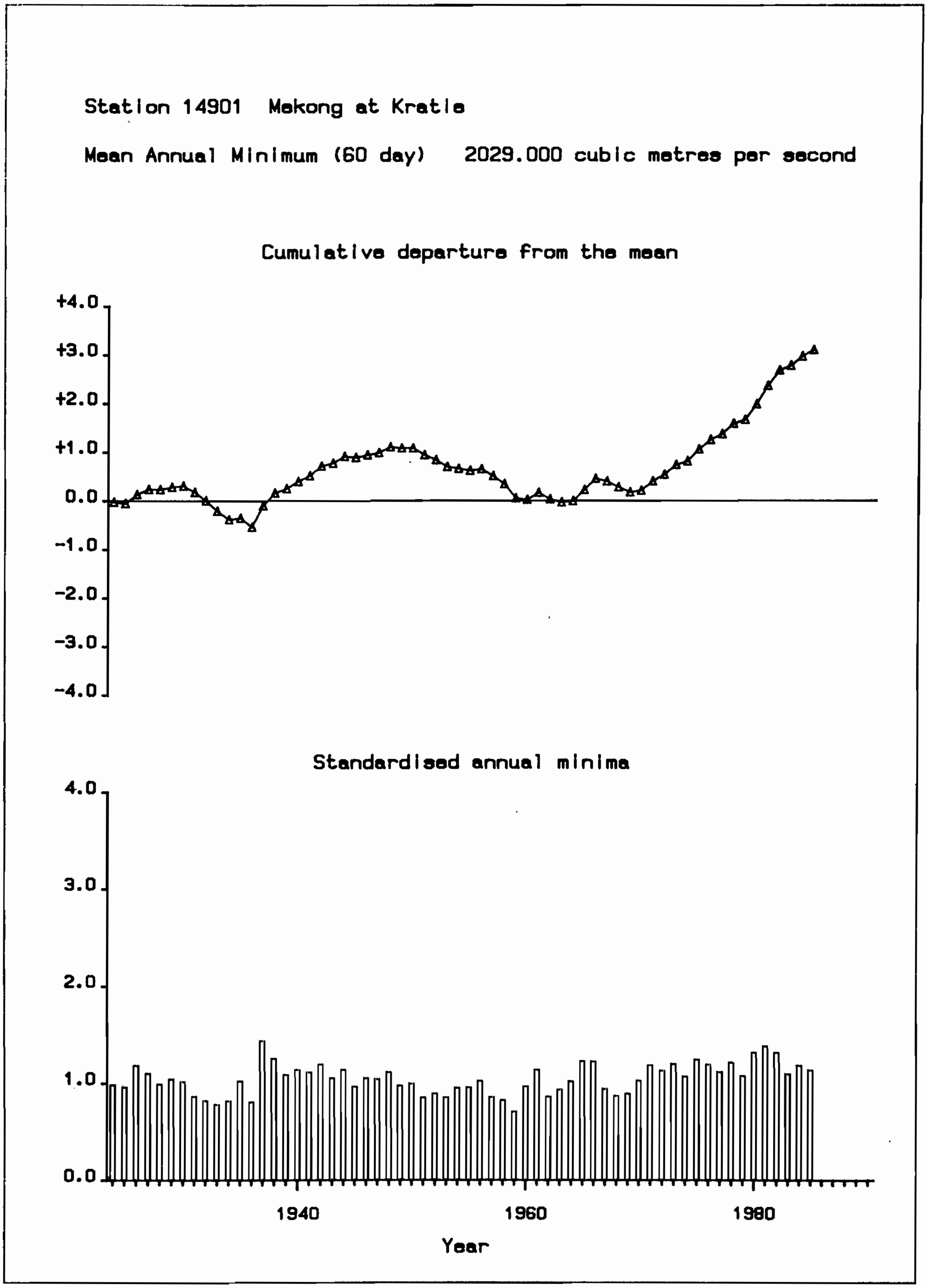

Figure 5.5

6. CONCLUSIONS AND RECOMMENDATIONS

Suitable dry season flow indices have been identified for use on the Lower Mekong Basin and derived for 44 mainstream and tributary catchments where sufficient data exist. These indices may be used as a benchmark against which any future changes in flow regime can be measured.

This study has successfully related these indices to the catchment area, catchment annual average rainfall and soil type. These preliminary relationships may be used on sites with no river gauging station to obtain an initial estimate of the flow indices.

A simple step by step approach has been provided as a guide for selection of the most appropriate dry season flow index for a given application.

Historic changes in the flow regime of the tributaries has been identified downstream of major reservoirs. Changes in the dry season flow regime of the mainstream has been identified at all stations downstream of the Nam Ngum confluence. However in proportion to total flow, the changes are more significant on the tributaries. In both cases there has been an increase in dry season flows. The increase in the mainstream flows can be attributed to the regulation on the tributaries and in particular to the turbine releases from the Nam Ngum reservoir during the dry season.

The preliminary investigation into climatic change since 1950, in terms of total annual rainfall, showed that there has been no significant change.

It has not been possible to attribute changes in the dry season flow regime to changes in land use and increases in irrigation demand. Before changes due to these factors can be identified several years more data at all sites will be required.

Flows in the delta have been estimated using simple time-series and regression models based on the flow at Kratie and storage in the Great Lake. The dry season flow indices calculated from this reconstituted flow sequence are consistent with those measured on the Mekong at Pakse and Kratie during the period before regulation on the tributaries. The flows observed at these mainstream gauging stations when combined with Great Lake storage can thus give an indication of the flow conditions into the delta. Analysis of the series of mean annual minima for Kratie and the delta inflows has indicated the important role of the Great Lake in maintaining dry season flows into the delta.

A simple method for detecting changes in the dry season flow regime in the future has been developed and tested on known changes on the tributaries and the mainstream. One of the first changes likely to be discovered in the future by this method will be the effect of hydro-electric schemes on the Upper Mekong (Lancang) in the People's Republic of China.

In addition to this report, the Mekong Secretariat has been provided with a software package (HYDATA) capable of performing not only many of the techniques of analysis described in this report, but more besides. Staff of the Mekong Secretariat have been given training in the use of HYDATA. Any of the member countries should be able to use the facilities of HYDATA to study additional stations since the package is an IBM PC/XT or PC/AT compatible.

In addition to HYDATA a computer program to handle monthly and annual rainfall data over the whole Lower Mekong Basin has been developed (RAINS). The applications of this program go beyond the many uses of rainfall data used in this study and should find uses on other projects in the Secretariat in the future. RAINS also holds information about hydrological properties of soils throughout the basin on a 40km x 40km grid.

A comprehensive review of the river gaugings and rating equations at ten important sites on the Lower Mekong has shown that a continued programme of river gauging is necessary to maintain data quality. The accuracy of the flow data at these sites has been found in general to be of good quality. The data from Pakse in Laos have been shown to be excellent.

In addition to revised rating equations in 1987, long term average rating equations have been produced for each of the ten mainstream sites. These equations, intended for use when no gaugings are being undertaken, should provide a less biased estimate of flow than using the most recently derived rating equation.

The main recommendations of this report are that:

(1) The procedure for detecting change in dry season flows should be used every year. In particular the procedure should quickly identify any changes resulting from the completion of the Manwan dam in the People's Republic of China.

(2) The facilities provided in the software packages HYDATA and RAINS be exploited to the full to enable a greater understanding of the hydrological data which have been collected over the years.

(3) The detailed recommendations concerning river gaugings and rating equations given in Section 3 and Appendix C are adopted. In particular the river gauging programme should be reviewed, so that priorities for future gaugings can be set. The available resources could then be directed to those stations where improvements to the rating curves are needed. Those stations with accurate and stable ratings would require less intensive gauging.

(4) Every opportunity should be taken to ensure that routine hydrological measurements at Kratie, the Tonle Sap and the Great Lake can be restarted in the near future.

(5) The remaining work programme for the overall Phase III project (of which the current study is only part) is completed. In particular simulation techniques based on either existing or new river basin models (as appropriate) should be used to study the effect of planned developments on the downstream flow regime.

(6) The Water Balance Study should continue along the lines of the future work programme set out below.

The current study has also identified certain areas of work for subsequent investigations under the Water Balance Study which will be of important practical benefit to the Mekong Secretariat. These are:

(1) Development of a flood design manual for the Lower Mekong Basin. This study would again make use of the flow data from many sites throughout the basin. The design manual produced would provide engineers and hydrologists with a consistent tool for flood estimation for flood protection

works, dam construction, urban and agricultural development, bridge and culvert design and spillway design.

(2) To improve on the preliminary dry season flow estimation procedure at ungauged sites presented in Appendix B, by reducing the grid size, including more stations and catchment characteristics. This would draw on the results of the present study and also make use of the catchment characteristic data necessary for the flood study ((1) above). Both studies would make use of the land use database the Mekong Secretariat is compiling on the ARC-INFO computer system.

(3) To develop computer aided procedures for fitting rating equations affected by backwater and small scale tidal influences. Such procedures would be of great benefit to the Secretariat and member countries where many gauging stations have ratings which are a function of both the water level at the measuring site and another site further downstream.

(4) Further work should be carried out on the development of the Pakse to delta model. In particular any more recent data from Kampuchea on flows in the Mekong at Kratie and the level of the Great Lake should be studied to obtain an updated inflow sequence to the delta. This updated inflow sequence should then be analysed using the methods described in this report so that any changes in flow regime into the delta may be identified.

(5) The work on estimation of areal rainfall from point rainfall undertaken in this report should be expanded using data from more raingauges and a finer grid resolution. This would have many applications including the proposed flood and low flow studies and hydrological models. In addition a frequency analysis of rainfall of various durations should be carried out for basin planning purposes. The relationships obtained here would be of direct benefit in flood estimation procedures.

(6) To investigate the feasibility of using remote sensing for the estimation of water level. This technique, using data from radar altimeters on board a satellite, could prove useful in obtaining water level elevation of the Great Lake and possibly the Mekong itself.

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INTERIM COMMITTEE FOR COORDINATION OF
INVESTIGATIONS OF THE LOWER MEKONG BASIN

WATER BALANCE STUDY
PHASE 3 REPORT

INVESTIGATION OF DRY SEASON FLOWS

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APPENDICES

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LOWER MEKONG BASIN

WATER BALANCE STUDY

PHASE III

Investigation of dry season flows

This report has been prepared by
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November 1988

The views expressed in this report
are not necessarily those of the
Overseas Development Administration
or Her Majesty's Government

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SUMMARY TO THE MAIN REPORT

This report is concerned with several aspects of the water resources of the Lower Mekong Basin. The river gaugings and rating equations are reviewed at ten mainstream gauging stations. An assessment of the quality of daily flow data at these ten sites is provided. One station, Pakse, in Laos has flow data of excellent quality. Suitable techniques for quantifying the dry season flow regime of the Mekong and its tributaries have been identified. Benchmark flow statistics describing the current dry season flow regime of the Mekong and its tributaries have been calculated. A preliminary method for estimating dry season flow characteristics at sites with no gauging stations, based on catchment area, annual average rainfall and soil type is provided. Changes in the dry season flow regime have been identified on all tributaries with large upstream reservoirs; dry season flows have been increased at the expense of wet season flows. Similar, but smaller, changes in the dry season flows of the Mekong below the Nam Ngum confluence have been noticed. In terms of annual rainfall, there has been no significant climate fluctuation in the basin. There is insufficient evidence at present to identify changes due to land use change. However reductions in average flows have been identified on some catchments which have irrigation development upstream. A simple technique to monitor the dry season flows in the future and assist with the detection of change has been provided and tested on known changes in the past. A time series model has been used to extend the flow record at Kratie using observed daily flow data for Pakse. A simple regression model has been developed to explain the flows in Tonle Sap in terms of the discharge at Kratie and the storage in the Great Lake. Synthetic flows generated using the model have been used to give indicative estimates of the flows into the delta. Computer software has been provided to update this study when more data becomes available in the future, and to include additional stations in the analysis. A computer program has been developed to estimate areal monthly and annual rainfall from 1950 for any catchment within the Lower Mekong Basin on a 40km x 40km grid.

Table of contents

Main report in separate volume

List of Tables

List of Figures

Glossary

a	Constant in regression equation
AAR.RMP	Average Annual rainfall map
ADF	Average Daily Flow
$AM(D)_T$	Annual minimum; duration D days, return period T years
AREA	Area
AR1950.RMP	Annual rainfall map 1950
b	Constant in regression equation
fse	Factorial standard error
HYDATA	Hydrological database and analysis system
MAM(D)	Mean Annual Minimum; duration D days
MAR	Mean Annual Runoff
MAR12.RMP	Mean monthly rainfall map, December (month = 12)
MR19501.RMP	Monthly rainfall map, January 1950 (month = 1)
MINITAB	Statistical analysis package
P(i)	Exceedance probabilities
Q(75)	75 percentile flow
Q(75%)	Q(75) expressed as a percentage of the ADF
Q(i)	Annual minimum flow series
Qk	Daily flow at Kratie
Qts	Daily flow in the Tonle Sap
R^2	Square of the correlation coefficient
RAINS	Rainfall information system
Sgl	Storage in the Great Lake
se	Standard error of estimate
SOIL	Soil index
UTM	Universal Transverse Mercator map projection
W(i)	Plotting position (Weibull)

Appendix A – Hydrological software

A.1 Introduction

An important aspect of the project was to provide the Mekong Secretariat with practical tools in the form of computer software which would be of benefit to future planning and water resource studies. This software will enable the Secretariat to extend the techniques of analysis described in the report to additional stations, and to update the analysis for all stations included in the present system as more data become available. Much of the software has other potential applications at the Mekong Secretariat and should prove useful in other studies as well as routine data processing.

The hydrological database and analysis package HYDATA, developed at the Institute of Hydrology, has played a central rôle in the current study. The implementation of HYDATA at the Mekong Secretariat is described in the following section.

As part of the data requirements of this project, areal monthly and annual rainfall were required over many catchments in the Mekong Basin. In order to meet this requirement a rainfall information system (RAINS) was established, using monthly and annual rainfall data stored on HYDATA. With elementary geographic information system capabilities, RAINS was also used by the project to store information about the hydrological properties of soils over the whole basin on a 40km x 40km grid. RAINS, which should be useful in other studies at the Mekong Secretariat, is described in Section A.3.

In order to extend the analysis of dry season flows to the delta, a computer model was developed to firstly extend the Kratie record from daily flows at Pakse and secondly to model the effects of the Great Lake in Kampuchea. This model is described in Section A.4.

Section 4.6 of the main report describes a procedure for detecting changes in the dry season flow regime in the future. Although the methodology is simple, a program has been written to carry out the calculations and produce the recommended plots. This program, called CHANGE, is described in Section A.5.

Most of the statistical analysis undertaken by the study was carried out using the IBM PC version of the statistical package MINITAB. MINITAB has been provided with full documentation to the Mekong Secretariat as part of this study.

A.2 HYDATA

HYDATA has been used throughout the project to store and analyse hydrological data. It is installed on an IBM PC/AT compatible PC (ARC Turbo 12) with enhanced colour graphics, a 30Mb hard disc, Epson LQ1050 printer and Roland DXY-880A pen plotter. This PC is linked to the Mekong Secretariat's main VAX 11/730 computer. This linkage provides an easy way of exchanging data files between the HMDB database on the VAX and HYDATA on the PC.

During the course of the study, training in the use of HYDATA has been given to Mekong Secretariat staff.

The HYDATA Operation Manual (Institute of Hydrology, 1987) provides comprehensive documentation of the system. Since the manual was prepared, however, there have been some improvements to the system which are described here.

The maximum number of river gaugings which can now be stored per station has been increased from 332 to 998 (Manual pages 1.2 and 5.1). The disc storage requirement for river gaugings has therefore been increased from 4000 bytes to 12000 bytes per station (Manual page 1.5).

Monthly data is now stored inside HYDATA's own direct access files and not in user specified ASCII (text) files. This change results in several improvements:

(1) More efficient data storage.

(2) Monthly data included in the backup procedure automatically.

(3) A system summary to the screen and printer giving availability of data.

(4) Station identification is now all that is necessary to edit monthly data.

File space is allocated (and deleted) for monthly data in the same way as for other types of data (Manual pages 2.23-2.24, 3.17-3.28). Monthly data is allocated for the whole of this century, so there is no need to specify start and end years. The options for start and end years on menus E3 and E4 still refer to the period that daily data are to be stored (or deleted). Several types of monthly data may be stored for one station (for example monthly rainfall total and number of rain days per month), however only one type of monthly data can be accessed at present. This is mean monthly flow for flow stations, monthly total for rainfall and general stations and month end for reservoir storage.

Space for annual data may also be assigned, again with space for yearly values for the whole century always being allocated. At present there is no edit facility for annual data, but if the space for annual data is assigned before monthly data are abstracted from daily data, annual data will be generated and stored within HYDATA's files. These annual values may then be accessed using the FORTRAN library HYLIB. If additional rainfall stations are added to HYDATA for use with RAINS (Section A.3), it is important to make sure that space is allocated for annual rainfall data because RAINS requires annual rainfall totals to be available on HYDATA.

The procedure for editing, printing and plotting monthly data is similar to that described in Section 7 of the HYDATA Operation Manual. However there are two changes which have been made as a result of the internal storage of data. Firstly option [8] of menu C7 "Data in file" has now been removed, since data are no longer stored in separate ASCII files. Option [7] of the same menu now reads HYDATA's own files to obtain the monthly data. Secondly an additional option in menu E13 is now available to update monthly data from daily data stored on HYDATA. Monthly data are not automatically generated when daily data are updated, so if monthly data are to be derived from daily data, it is necessary to select option [5] from menu E13; "Read daily". Monthly data will only be updated from daily over the period specified in menu C7.

The FORTRAN library, HYLIB, now has additional subroutines to abstract monthly and annual data.

Three additional files (Manual page 3.13) now exist with the HYDATA system to store monthly and annual data these are:

HDB09 Monthly data of all types except rainfall
HDB10 Monthly rainfall data
HDB11 Annual data of all station types

HYDATA's own data backup and restore facility now includes these files.

HYDATA provides a facility for processing a file of commands using the "Read File" facility (Manual pages 2.19-2.23). When preparing such a file it is necessary to ensure that the end of file is identified by an end of file character ([CTRL Z] or ASCII character 26 (decimal)). Some word processors such as Wordstar automatically insert this special character, but others such as Microsoft Word do not. An end of file character may be inserted in Microsoft Word by moving to the end of file, holding down the [ALT] key and typing 26 on the numeric keypad. If the file is prepared by an external program the end of file character may be written by the program; for example in FORTRAN :

```
WRITE(IFILE,'(A1)')CHAR(26)
```

It should be noted that the baseflow separation procedure in the HYDATA 'Low Flow Analysis' module should only be used on daily flow data from small to medium sized catchments (up to about 2000 km^2). The technique does not work well on large catchments where it over estimates the baseflow component of the hydrograph.

A.3 Rainfall Information System (RAINS)

A.3.1 Introduction

RAINS is an IBM PC based computer program written in FORTRAN 77 (Prospero) for estimating areal rainfall over the whole of the Lower Mekong Basin on a monthly or annual basis using a 40km x 40km grid.

RAINS has been compiled to make use of a 80186 or an 80286 processor and requires an enhanced graphics adaptor (EGA) with the GEM EGA driver loaded in memory (this driver is normally loaded in memory for use with HYDATA).

RAINS uses monthly and annual rainfall data stored on HYDATA to derive rainfall maps of the basin on a monthly and annual basis. RAINS will also store maps of any variable over the region, such as the hydrological properties of soils. Maps are stored as values on 40km x 40km grid over the whole area. This coarse grid size was necessary because the large number of rainfall maps (over 600) imposed a large requirement for disc storage. Disc storage increases in inverse proportion to the square of the grid size.

Disc space has been allocated for rainfall data from 1950 to 1995 and rainfall maps generated for the period 1950 to 1985. At the time the 1985 maps were generated there was an incomplete set of monthly data available. When 1985 monthly rainfall data is complete on HMDB this should be transferred to HYDATA and the 1985 maps re-calculated.

River basins are defined on the system on the same 40km x 40km grid. In fact the river basins on RAINS are a set of maps just like rainfall maps. River basin maps have been defined for all project catchments and some other areas of interest such as northeast Thailand and the delta. Additional river basins may be added to the system at any time.

Any map may be analysed to find its area, total value, average value, maximum value and minimum value. For example if the catchment annual rainfall were required in 1980, RAINS would be able to supply the answer.

New maps may be created by simple arithmetic operations on any two existing maps. For example it is possible to find whether the 1980 catchment rainfall was above or below the average by dividing the 1980 rainfall map by the average annual rainfall map.

Maps of any variable or basin may be entered onto the system by editing an ASCII file using a word processor. Any map on the system may be transferred to an external ASCII file for editing and re-importing or printing.

Maps are identified on the system by a unique name called a map-id. A map-id may be up to twelve characters in length and should conform to the normal MS-DOS practice of a maximum 8 character file name followed by a period "." and terminated by a maximum of three characters for the file type; for example SOIL2.DAT is a valid map name. The reason for the compatibility between map-id and MS-DOS filename is that when a map is imported to the system, the map-id will be same as the name of the imported file. Conversely, when exporting a map, the MS-DOS file containing the map will be given the same name as the map-id.

Rainfall and basin maps always have a map-id ending with .RMP (Rainfall MaP) or .BMP (Basin MaP). General maps may have any map-id ending apart from .RMP and .BMP.

For rainfall maps the first part of the map-id is also fixed. The following rainfall maps are pre-defined and already on the system:

AAR.RMP	Average annual rainfall map				
MAR1.RMP	Monthly average rainfall map - January				
MAR2.RMP	"	"	"	"	- February
.	.	.	.		
.	.	.	.		
MAR12.RMP	"	"	"	"	- December
AR1950.RMP	Annual rainfall 1950				
AR1951.RMP	"	"	1951		
.	.	.	.		
.	.	.	.		
AR1995.RMP	"	"	1995		
MR19501.RMP	Monthly rainfall 1950 - January				
MR19502.RMP	"	"	"	- February	
.	.	.	.		
.	.	.	.		
MR195012.RMP	"	"	"	- December	
.	.	.	.		
.	.	.	.		
MR199512.RMP	"	"	1995 - December		

The first part of the map-id for basin maps (.BMP maps) may be any eight characters. However, to maintain HMDB convention, the basin maps have been given the HMDB number; for example 610101 for the Stung Sen at Kompong Thom.

The first part of a general map-id is not restricted.

A complete list of rainfall, basin and general maps may be obtained on the printer as described in Section A.3.2.

Maps displayed on the screen are at a fixed scale and cover the whole basin. A variety of options are available to enhance the map: addition of the coastline, mainstream basin boundary, tributaries, raingauge location, river gauging stations and a 40km x 40km grid overlay.

A paper copy of any map may be made on an A3 sheet of paper on the Hewlett Packard compatible Roland plotter. The map will be produced at a fixed scale of 1:5,000,000. As an alternative to shading each grid square on the paper copy, the actual value of the grid square may be written.

The maps are based on the UTM system with the origin at 8°N and 105°E. The area of the map extends 1600km north from this point (40 grid squares), 640km west (16 grid squares) and 480km east (12 grid squares). RAINS makes the necessary adjustments to allow the maps to extend over three UTM zone (Zones 47,48 and 49).

The program must be run from the HYDATA directory and is started from MS-DOS by typing the name RAINS.

The system is operated by a system of menus under five main headings:

(1)	System management	- Lists names of maps on the printer. - Imports maps from text files prepared outside the system. - Exports maps to text files for use outside the system. - Deletes maps on the system. - Read commands from a file such as display a sequence of maps.
(2)	Display map	- Choose the map to display. - Choose the basin to study. - Decide what to show on the map; for example the river network or locations of raingauges. - Change the intervals for colouring or shading the displayed map. - Change the title of the displayed map. - Produce an A3 paper copy of the displayed map on the plotter. - Re-draw the current map on the screen.
(3)	Generate map	- Generate annual rainfall maps from annual rainfall data stored on HYDATA. - Generate an annual average rainfall map from a series of annual rainfall maps. - Generate monthly rainfall maps from annual rainfall maps and monthly rainfall data stored on HYDATA. - Generate 12 monthly average rainfall maps from a series of monthly rainfall maps. - Generate a general map by simple arithmetic from any two existing maps.
(4)	Generate time series	- Generate an external ASCII (text) file of basin annual rainfall over a given period. - Generate an external ASCII (text) file of basin monthly rainfall over a given time period.
(5)	Analyse map	- Find the area of the displayed map in km^2. - Find the sum of all the grid values in the displayed map. - Find the average grid value of all the squares displayed. - Find the maximum grid value in the displayed map. - Find the minimum grid value in the displayed map.

The following five sections consider the five main headings outlined above. Section A.3.7 describes the data files used by RAINS and the backup procedure for these files.

A.3.2 System management

List maps on printer

Enter "R" to print a list of the rainfall maps (there are about 600!), enter "B" to print a list of basin maps or enter "G" to print a list of general maps.

Import map

A map of any spatially distributed variable may be imported to the RAINS system on a 40km x 40km grid. A "map" of the variable is first prepared on a word processor as an unformatted text file (ASCII) containing a numeric value for each grid square. A template file (TEMPLATE.DAT) is available which may be copied into the new map file, and the new map file then edited before importing into RAINS. Alternatively, if the new map closely resembles an existing map, the existing map may be exported from RAINS, renamed, edited to become the new map and finally imported back into RAINS.

For example, if a topographic map were required on RAINS, the following procedure could be followed:

(1) Estimate the average elevation on each 40km grid square.

(2) Make a copy of the template file for editing using the following MS-DOS command:

COPY TEMPLATE.DAT TOPO.MAP

(3) Edit file TOPO.MAP to contain the values of elevation at each grid square. Note that -999 indicates a missing or unknown value. Values entered should be integers and right justified in the columns previously occupied by -999. Each value you enter will be multiplied by RAINS by the overall scaling factor on the second line of the file. Adjust this factor to obtain the best resolution for your map; for example if the map values range from 0.0 to 10.0, the overall scaling factor should be set to 0.01 and integer values entered for the map ranging from 0000 to 1000. A map title of up to 32 characters may be entered on the first line of the file. The eight colouring or shading intervals for map display may be edited into the 3rd line of the file. Both the map title and the eight shading intervals may be changed later inside RAINS.

(4) Execute RAINS and select the option to import map. Enter the file name TOPO.MAP. To display the imported map select the "define map" option under "display map".

When preparing basin maps, a value of 1 should be entered for each grid square occupied by the basin with all other grid squares set to -999.

Export map

Any map may be transferred from RAINS internal files to an external text (ASCII) file for editing or printing using this option. The name of the file created will be the same as the map-id.

Delete map

Maps may be deleted from the system using this option. The space previously occupied by a map will be re-used later as new maps are created.

Read from file

RAINS commands may be stored in a file and executed using this option. The procedure is similar to that adopted by HYDATA except that HYDATA is able to process files from anywhere in the system, whereas RAINS can only process files from this option. The commands in the file are exactly the same structure as would be entered by hand (like HYDATA). One useful additional command that may be included in the file is $P which halts processing of commands. This pause facility is useful when setting up a series of maps to view in sequence, or when analysing a series of maps.

A.3.3 Display map

Define map

This option defines the map to be displayed. Any map on the system may be displayed by entering its map-id. Only the portion of the map covering the currently selected basin will be displayed. Basin maps can also be displayed by entering the basin map-id.

Define basin

Any basin, defined by a basin map, may be selected for study by entering the first part of the basin map-id. For example, if basin 610101 were required, then 610101 should be entered. The full map-id of 610101.BMP is not required as the map-id extension of .BMP is assigned by default. Having selected a basin, only that portion of the displayed map will be visible and available for analysis. The full map may be displayed once again by entering ALL for the basin name or the map may be completely removed by entering a basin of NONE.

Define options

Different options are available to control the map displayed. These are switched on and off by selecting the appropriate letter for that option:

Option letter	Function
C	Draw/undraw coastline
B	Draw/undraw mainstream basin boundary
M	Draw/undraw mainstream Mekong and Tonle Sap
T	Draw/undraw tributaries
R	Draw/undraw location of raingauges
Q	Draw/undraw location of gauging stations
G	Draw/undraw 40km x 40km grid overlay
V	Write values in each grid square on the paper map rather than shading the squares

Define scales

Any of the eight scaling intervals which control the nine scaling colours on the screen map or density of shading on the paper may be changed by this option. The scaling intervals should be in descending order of magnitude. The new scales are saved automatically on file.

Define title

The map title may be changed to any 32 characters. The new title has to be entered in 4 stages with each stage accepting a maximum of 8 characters. The new title is saved automatically on file.

Paper copy

An A3 map at a scale of 1:5,000,000 may be produced on the Hewlett Packard compatible Roland pen plotter. The plotter will be connected either to the first or second serial port. RAINS will ask which port is required; for the project PC the answer is "2" (for the second serial port) since the first serial port is used for the link to the VAX. Up to seven pens will be required, the actual pens used will depend on the option selected :

Option selected	Pen used
C	1
B	2
M	3
T	4
R	5
Q	6
G	7
V	7

Pen 1 is also required for the map titles and border. Pen 7 is always required for latitude and longitude annotation.

Screen display

The currently selected map with display options is re-drawn on the screen by selecting this option.

A.3.4 Generate map

Annual rainfall

Annual rainfall maps are generated using information from two sources. Firstly annual total rainfall recorded at raingauges throughout the basin and secondly the annual average rainfall map AAR.RMP.

The annual average rainfall map is based on the 1950-1985 annual isohyetal map produced by the Mekong Secretariat. For each 40km x 40km grid square that the isohyetal map covers, the average grid value was estimated by eye. If one or more raingauges were located in a grid square, the value in that square was adjusted to agree with the long term mean of those gauges. There had to be at least 7 years of annual rainfall data during the period 1950 to 1985 for this adjustment to be made.

The raingauges used in the analysis are listed in Table 2.3 of the main report. Each raingauge was given a weighting factor according to the quality of the data from the station. The weighting factor ranged from 1 for a poor station to 3 for a very reliable station.

Individual annual rainfall maps were derived from the long term average annual map and annual total rainfall for each raingauge stored on HYDATA. The following procedure, based on a study of correlation between annual total rainfall in one square with annual total rainfall in squares at different distances away, was used to generate annual rainfall maps:

(1) For squares with raingauges the weighted average of all raingauges within that square was calculated. The total weighting factor for the square was stored.

(2) For squares with no raingauges the annual total rainfall was estimated from either one of two methods. The second method was only used if the first method failed to obtain an estimate. The first method was:

> Search for all squares whose centres were no more than 50km away. If the total raingauge weighting factor of these squares was greater than 3, the ratio of current annual to long term annual rainfall in each surrounding square was calculated. A weighted average of these ratios was then multiplied by the long term annual average rainfall of the square in question. This provided the estimate of annual average rainfall for the square.

The second method was :

> Search for all squares whose centres were between 50 km and 325km away. If the total raingauge weighting factor of these squares was greater than 3, the ratio of current annual to long term annual rainfall in each surrounding square was calculated. A weighted average of these ratios was then multiplied by the long term annual average rainfall of the square in question. This provided the estimate of annual average rainfall for the square. If the combined weighting factor from surrounding squares was less than 3, the annual rainfall in the square was recorded as unknown.

(3) A final adjustment was made to those squares with raingauges where the weighting factor was less than 3. The value of annual rainfall inside these squares was then adjusted according to the ratio of current annual to long term annual rainfall in surrounding squares.

The above procedures are built into RAINS and may be used to generate annual total rainfall maps in the future providing the necessary monthly rainfall data has been transferred to HYDATA.

Annual average rainfall

Having established a database of annual rainfall maps, RAINS can then generate long term annual rainfall maps over any time period. There must be at least seven years of data in each grid square to estimate a long term average value. The map-id of this new long term annual average rainfall map is AAR.NEW.

Monthly rainfall

Monthly rainfall is generated using a similar procedure to that described above for annual rainfall. The differences are firstly that monthly rainfall data are abstracted from HYDATA. Secondly the estimation of rainfall in a square with no raingauges is based on the proportion of the annual rainfall falling on surrounding squares in each month. Consequently the annual rainfall map must be derived before proceeding to generate monthly rainfall maps for any year.

Monthly average rainfall

Monthly average rainfall maps may be generated over any period from monthly rainfall maps. There must be at least seven years of data in any square before the map is generated.

Seasonal rainfall and season average rainfall

The facility for generating seasonal rainfall has not been implemented, although file space exists to hold these maps.

General map

Simple arithmetic operations may be employed to generate a new map from one or two existing maps. Maps may be added, subtracted, multiplied, divided and overlaid. Addition, subtraction, multiplication and division of maps is straightforward except that it should be remembered that any operation involving a missing or unknown grid value will result in a missing value being entered in that square for the new map.

Overlaying one map on top of another creates a new map composed of the squares with the value of the first map except where there is a value available from the second map, in which case the value of the second map is transferred to the new map.

Having selected this option RAINS first asks you for the new map name. The map-id of the first map (source map) is then entered, followed by an operator (+ for add, - for subtract, * for multiply, / for divide or & for overlay). Finally the second map-id is entered. The new map is calculated and displayed on the screen. The title of the new map is automatically set to the formula just entered for its creation. The eight scale or colouring intervals are deduced from maximum and minimum value of the generated map. Both the scaling factors and map title of the new may be changed as described above under "display map".

Instead of a map name, either the first or second map may be replaced with a constant by entering a # symbol before the value. For example if a new map called NEWFISH.DAT was to be created by multiplying map FISH.DAT by 2.34 the following formula should be entered:

NEWFISH.DAT=FISH.DAT*#2.34

Default options at each stage of the calculation are obtained by pressing [ENTER] at the appropriate point:

New map name	: Defaults to currently displayed map
First map	: Defaults to currently displayed map
Operator	: Defaults to +
Second map	: Defaults to #0.0 (ie add value of zero)

This facility may be used to speed up creation of maps based on a series of calculations or simple copying of maps.

If areas of a map which are greater or less than a certain value are required, this can be found by using the fact that values equal to or less than -999 are equivalent to missing. For example, if the proportion of the rainfall map AR1985.RMP greater than 1000mm was required, this could be found as follows:

TEMP=AR1980.RMP-#1999.

All values less than or equal to 1000 mm will be set missing. the map TEMP may then be analysed to find its area in km^2 and compared with the area of AR1980.RMP.

A.3.5 Generate time series

Annual time series

A time series of annual maps may be analysed to derive a time series of annual rainfall totals for any basin. This may be achieved by first selecting the basin of interest as described in "Display map" above. The time period over which the basin annual rainfall totals are required is then specified under this option. An external ASCII file of the year followed by annual rainfall total will then be produced. The name of this file will be the basin name followed by the file type extension of .ATS (Annual Time Series). For example, the name of the annual time series file for the Stung Sen at Kompong Thom would be 610101.ATS.

Monthly time series

Monthly time series may be derived in the same way as annual time series described above. In this case the file type extension is .MTS (Monthly Time Series).

Season time series

The facility for seasonal rainfall has not been implemented so this option has no effect.

A.3.6 Analyse map

Area of map

The area of the current is calculated in km^2 and displayed on the screen.

Squares total

The cumulative value of all squares is calculated and displayed on the screen.

Average of squares

The average of all the squares of the current map is calculated in and displayed on the screen.

Maximum square

The highest value in any square of the current map is found and displayed on the screen.

Minimum square

The lowest value in any square of the current map is found and displayed on the screen.

A.3.7 RAINS files

Important MS-DOS files for use with the RAINS system can be identified by the # symbol as the first character of the file type extension in the file name. For example GENMAP.#MP is a RAINS file. All important files and the RAINS program RAINS.EXE may be backed up onto floppy disc using the batch file BACKRAIN.BAT.

The individual files are :

Filename	Type of data	Comments
COAST.#VC BASIN.#VC MAINS.#VC TRIBS.#VC	Vectors	Coastline Mainstream basin boundary Mainstream Mekong and Tonle Sap Tributaries
GRIDINDX.#MP	Master index	Index file for all maps on RAINS
RAINMAP.#IX BASINMAP.#IX GENMAP.#IX	Index	Index to rainfall maps Index to basin maps Index to general maps
RAINMAP.#MP BASINMAP.#MP GENMAP.#MP	Maps	Rainfall maps Basin maps General maps
RAINGS.#LS FLOWGS.#LS	List of stations	Raingauges and weighting factors River gauging stations

The list of station files may be edited to include additional raingauges stored on HYDATA or to change raingauge weighting factors. The list of gaugings stations may also be modified to include more stations for plotting on the screen or map. In both cases the latitude and longitude given to each gauge on HYDATA is used to determine gauge location. It is particularly important that the raingauge location is correct as this influences the grid square in which it will be located.

A.4 Pakse - delta model

A.4.1 Introduction

The analysis of the Great Lake and extension of Kratie flows consisted of three parts:

(1) Kratie flow extension model.

(2) Estimation of Great Lake storage from lake water levels.

(3) Tonle Sap flow generation model.

Two simple FORTRAN programs were written for this work and are described in the following sections. Note that the programs are held on directory \LAKE, but that they must be executed from directory \HYDATA. This is because the programs read flow data directly from HYDATA as inputs to the models using the HYDATA FORTRAN subroutine library.

A.4.2 Kratie flow extension model

The relationship between daily flows at Pakse and Kratie was investigated at the Institute of Hydrology in Wallingford using the micro-CAPTAIN time series package (Micro Computer Aided Program for Time Series Analysis & Identification). The model was fitted using the four years 1961 to 1964 as the calibration period; the period 1965 to 1968 was used for testing the derived model.

It was found that a better overall fit could be achieved using separate models for the wet and the dry seasons. For this analysis the wet season was defined as starting on day 140 (around 20 May) and finishing on day 340 (around 10 November); the dry season extended from day 1 (1 January) to day 115 (around April 25). The periods between these two seasons are transition periods, when the fitted model parameters change gradually to ensure a smooth hydrograph.

Each year was fitted individually, and the correlation coefficient for each year was over 98%. The model parameters for each year were very similar so it was decided to use a single model for predictive purposes using model parameters averaged over the calibration years. The model adopted is given by:

Wet season	Transition (116 < t < 140)
$Qk_t = 1.375 \times Qp_{t-1}$	$Qk_t = (0.709 + 0.00476 \times t) \times Qp_{t-1}$

Dry season	Transition (341 < t < 365)
$Qk_t = 1.256 \times Qp_{t-1}$	$Qk_t = (2.993 - 0.00476 \times t) \times Qp_{t-1}$

where,

Qk_t = flow at Kratie at day t
Qp_{t-1} = flow at Pakse at day t-1

This model was able to explain over 90% of the observed variance in the daily flows over the testing period (1965 to 1968). Plots of the observed and predicted discharges are given as Figures 5.2 and 5.3 in the main report.

In an attempt to improve the fit an additional noise component was added. However the overall fit was poorer than with the simple no noise model. It is possible that the model could be improved by including some measure of rainfall in the intermediate catchment as an additional variable. However given the excellent fit of the simple model, the availability of only monthly rainfall data for the intermediate catchment, and the very limited time available for the study, the simple model was considered to be adequate.

The program PREDQK1 was used to generate daily flows at Kratie from observed flows at Pakse. The generated flows are written to a file that can be read directly by HYDATA. PREDQK1 calculates Kratie flows one year at a time, starting in January. The user is prompted to give the start year (e.g. 1969) and then the final year (e.g. 1986). The generated flow data are written to a text file (PREDQK.DAT) which can be read into HYDATA at menu C6. These modelled flows are stored on HYDATA as estimated values.

A.4.3 Great Lake storage

Daily water levels for the Great Lake are stored on HYDATA for station 20103, Kompong Chnnang. These water levels were converted to storage volumes using the elevation - storage relationship described in Section 5 of the main report. This relationship can be considered as a rating equation, and is kept as such on HYDATA. Daily records of lake storage were derived and stored in station number 20103 on HYDATA.

A.4.4 Great Lake model and delta inflows

Continuous records of daily flows at Kratie (Qk) and the Tonle Sap (Qts), and the storage in the Great Lake (Sgl) were available for the period 1960 to 1969. The MINITAB statistical package (Section A.1) was used to carry out multiple regression analysis on these data.

Initially a single relationship for the whole year with Qts as the dependent variable and Qk and Sgl as the independent variables was carried out; reasonable results were obtained. During the flood season there is a net inflow to the Great Lake from the Mekong through the Tonle Sap. The flow then changes direction as the Mekong recedes; flows from the lake then augment the dry season flows into the delta. The dry season contribution of the lake to delta inflows is then less dependent on Mekong flows. Further analyses, with the data set divided up into two parts, was then carried out.

Various methods of dividing up the data set were attempted. Eventually it was decided to base the start of the first period at the time when Qk fell during the recession to a given threshold discharge. This period continued until Kratie flows began to rise again, thus reducing the outflow in the Tonle Sap. The end of this period was set at the time when Qts fell below a given threshold as the lake drains into the Mekong. The threshold discharges finally chosen were Qk < 15,000 m^3s^{-1} and Qts < 750 m^3s^{-1}.

The correlation matrices for the three variables for each of these periods are given below:

Period 1 (starts at the first day after 1 October when Qk < 15,000 m^3s^{-1} and continues until the start of period 2)

	Qts	Qk
Qk	-.581	
Sgl	.094	.701

Period 2 (starts at the first day after 1 January when Qts < 750 m^3s^{-1} and continues until the start of period 1)

	Qts	Qk
Qk	.800	
Sgl	.924	.890

During the first period when the flow in the Mekong is high, the storage in the lake has little effect on the Tonle Sap flows. However later in the dry season when the water level in the Mekong is low, and there is little backwater effect on the draining of the lake through the Tonle Sap, the storage in the lake becomes more significant.

Regression using each variable in turn was attempted initially. Poor correlations were obtained with a single variable. Much better correlations were obtained using both of the independent variables. The analysis gave the following results:

$$Qts = 114 - (0.369 \times Qk) + (0.0200 \times Sgl) \quad (R^2 = 78\%)$$

$$Qts = 157 - (0.146 \times Qk) + (0.0231 \times Sgl) \quad (R^2 = 86\%)$$

The program PREDQTS1 is used to generate daily flows in the Tonle Sap using these model parameters. On execution of the program the user is prompted to give the start year of the flow generation (e.g. 1924) and the final year (e.g. 1960). The generated data are then written to a text file (PREDQTS.DAT) for transfer to HYDATA at menu C6.

The generated Qts were then read into station 20102 on HYDATA to provide a composite record from 1924 up to 1969; the generated data from 1924 up to 1960 were flagged as estimated values. This long-term flow record and the corresponding flow record for Kratie were then added together to give an estimate of the total inflows into the delta at an imaginary gauging station (number 999000) just downstream of Phnom Penh, and before the river divides into the Bassac and the Mekong. There is a small intermediate catchment between Kratie and the Mekong just upstream of Phnom Penh, but for this preliminary study the contribution of this catchment has been ignored.

A.5 CHANGE

The procedure for detecting future change in the dry season flow regime of rivers in the Lower Mekong Basin is described in Section 4.6 of the main report. The program CHANGE has been written to carry out this analysis and provide a print and plot of the results.

CHANGE reads a data file of 60 day annual minimum discharges prepared by a word processor. Each line of the file contains the year followed by the 60 day annual minimum discharge in m^3s^{-1}. If the annual minimum discharge is not known, a value of -999.0 should be entered. The annual minima must be in chronological order. The graphs plotted by CHANGE uses the first and last years in this file for scaling the time axes, even if the annual minima in those years is unknown (i.e. set to -999.0). This feature may be used to ensure that all stations have the same time axis, which aids comparison between stations. Input files for CHANGE have already been prepared for project stations and have been given the MS-DOS file type extension of .AM (for Annual Minimum). For regulated catchments the file name is .AMR (for Annual Minimum Regulated). On the project PC these files are in the \HYDATA directory.

The most convenient way to update this analysis for any station is as follows:

(1) Transfer the additional flow data to HYDATA

(2) Run the low flow frequency analysis option of HYDATA and obtain a printout of the most recent annual minima (note there must be at least four complete years of data in this analysis).

(3) Edit the appropriate .AR or .AMR file to contain the additional years of 60 day annual minima.

(4) Run program CHANGE.

If the analysis is to be carried out on a new station the procedure is the same except a new .AM or .AMR file will need to be created. Program CHANGE is executed by typing CHANGE at the MS-DOS prompt in the \HYDATA directory. The following example shows how the program might be run to obtain results for station 10501, the Mekong at Chiang Saen; program prompts are in *italics*:

Enter station number > 10501

Enter station name > Mekong at Chiang Saen

Enter file name containing annual minima > 10501.AM

Enter annual minimum for standardisation > 818 (from Table 4.7 in main report)

Printer output y/n > y

Plotter output y/n > y

Enter 1 or 2 for plotter connected to serial port 1 or 2 > 2 (2 for project PC)

The plotter requires two pens in positions 1 and 2 and produces a plot on A4 size paper. Table 4.8 and Figure 4.8 of the main report were produced by CHANGE for Chiang Saen.

Appendix B - Dry season flow estimation procedure

B.1 Introduction

This appendix presents some provisional methods for estimating flow indices on ungauged tributaries. The methods require the calculation of three catchment characteristics, catchment area (AREA), catchment average annual rainfall (AAR) and catchment soil index (SOIL). The estimation equations presented here have large standard errors or factorial standard errors. This means that the flows indices provided by these equations will have a high degree of uncertainty associated with them and will not be as good as values calculated from daily flow records. Nevertheless the estimates from the equations should provide an initial guide to the average and dry season resources of an ungauged river basin.

The standard error, se, gives the maximum error in m^3s^{-1} that would occur 68% of the times that the equation is used. The factorial standard error, fse, presented with equations containing exponents, gives the maximum error in terms of a multiplication or division of the estimated flow, that would occur 68% of the times that the equation is used.

The prediction equations have been derived from gauged catchments with catchment characteristics in the range given in Table B.1.1

Range of application for estimation equations

Catchment characteristic	Minimum value	Maximum value
AREA	200 km^2	100,000 km^2
AAR	1000 mm	2000 mm
SOIL	0	100

Table B.1.1

It is recommended that the regression equations only be used for estimating flow indices when the catchment characteristics fall within the limits given above. Results on catchments which are less than about 1000 km^2 may suffer loss in accuracy due to the coarse 40km x 40km grid used to define AAR and SOIL.

One of the recommendations in the final report is to improve upon the estimation procedures given here by using a smaller grid size, additional catchments and more catchment characteristics.

B.2 Estimation of catchment characteristics

Three catchment characteristics are used to estimate flow indices. These are catchment AREA in km^2, annual average rainfall over the catchment AAR in mm, and hydrological soil index SOIL. The soil index has a value between 0 and 100.

Catchment area, AREA, should be estimated in km^2 by drawing the catchment boundary on a topographical map of suitable scale; 1:250,000 would be adequate for most purposes.

The catchment boundary is then traced from the map onto a separate sheet, marking the edge of the sheet with convenient latitude and longitude divisions. This tracing should then be reduced to a scale of 1:5,000,000.

Figure B.2.1 (at the end of this volume) shows annual average rainfall (AAR) over the Lower Mekong Basin on a 40km x 40km grid at a scale of 1:5,000,000. The tracing of the catchment boundary should then be placed in the correct position over the AAR map. For large catchments, AAR is estimated by finding the average of all squares which have all or most of their area covered by the catchment boundary. For small catchments, some subjective judgement is required to assess which square(s) to use to obtain the value of AAR.

Figure B.2.2 (at the end of this volume) shows the hydrological soil index over the Lower Mekong Basin on a similar 40km x 40km grid. The same procedure is used to obtain the average value of soil index, SOIL, as described above for AAR.

The computer program RAINS described in Section A.3 provides an alternative method of estimating AAR and SOIL for any catchment.

Table B.2.1 gives AAR and SOIL index for the study catchments.

AAR and SOIL index for tributary catchments

Station Number	AAR mm	SOIL	Station Number	AAR mm	SOIL
40201	1867	69	371101	1060	64
50103	1364	89	371203	1169	50
50105	1510	94	371509	1431	50
50201	1291	87	380103	1262	40
70103	1295	59	380110	1239	38
120101	1875	93	380112	1215	52
140201	1113	100	380404	1250	94
140301	1210	100	380602	1290	60
190101	1260	64	380705	1250	37
230102	2355	96	380903	1240	8
320101	1820	55	381001	1235	15
340101	1410	55	381206	1280	25
350101	1586	75	381401	1570	30
370104	1221	47	381501	1200	92
370107	1125	67	430101	2196	87
370111	1140	55	550101	2100	55
370204	1438	89	610101	1166	82
370502	1070	64			

Table B.2.1

B.3 Mean annual runoff and average daily flow

Mean annual runoff (MAR) expressed as mm over the catchment can be estimated at the ungauged site from the following equation:-

$$MAR = (0.982 \times AAR) - 863 \quad mm \qquad R^2 = 74\% \quad se = 199$$

Equation B.1

This implies a linear relationship between rainfall and runoff and mean losses of 863mm.

The average flow (ADF) in m^3s^{-1} can be calculated from MAR and AREA from :

$$ADF = 0.00003171 \times AREA \times MAR \quad m^3 s^{-1}$$

Equation B.2

B.4 Flow duration

Estimation of the flow duration curve is a two stage procedure. The first step involves estimating Q(75), the next step (if required) is to estimate other percentiles of the curve:

STEP 1

$$Q(75) = 0.0776 \times \left[\frac{AAR - 900}{1000}\right]^{1.74} \times \left[\frac{AREA}{1000}\right]^{0.984} \times SOIL^{0.922} \quad m^3 s^{-1}$$

$R^2 = 71\%$ fse = 3.826

Equation B.3

STEP 2

Other percentiles between Q(5) and Q(95) can be estimated from Q(75) using the following relationship:

$$Q(P) = a \times Q(75) \times Q(75\%)^b \quad m^3 s^{-1}$$

Equation B.4

where,

Q(75) = 75 percentile flow from step 1 above

$$Q(75\%) = \left[\frac{Q(75)}{ADF}\right] \times 100 \qquad \left[\begin{array}{l} Q(75) \text{ from step 1 above} \\ ADF \text{ from Section B.3} \end{array}\right.$$

Equation B.5

The values of the coefficients a and b depend on the percentile of interest and are calculated from:-

$$a = 10^{[2.927 - (0.0398 \times P)]}$$

Equation B.6

$$b = (0.01784 \times P) - 1.28$$

Equation B.7

B.5 Low flow frequency

The following procedures enable the mean annual minimum discharge for **durations** between 10 and 180 days to be estimated (MAM(10)) to MAM(180)). A method has also been developed for estimating the 60 day annual minimum $AM(60)_T$ for different **return periods**, T, at the ungauged site.

Estimation of mean annual minimum discharges for different durations is a two stage process. The first step involves estimating MAM(60), the 60 day mean annual minimum. The second step (if required) involves estimating mean annual minimum of the required duration MAM(D) from MAM(60):

STEP 1

$$MAM(60) = 0.00121 \times \left[\frac{AAR - 900}{1000}\right]^{1.73} \times \left[\frac{AREA}{1000}\right]^{0.784} \times SOIL^{1.98} \quad m^3 s^{-1}$$

$R^2 = 76\%$ fse = 2.568

Equation B.8

STEP 2

The mean annual minima for other durations MAM(D), can be estimated from MAM(60) obtained in step 1 above, AREA and the duration D of interest:

$$MAM(D) = (a \times MAM(60)) + (b \times AREA)$$

Equation B.9

The values of the coefficients a and b are calculated from the duration of interest D ($10 \leq D \leq 180$ days).

$$a = 0.761 + (0.00412 \times D)$$

Equation B.10

$$b = 10^{[(0.00992 \times D) - 5.4]} - 0.00002$$

Equation B.11

The equations given above provide estimates of the mean annual minimum discharge at different durations on the tributaries. Estimates of more severe droughts, in other words dry season flows which occur less often, can be obtained for the 60 day duration (only). The first step is to estimate MAM(60) as described above. Annual minima which occur at return period from once in 2 years to once in 25 years, $AM(60)_T$, may then be estimated from MAM(60) by applying the multiplying factors given in Table B.5.1 to MAM(60).

Higher return period factors - tributaries

Return period Years	MAM(60) Multiplying factor
2	0.95
5	0.71
10	0.58
25	0.45

Table B.5.1

If for example the mean annual minimum discharge, MAM(60), were estimated as 100 m^3s^{-1}, the 10 year return period 60 day dry season flow would be:

$$MAM(60)_{10} = 100 \times 0.58 = 58 \quad m^3 s^{-1}$$

This regional low flow frequency relationship was obtained by averaging the ratios of AM(T)/MAM(60) for the natural catchment data set excluding four stations (190101, 340101,370111 and 370204) which recorded zero 60 day annual minima. It has not been possible to develop a procedure for estimating the frequency of zero flows although for some situations these rivers will be known from local knowledge.

Although the Mekong river is well gauged and therefore estimation at the ungauged site is normally unnecessary there are some records which are too short to carry out an annual minimum analysis but will provide a good estimate of MAM(60). For these stations the multiplying factors, given in Table B.5.2 below and derived from long flow records on the Mekong will be useful for estimating extreme annual minima.

Higher return period factors - mainstream

Natural river above Nam Ngum confluence	
Return period Years	MAM(60) Multiplying factor
2	1.01
5	0.94
10	0.85
25	0.79
Regulated river below Nam Ngum confluence	
Return period Years	MAM(60) Multiplying factor
2	1.00
5	0.90
10	0.85
25	0.79

Table B.5.2

These multiplying factors define the average low flow frequency curves for the Mekong. At present the reach above the Nam Ngum confluence is natural whereas the reach downstream is regulated. Values of the ratios for individual stations are given in Table 4.2 of the main report for the natural river and Table 4.3 for regulated stations.

B.6 Example

The use of the equations given above is illustrated in this section by an example problem. Suppose that the following information were required for the Nam San dam site in northeast Thailand, station 140301:

(1) The average daily flow, ADF

(2) The daily flows that would be exceeded 95% of the time, Q95

(3) The mean annual minimum 60 day discharge, MAM(60)

(4) The mean annual minimum 120 day discharge, MAM(120)

(5) The 10 year return period, 60 day duration, annual minimum discharge, $AM(60)_{10}$

This station was chosen because the errors in prediction were typical of those which might be expected when using these equations. For each of the flow indices above the 'actual' value obtained from the daily flow data at this site is given so that it may be compared with the predicted value.

The first step is to obtain the catchment characteristics. Catchment area is obtained from a topographical map as described in Section B.1. Figure B.2.1 is used to obtain an estimate of annual average rainfall; the single grid square used to find AAR for this catchment is marked with a "*'. Similarly Figure B.2.2 is used to obtain the soil index for this catchment. Alternatively the computer program RAINS described in Section A.3 can be used to obtain AAR and SOIL. Table B.2.1 also gives AAR and SOIL for this catchment. The catchment characteristics for this station are :

AREA = 703 km^2
AAR = 1210 mm
SOIL = 100

Note how the coarse resolution of the grid in Figures B.2.1 and B.2.2 makes it difficult to get estimates of AAR and SOIL for small catchments.

The catchment characteristics given above fall within the limits set in Table B.1.1, which means that the equations given in this section can be used for estimation. If, for example, the catchment area was $50km^2$, the equations could not be used since they are only valid for AREA between $200km^2$ and $100,000km^2$.

B.6.1 ADF

The average daily flow, ADF, is estimated from Equations B.1 and B.2 given in Section B.3:

STEP 1

From Equation B.1:

MAR = (0.982 x 1210) - 863

MAR = 325 mm (from flow data MAR = 370 mm)

STEP 2

From Equation B.2:

$$ADF = 0.00003171 \times 703 \times 325$$

$\underline{ADF = 7.25 \quad m^3 s^{-1}}$ (from flow data ADF = 8.24 $m^3 s^{-1}$)

B.6.2 Q(95)

The 95 percentile flow, Q(95), is estimated from Equation B.3 to obtain Q(75) and then Equations B.4, B.5, B.6 and B.7 to extend Q(75) to Q(95).

STEP 1

From Equation B.3:

$$Q(75) = 0.0776 \times \left[\frac{1210 - 900}{1000}\right]^{1.74} \times \left[\frac{703}{1000}\right]^{0.984} \times 100^{0.922}$$

$Q(75) = 0.5 \quad m^3 s^{-1}$ (from flow data Q(75) = 0.971 $m^3 s^{-1}$)

STEP 2

Equation B.4 is now used to estimate Q(95) from Q(75). However some of the parameters in Equation B.4 have themselves to be estimated beforehand. Firstly Equation B.5 is used to calculate Q(75) as a percentage of the average daily flow:

$$Q(75\%) = \left[\frac{0.5}{7.25}\right] \times 100$$

$$Q(75\%) = 6.9$$

STEP 3

Equation B.6 is then used to obtain the parameter "a" in Equation B.4:

$$a = 10^{[2.927 - (0.0398 \times 95)]}$$

$a = 0.14$

STEP 4

Equation B.7 is now used to obtain the parameter "b" in Equation B.4:

$b = (0.01784 \times 95) - 1.28$

$b = 0.415$

STEP 5

Q(95) may now be estimated from Equation B.4:

$Q(95) = 0.14 \times 0.5 \times 6.9^{0.415}$

$\underline{Q(95) = 0.156 \ m^3 s^{-1}}$ (from flow data $Q(95) = 0.412 \ m^3 s^{-1}$)

B.6.3 MAM(60)

The 60 day mean annual minimum discharge, MAM(60) is estimated from Equation B.8 in Section B.5:

$$MAM(60) = 0.00121 \times \left[\frac{1210 - 900}{1000}\right]^{1.73} \times \left[\frac{703}{1000}\right]^{0.784} \times 100^{1.98}$$

$\underline{MAM(60) = 1.1 \ m^3 s^{-1}}$ (from flow data $MAM(60) = 0.634 \ m^3 s^{-1}$)

B.6.4 MAM(120)

Having obtained MAM(60) above, Equation B.9 is now used to obtain the mean annual minimum at the required duration of 120 days. However two of the parameters in Equation B.9 have themselves to be estimated beforehand.

STEP 1

Firstly Equation B.10 is used to obtain the parameter "a" in Equation B.9:

$a = 0.761 + (0.00412 \times 120)$

$a = 1.26$

STEP 2

Secondly Equation B.11 is used to obtain the parameter "b" in Equation B.9:

$b = 10^{[(0.00992 \times 120) - 5.4]}$

$b = 0.0000617$

STEP 3

MAM(120) may now be estimated from Equation B.9:

$MAM(120) = (1.26 \times 1.1) + (0.0000617 \times 703)$

$MAM(120) = 1.42\ m^3 s^{-1}$ (from flow data $MAM(120) = 0.889\ m^3 s^{-1}$)

B.6.5 $AM(60)_{10}$

The ten year return period, 60 day duration, dry season flow is estimated from MAM(60) obtained in Section B.6.3 above and from the table of multiplying factors given in Table B.5.1:

$MAM(60) = 1.1\ m^3 s^{-1}$

Multiplying factor to obtain the ten year return period low flow is 0.58.

$AM(60)_{10} = 1.1 \times 0.58$

$AM(60)_{10} = 0.638\ m^3 s^{-1}$ (from flow data $AM(60)_{10} = 0.658\ m^3 s^{-1}$)

Appendix C - Rating review

C.1 Introduction

This report describes a review of the rating equations of ten important mainstream gauging stations on the non-tidal reaches of the Lower Mekong.

The aims of the review were :

(1) To identify any changes in rating that have become apparent from the recent gaugings made by the current meters provided under UK government assistance during 1986/87.

(2) To provide an insight into the reliability of the flow records at each station by studying gauging and rating history. This is of direct importance to the dry season flow analysis of the current Water Balance investigations which made extensive use of these flow data.

(3) To provide future users of these flow data with a guide to their reliability.

The stations considered in this report are shown on Figure 2.1 of the main report and comprise :

Number	Name
10501	Chiang Saen
11201	Luang Prabang
11901	Vientiane
11903	Chiang Khan
11904	Pa Mong dam site
12001	Nong Khai
13101	Nakhon Phanom
13402	Mukdahan
13801	Khong Chiam
13901	Pakse

Recent gaugings (1986 and 1987) have so far only been possible at five of the ten sites in this study. These sites are Luang Prabang, Vientiane, Nong Khai, Mukdahan and Pakse. Consequently at other sites the review is limited to gaugings prior to 1986. Additional gaugings at Nong Khai (October 1982 to December 1985) and Mukdahan (April 1983 to March 1984) have been found since the completion of this part of the study. Consequently they were not included in the analysis reported here.

An insignificant number of gaugings were made on the Mekong before 1960. Flow data before 1960 has either been calculated using ratings derived after 1960 or infilled by correlation techniques using data from other stations (Harza, 1962 and U.S. Army Engineer Division, 1968). Consequently this review is limited to the period from 1960 to 1987, the most recent year for which gaugings were available at the time of this review.

In the course of the study, river gaugings were obtained from several sources[1] and although every effort was made to obtain all gaugings for each site, it is possible that some gaugings exist elsewhere. However it is thought that nearly all the gaugings which have been carried out have been used in this investigation. In view of the work that has gone into river gauging, their quality control and entering them onto computer, Section C.9 contains a listing of all gaugings for all ten stations. Collation of these results in this document will, it is hoped, provide a useful reference for future hydrometric and water resource studies in the Mekong Basin.

Section C.9 also contains other useful information for individual stations, including a history of gauging at each station, the number of gaugings in each year and graphs of all gaugings and fitted rating equations. The recommended long term average rating equations for each station may also be found in Section C.9.

The results given in the main body of this report may be used by any engineer or hydrologist concerned with flow data from these stations to obtain a quantitative measure of the reliability of daily flow data at each site. Results are presented to show the errors associated with these data for periods when the river has been gauged and for periods when no gaugings have been undertaken. Other results show the stage range over which gaugings have been made, compared with the maximum range recorded at the station.

The review was undertaken using the software package HYDATA (Institute of Hydrology, 1987) which has been provided to the Mekong Secretariat as part of the current water balance investigations. HYDATA is an IBM PC/XT or PC/AT compatible package for use in hydrological data processing and analysis.

All gaugings and programs are available for future use on an IBM AT compatible computer at the Secretariat and the facilities remain with the Secretariat to extend and update this review as required.

C.2 Procedures currently in use

The procedures for fitting rating equations and estimating daily mean flow by the Mekong Secretariat are outlined in this section.

[1] Sources of gaugings :

National Energy Administration, Bangkok, Thailand, Unpublished river gaugings from station files. (gaugings from mid 1960's to mid 1970's)

Harza Engineering Company, 400 West Madison St., Chicago 6, Illinois, USA, "Hydrologic Data Mekong River Basin - Laos 1960", May 1962. (gaugings from early 1960's)

Harza Engineering Company, 400 West Madison St., Chicago 6, Illinois, USA, "Hydrologic Data Mekong River Basin - Laos 1961", July 1962. (gaugings from early 1960's)

Harza Engineering Company, 400 West Madison St., Chicago 6, Illinois, USA, "Hydrologic Data Mekong River Basin - Thailand 1960", April 1962. (gaugings from early 1960's)

Harza Engineering Company, 400 West Madison St., Chicago 6, Illinois, USA, "Hydrologic Data Mekong River Basin - Thailand 1961", May 1962. (gaugings from early 1960's)

Mekong Secretariat, Bangkok, Thailand, Unpublished river gaugings from computer listing. (gaugings from 1986 and 1987).

C.2.1 Rating equations

Provided that sufficient river gaugings have been made at the site in the year, rating equations are fitted to river gaugings on an annual basis. A single annual rating equation is fitted through the points and this rating is applied throughout the year. Each gauging within the year is compared with the fitted rating equation and the departure, in terms of metres from the rating, is calculated. These values then constitute a time series which is used to determine consistent shifts above or below the 'average' rating. Shifts are determined by inspection and translated into a gauge height correction which is applied at the time of converting stage to flow.

The fitting of the 'annual' rating is achieved either by drawing a smooth line by eye through the points or more recently by fitting an equation using a least squares procedure. Rating curves are presented in the Mekong Secretariat "Lower Mekong Hydrologic Yearbook". These are a series of publications dating from 1962 listing data from key hydrological and meteorological stations in the Lower Mekong. (Mekong Secretariat, 1962-1984).

When there are no gaugings available in a year, the most recent rating equation is used to convert stage to flow.

C.2.2 Calculation of daily mean flow

Normally several gauge height readings per day are made by observers at these sites. The actual number of readings per day varies from site to site and in some cases the number of readings per day increases during periods of high flows (Mekong Secretariat, 1962-1984). These readings are then averaged to determine daily mean gauge height. Any shift correction is then applied and the rating used to convert daily mean gauge height to daily mean flow. On some days, when the stage has been changing rapidly the day is divided into smaller time intervals and flow calculated for each stage to allow for the non-linear relationship between stage and flow. Both the daily mean gauge height and the daily mean flow are published in the Mekong Secretariat Hydrologic Yearbooks.

The daily mean gauge height and daily mean flow are stored on the Mekong Secretariat's main VAX computer under a hydrological database system called HMDB (Hydrological and Meteorological Database). (Mekong Secretariat, 1986)

C.3 Fitting of rating equations

Although the procedures for deriving rating equations at the Mekong Secretariat were adequate for their purpose, the different forms of fitting made comparison difficult in this study. For this review it was necessary to have a set of consistently derived rating equations for each site in the same form. Early rating equations had been derived by a drawing a smooth curve by eye through gaugings and using a rating table as the method of conversion of stage to flow. More recent ratings were fitted using a least squares fitting procedure on computer. The later method was chosen on the basis that the fitting procedure could be computer assisted and was more objective. The form of equation chosen was that already in use at the Mekong Secretariat :

$$Q = a\ (h + c)^b$$

where ,

Q = discharge
h = stage
a = multiplier
b = exponent
c = constant

This is probably the most common mathematical form of rating equation used in the world and has been shown to be physically realistic. The exponent "b" can be related to the channel cross section profile and the constant "c" to the value of stage at which flow ceases. Provided the fitted equation is plotted with the gaugings to check the validity of fit and that the exponent "b" and constant "c" are reasonable this is a sound and objective method of fitting rating equations.

All river gaugings for these stations were entered onto the software package HYDATA which was then used to help fit the rating equations to the gauging data. It is necessary to understand some of the principles of fitting rating equations with HYDATA and some of the options available as these will be referred to later in this review.

River gaugings are stored in chronological order and may be given an identifying letter to show which rating equation it belongs to. For example, all gaugings in 1970 might be allocated a letter D and all gaugings in 1971 a letter E. HYDATA is able to store several rating equations for each station, with each rating equation applying from a specified date and identified by a letter. For example, in continuation of the above example, station 10501 might have rating equation D effective from 1st January 1970, rating E from 1st January 1971 and so on.

It is therefore possible to fit separate rating equations to individual groups of river gaugings. The identifying letter of the rating equation being the same as the identifying letter of the river gaugings used in the fitting.

It is also possible to exclude certain gaugings which are obvious outliers from the fitting procedure but maintain them on the list of gaugings. This is achieved by replacing the identifying letter by the character "?". Gaugings which are given this 'flag' in Section C.9, have been checked for data entry error and found to be valid, but are obviously inconsistent with other gaugings within the group. These unreliable gaugings should clearly not be used in the fitting procedure but as they form part of the station record they should not be deleted from the archive.

At some stations there may be flood gaugings at very high stages which should be used in fitting all rating curves. HYDATA offers the facility of defining exceptional flood gaugings to be included in the fitting of all ratings to improve the definition of the upper region of all curves. The method is optional so it need not be used if there appears to be a definite change in the rating at high flows. Gaugings which have been marked with a "+" symbol in Section C.9 are exceptional flood gaugings which have been included in the fitting of all ratings.

This Appendix gives details of the rating equations fitted for each station together with plots of all ratings and gaugings. These data are also held on HYDATA at the Mekong Secretariat.

The database of gaugings and rating equations were also used in the procedure for estimating hydrometric errors which is described in Section C.5.

C.4 Sources of error

Three main errors are introduced during the process of conversion of water level or stage to daily flow. Firstly in recording water level, secondly in deriving the rating equation and thirdly in applying the equation to convert level to daily flow. Each main source of error is considered below.

C.4.1 Recording of stage

Stage boards are read by the observer to the nearest centimetre. Following the procedures described by Herschy (1978) the percentage error in recording of stage was calculated at each station and found to be never more than 1%. This low error can be attributed to the large stage range at all these sites and the fact that even at the lowest stages there is typically two or more metres depth of water to the zero flow condition. This error in recording stage can be combined with the error in rating to calculate the error in daily flow. However, in view of the small percentage error in stage measurement the analysis has been simplified and only the gauging errors are presented for each station and flow range.

Probably of more potential importance are mistakes in reading which are easily made especially when stages are changing rapidly. However the plotted stage hydrographs have a smooth shape with no steps or large jumps except during periods of flood indicating that the stage data for these sites are of good quality and can be used with confidence.

C.4.2 Application of rating equation

An important source of error, and the one most relevant to this study, is the use of rating curves to convert these stage data to flow. The procedure for fitting rating equations to river gaugings on an annual basis has been described in Section C.2. Unfortunately during the period 1960 to 1987 there were many years when gaugings could not be made at any station.

Firstly let us consider the case when the site has been gauged and an annual rating equation fitted. The degree of scatter about the rating equation is a measure of confidence in the rating. Where gaugings fall close to the fitted line with little scatter there will be a low error associated with the estimated discharge. When the scatter is high, the error in the estimated flow will be much larger. By measuring the departure of each gauging from the rating equation it is possible to quantify this error.

In the case of data from the Mekong Basin, this is not the complete story. Section C.2 described how shift corrections are applied to the stage data to allow for temporary departure from the annual rating equation. Application of shifts will therefore reduce the error of the estimated flow. Section C.5 describes how this error may be quantified by measuring the scatter of gaugings after the shift correction has been applied. This type of error has been called 'rating' error because it quantifies the random scatter about the derived rating (after shift correction).

Secondly we consider the case when the river has not been gauged. During these periods the most recently available rating equation is used to convert stage to flow. In addition to the 'rating' error described above, two further sources of errors become relevant.

The inability to apply a shift correction when gaugings have not been made has been termed 'shift' error. There will also be an error associated with the use of an incorrect rating as no annual rating equation has been derived. This has been called 'incorrect rating' error. The total error in flow data during periods of no gauging is therefore a combination of 'rating', 'shift' and 'incorrect rating error'. Section C.5 describes how this combined error has been quantified.

C.4.3 Conversion to daily flow

Section C.2.2 describes how stage readings are averaged during the day to produce an 'average daily gauge height' and this single value converted to give daily mean flow. Although this procedure is adequate during periods of steady flow, during times of changing flow it always leads to an underestimation of daily mean flow. This is because the relationship between stage and flow is non linear with a typical exponent of around 2. In some instances the day may be divided to calculate daily mean flow when the water level is changing rapidly as described in Section C.2.2. However, as a general principle, it is better to evaluate flow for each stage reading and obtain the estimate of daily mean flow from the average of the individual flow readings.

C.5 Testing procedures

C.5.1 Introduction

The source of errors associated with the application of rating equations was described in Section C.4.2. This section describes how the magnitude of these errors was calculated for periods when the river has been gauged and for periods when it has not. The following assumptions were made:

(1) That the rating equations fitted as described in Section C.3 were a good approximation to the rating equation actually in use at the time.

(2) That the errors introduced by using mean daily stage can be ignored (Section C.4.3).

(3) Following from (2), the gauging undertaken on the day was representative of the flow on that day.

(4) That shift corrections have been applied, where appropriate, to obtain the published daily flow data on the days a river gauging has been made.

The following information was obtained for each day a river gauging was undertaken :

Q1 - The published daily flow value as stored on HMDB taken as the best available measure of daily flow on each date since it incorporates both the use of the correct rating equation and any shift corrections.

Q2 - The flow calculated from the current meter gauging representing the discharge sampled by a single gauging.

Q3 - The flow re-calculated from the stage value stored in HMDB using the correct rating equation derived using HYDATA as described in Section C.3. The correct rating was the current annual rating equation, and represents the flow estimated if no shift correction had been applied.

Q4 - As Q3 but a series of flows calculated using each incorrect rating in turn. (Incorrect ratings were ratings from different years and were used to give an estimate of the error that would arise using the wrong rating equation; this would occur if the last rating had to be used for several years.)

The following sections describe how the error of estimating a single value of daily mean flow was calculated for periods when the river has been gauged and for periods when it has not. The procedures used are based on the principles described in Herschy (1978).

C.5.2 River gauged

During periods when the river has been gauged the rating error can be estimated from the scatter about the rating after the shift correction has been applied. This has been calculated from Q1, the best estimate of daily flow including shift corrections, and Q2 the current meter gauging which, for any one reading, is subject to some uncertainty. The standard error of the rating has been calculated from the formula:

$$Se(g) = \left[\frac{\Sigma \left[\frac{(Q1-Q2)}{Q2} \times 100 \right]^2}{N - 2} \right]^{\frac{1}{2}}$$

where,

Se(g) = Standard error of rating (gauged)
N = Number of observations of Q1 and Q2

(Q2 was chosen as the standardising factor to be compatible with a similar formula for use when the river was not gauged (Section C.5.3).)

The calculation of the error in the daily mean flow for any day is complex and varies according to stage, gauge zero, confidence limit, segment of a multi-part rating equation and differs from rating to rating (Herschy, 1978). It was not appropriate to provide a detailed evaluation of this error and instead the standard error, as defined above, was used as the basis of comparison of stations. The absolute magnitude of the actual errors in daily mean flow will be less than that given.

C.5.3 River ungauged

During periods when the river has not been gauged the errors include the rating error, the shift error and the incorrect rating error as described in Section C.4.2. The error is estimated in the same way as described above for the gauged case, but using one different variable, Q4. The current meter gauging, Q2, is again used and includes the random scatter and the Q4(i) are a series of flows that would have been derived, had the wrong rating been used and no shift applied as may occur if the last rating is used for several years. The standard error, Se(u) of the ungauged series is given by:

$$Se(u) = \left[\frac{\Sigma \left[\frac{(Q2-Q4)}{Q2} \times 100 \right]^2}{N - 2} \right]^{\frac{1}{2}}$$

where,

Se(u) = Standard error of rating (ungauged)
N = Number of observations of Q1 and Q4

The standard error, Se(u), was used as the best estimate of the error in daily flow data for periods when the station has not been gauged.

C.5.4 Shift error

Shift error is described in Section C.4.2 and may be estimated in the same way as described above in Sections C.5.2 and C.5.3. In this case the shift error is estimated from the variables Q1, the best estimate of daily mean flow incorporating any shift, and Q3 the daily flow calculated from the estimated rating equation without any shift applied. The shift error has not been calculated explicitly here because it is allowed for in the ungauged case by use of Q4 as described in Section C.5.3.

C.5.5 Errors at low and high flows

River flow data are used for many purposes. Some applications make use of the entire record; for example estimating annual runoff, while others only use selected parts of the flow series; for example low flows for water resource planning or high flows for flood forecasting.

The measures of errors so far described may be considered to index the first of these three applications since all river gaugings are used in the analysis.

In order to help quantify the errors in periods of low flow, the tests were repeated for gaugings made only in the three dry months of March, April and May. Similarly, the errors in daily mean flow estimation at high flows were obtained by considering gaugings from the months of July, August and September only.

When the errors are presented in this report the three sets of figures 'All', 'Low' and 'High' refer to the three categories described in this section.

C.5.6 Completeness tests

In addition to the tests described in Sections C.5.2 and C.5.3, two additional statistics were produced for each station to assist with interpretation of data quality.

The first of these tests gives the percentage of time that the river has not been gauged. This is done on an annual basis and is defined as the number of years that the river has not been gauged (less than 10 river gaugings) divided by the number of years for which stage data exist after 1960. This value is expressed as a percentage.

The second of the completeness tests gives the percentage of the recorded stage range that has been gauged. For example consider the case if the minimum and maximum stages recorded since 1960 were 1 and 11 metres respectively and the lowest and highest river gauging were 2 metres and 8 metres. The recorded stage range would be 10 metres and the range of gaugings 6 metres. The station could then be said to have been ungauged over 40% of its recorded stage range.

C.6 Results of tests

C.6.1 Results

Table C.6.1 summarises the results of the tests described in Section C.5. for all stations. From this table it is clear that the errors for periods when stations have been gauged is much less than for other periods. Taking an average of all stations over all flow conditions there is an increase in error due to not gauging of 66%. The importance of continuous river gauging is therefore well illustrated. The re-introduction of the gauging programme in 1986 and the new equipment now in use have been, and are continuing to be, of great benefit to water resource studies in the Lower Mekong Basin.

Considering that the errors presented here are higher than that associated with obtaining a single value of daily flow, the data can be regarded as good for most stations when the river is gauged. For one station, Pakse, the data are excellent.

Table C.6.1 shows that in one case the 'not gauged' error is one percent less than the 'gauged' error. This arises firstly because of the assumptions made during the analysis and secondly from the fact that the errors presented are themselves subject to some uncertainty.

The completeness statistics in Table C.6.1 show that there has been a high percentage of time that gaugings have not been made since 1960. Only in one case is the figure less than 50%. However most stations have been well gauged over the full range of stages with two stations having river gaugings from the minimum recorded stage right up to the maximum stage.

Summary of test results

Station	River gauged			River not gauged			Completeness	
	All	Low	High	All	Low	High	C1	C2
10501 Chiang Saen	7%	7%	7%	13%	13%	14%	61%	30%
11201 Luang Prabang	8%	8%	10%	10%	12%	11%	82%	43%
11901 Vientiane	5%	5%	5%	13%	19%	8%	75%	6%
11903 Chiang Khan	7%	9%	7%	8%	12%	6%	62%	6%
11904 Pa Mong	11%	13%	8%	14%	20%	12%	70%	12%
12001 Nong Khai	8%	6%	9%	12%	15%	12%	53%	0%
13101 Nakhon Phanom	10%	14%	5%	19%	25%	12%	75%	0%
13402 Mukdahan	11%	12%	6%	21%	27%	11%	43%	6%
13801 Khong Chiam	13%	17%	8%	22%	29%	11%	68%	13%
13901 Pakse	3%	2%	3%	6%	8%	3%	86%	13%

C1 = Completeness(1) - Percentage of years not gauged
C2 = Completeness(2) - Percentage of stage range not gauged

Lower percentages for all tests indicate better results

Table C.6.1

Using the results of Table C.6.1 it is possible to rank the stations in order of data quality in several ways. Table C.6.2 shows the stations ranked in such a way as to provide a general guideline as to the stations with the best data. The procedure for ranking in this table uses the mean error for all flow conditions but takes into account the accuracy of data both when the station is gauged and when it is not. The procedure also accounts for the percentage of years that the station has been gauged. The calculation of this statistic for each station has been made as follows :

$$E(all) = \frac{(Eg \times Pg)}{100} + \frac{(Eu \times Pu)}{100}$$

where,

E(all) = Error index for all flows %
Eg = Mean error over all flow conditions (gauged) %
Pg = Percentage years station has been gauged %
Eu = Mean error over all flow conditions (ungauged) %
Pu = Percentage years station has not been gauged %

There are other rankings possible from Table C.6.1. In fact Table C.6.2 also contains the rankings of stations according to data quality for low and high flow conditions.

Stations ranked in order of data quality

Flow Condition	Error "E"	Number	Name
All	6%	13901	Pakse
	8%	11903	Chiang Khan
	10%	11201	Luang Prabang
	10%	12001	Nong Khai
	11%	10501	Chiang Saen
	11%	11901	Vientiane
	13%	11904	Pa Mong dam site
	15%	13402	Mukdahan
	17%	13101	Nakhon Phanom
	19%	13801	Khong Chiam
Low Flow	7%	13901	Pakse
	11%	10501	Chiang Saen
	11%	12001	Nong Khai
	11%	11903	Chiang Khan
	11%	11201	Luang Prabang
	16%	11901	Vientiane
	18%	11904	Pa Mong dam site
	18%	13402	Mukdahan
	22%	13101	Nakhon Phanom
	25%	13801	Khong Chiam
High Flow	3%	13901	Pakse
	6%	11903	Chiang Khan
	7%	11901	Vientiane
	8%	13402	Mukdahan
	10%	13801	Khong Chiam
	10%	13101	Nakhon Phanom
	11%	12001	Nong Khai
	11%	11904	Pa Mong dam site
	11%	11201	Luang Prabang
	11%	10501	Chiang Saen

Table C.6.2

C.6.2 Long term average rating equations

The results of this study show that there is a considerable difference in errors in flow data for times when stations are gauged and rated and times when they are not. The main recommendation must be that every effort should be made to continue gauging at these sites in order to provide hydrological data of good quality.

However at any time there may be a number of reasons which dictate that gaugings cannot be made. In this section we consider this situation and discuss how to minimise the errors in flow data during such times.

Firstly let us consider the three types of rating error identified in Section C.4.2. The rating error or random scatter of gaugings about an existing rating equation after shifts have been applied, will tend to cancel out over a period of time. This is because the scatter is random with a mean of zero. The same is true of the shift error where over a one year period the positive shifts will tend to cancel out the negative shifts in rating.

However the errors associated with the use of an incorrect rating do not reduce in the same way. Consider, for example, the case when gaugings were not made between 1976 and 1985. During this ten year period the rating used would have been the one derived using gaugings from 1975. If this rating was above or below the average for the station then the flows estimated for the whole period would be consistently lower or higher than those which did occur. The persistence of this error makes it more serious than the two other sources of error.

In order to eliminate this persistent error one of two courses of action are possible, depending on the nature of the spread of rating equations. Firstly if there is a definite trend (movement up or down) in the rating with time it would be possible to interpolate between two ratings for the years in question. Secondly, if there is no trend in movement of the rating curve, a long term average rating equation using gaugings from several years would provide a more satisfactory method of calculating flow during periods of no gauging. From an inspection of rating curves for each station it appears that a random shift in rating occurs at all sites studied.

There were no gaugings at any station in the ten year period 1976 and 1985 (apart from gaugings at Nong Khai and Mukdahan found subsequent to this study as mentioned in Section C.1). This is the longest period since 1960 that stations have not been gauged and therefore the period most likely to have the most serious errors as the result of an extreme rating. Stage data for this ten year period were converted to daily flow data using HYDATA with a long term average rating equation based on all gaugings. These re-calculated data should have no consistent bias and formed the basis of comparison with published data which may have been biased by an untypical rating being in force at the start of the period. The average daily flow of both the published and re-calculated data was found for each station and the percentage difference evaluated. The results of this comparison are given in Table C.6.3. The same table gives a similar comparison for the 95 percentile flow to show the effect on low flows and the 5 percentile flow to show the effect on high flows. Both the 95% and 5% flows were calculated using a one day time interval.

The results are on the whole encouraging; particularly the average daily flows where no station shows a difference of more than 5%. The effect on extreme low and high flows is more noticeable, especially on the low flows. Station 13801, Khong Chiam, has a particularly large difference of 34%. However data from this station, and particularly its low flow data, are the poorest of all ten stations as

Table C.6.2 illustrates. Although the case for re-calculation is stronger for obtaining better estimates of low and high flows than for mean flows, it may not justify changing data already published. However the user of data from these stations should be aware of the results given in Table C.6.3 as the bias over this ten year period may effect the outcome of any analysis.

Although the case for re-calculation of published flows is not strong in the ten year period studied it would be good practice in future to use the long term average rating equation for periods when a station is not being gauged. It is therefore recommended that long term average rating equations be used to calculate flow at each of these sites for periods in which no gaugings and ratings are available. These average rating equations are presented in Table C.6.4. No equation is given for the Pa Mong site because of a recent relocation of the gauging site some distance from the old location.

If there is a trend in the annual shift of rating which is not possible to detect by visual inspection of rating curves, it would be possible to allow for this by updating the average rating equation every five years or so. The revised average rating equation could be derived from gaugings made from the last ten years for which gaugings were available. In this way the most recent gaugings would be used in the fitting of the average equation and the very old gaugings eventually removed.

Effect of not using the average rating equation 1976 - 1985

Average daily flow			
Station number	Published data $m^3 s^{-1}$	Average rating $m^3 s^{-1}$	Difference %
10501	2593	2739	5
11201	4107	4202	2
11901	4574	4631	1
11903	4283	4481	4
11904	4469	4428	-1
12001	4624	4691	1
13101	6938	7036	1
13402	7309	7481	2
13801	9570	9849	3
13901	10021	9882	-1
95 percentile flow - (dry season flow)			
Station number	Published data $m^3 s^{-1}$	Average rating $m^3 s^{-1}$	Difference %
10501	766	844	9
11201	959	1076	11
11901	1137	1223	7
11903	967	1000	3
11904	1014	1129	10
12001	1066	1149	7
13101	1435	1440	0
13402	1492	1443	-3
13801	1642	2491	34
13901	1843	1890	3
5 percentile flow - (flood flows)			
Station number	Published data $m^3 s^{-1}$	Average rating $m^3 s^{-1}$	Difference %
10501	6599	6812	3
11201	11004	11825	7
11901	12758	12813	0
11903	11799	12625	7
11904	13125	12621	-4
12001	13013	13245	2
13101	20766	21137	2
13402	22162	23180	4
13801	29608	29646	0
13901	30222	30044	-1

Table C.6.3

Long term average rating equations

Station		Rating equation parameters a	b	c	Maximum stage
10501	Chiang Saen	282.00 154.88	1.398 1.873	1.42 1.42	2.11 m 15.00 m
11201	Luang Prabang	7.249	2.615	3.59	25.00 m
11901	Vientiane	42.80	2.207	3.95	15.00 m
11903	Chiang Khan	17.20 5.037	2.318 2.871	3.10 3.10	6.10 m 20.00 m
12001	Nong Khai	28.32	2.331	3.84	15.00 m
13101	Nakhon Phanom (after 1971)	145.42 20.39	1.939 2.694	2.41 2.41	11.10 m 15.00 m
13402	Mukdahan	428.05	1.651	0.85	15.00 m
13801	Khong Chiam	68.98	2.181	3.76	20.00 m
13901	Pakse	723.06 530.95	1.534 1.664	1.16 1.16	9.74 m 15.00 m

Form of equation :

$$Q = a\,(h + c)^{b}$$

Table C.6.4

C.7 Conclusions and recommendations

The computerised database of river gaugings and rating equations for these ten important stations on the Mekong form a useful dataset with which to study future changes in ratings. An analysis of these data has provided an estimate of the reliability of flow data at each site and identified those stations which have the better data.

For periods when stations have been gauged the flow data are generally of good quality. One station, Pakse, has data which must be regarded as excellent.

On average, the error in flow data increases by 66% for periods when stations are not gauged. This clearly demonstrates the need for a continuous programme of river gauging. The re-instatement of this programme on the Mekong after a break of 10 or more years must therefore be welcomed. The new current meters provided as part of an earlier programme of assistance by the United Kingdom Government have helped in redefining ratings at several stations since 1986.

The analysis has also provided a comparison of errors for data from periods of low and high flow. Generally the errors associated with low flows are greater than the average, whereas the errors at high flows are less than average.

The derivation of rating equations and the analysis was carried out using HYDATA, the hydrological database and analysis system developed at the Institute of Hydrology. Both HYDATA and the gauging and rating database remain with the Mekong Secretariat so that the study may be extended to other stations when required.

When fitting rating equations major shifts often occurred in the flood season. A more stable yearly rating curve, with smaller shifts would be obtained by fitting rating equations to gaugings from the peak stage one year to the peak stage in the following year.

The possibility of a bias in flow data during periods when no gaugings have been made has been identified. Long term average rating equations would help to eliminate this bias. Although a study for one period indicated that recalculation of past flow may not be necessary, it would be good practice to use average rating equations in future for periods when no gaugings are made. Long term average rating equations have been derived for each site and presented in this report.

The moving boat method of river gauging has been used at some sites for a limited period. It is interesting to note that gaugings obtained by this method nearly always produce an underestimate of flow for a given stage when compared to the conventional method of gauging. This difference has been attributed to calibration of the equipment used at the time and not to method itself. The difference is of such a magnitude that these gaugings have not been used to fit rating equations at Luang Prabang, Vientiane and Pakse.

Since major shifts in the rating occur during the flood season, it is recommended that rating equations be fitted from peak stage one year to peak stage the next, rather than on a calendar year basis.

Recommendations may be listed as follows :

(1) Every effort should be made to continue the gauging programme on the Mekong.

(2) The data from Pakse are of the highest quality. It is therefore important to ensure the continuous return of stage data from the station.

(3) Long term average rating equations should be used during periods when no gaugings have been made.

(4) The database of gaugings and ratings should be maintained at the ten sites in this study and updated when new gaugings are available.

(5) The analysis should be extended to other major sites of interest in the Lower Mekong Basin to provide guidelines on data quality at more sites

(6) The long term average rating equations should be revised every five years using gauging from the last ten years that gaugings have been made.

(7) Rating curves should run from the peak flow in one season to the peak flow in the next.

C.8 References

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C.9 Data annex

C.9.1 Introduction

This data annex provides details of river gaugings and rating equations for all ten stations considered in the study. Following a general introduction to the tabular and graphical information, separate sections devoted to each station are presented. Further information concerning these stations can be found in the Lower Mekong Hydrologic Yearbook. There is one section of the appendix devoted to each station. The general features to be found for each station are described.

A short description of the procedure used to fit rating equations is given for each station together with a 'Gauging History' table. This lists the years in which gaugings have been made, the number of gaugings in each year and the rating letter which identifies the grouping of gaugings for rating equation fitting. The first year in the table was based on the start of flow data on the Mekong Secretariat's HMDB hydrological database.

The 'Shifts' column in the table shows whether there are consistent and identifiable shifts within any rating. A 'Y' indicates that there are shifts. The shifts have not been quantified here, but this may be done, if required, by applying the following technique. In the list of gaugings for each station the 'comparison' after each gauging gives the departure in metres above or below the fitted rating. For example -0.10/A indicates that the gauging is 0.1 metres below rating equation A. The plot to the right of this comparison is a graphic indicator of the size and sign of the difference. Although some subjective judgement is required, the presence of consistent shifts can be identified from these tables. The magnitude of the shift can be quantified and the duration of the shift determined from the same source.

The fitting method column also shows which HYDATA fitting techniques have been used for each rating using the following code:

(1) "Free" least squares fit of all parameters. A single equation applies over the whole range of stages. This is the most common form of fitting.

(2) Two or three segment ratings with each segment applying over a particular range of water levels.

(3) A weighted fit to improve the fit at high flows.

(4) Restriction of the upper and lower bounds of the exponent "b". It is important that "b" is within physically realistic limits, paricularly when the rating is extrapolated to higher flows.

(5) Fixing the exponent "b" to a pre-determined value.

(6) Restriction of the constant "c" to within physically realistic limits.

(7) Fixing the constant "c" to a pre-determined value.

(8) Manual entry of pre-determined rating curve. For example, re-entry of an old rating with revised datum change reflected in a new value of parameter "c"

(9) Manual entry of a multi-segment rating. For example, retaining an upper segment for flood flows between years and replacing the lower segment within each year to reflect the change in low flow regime.

(10) Inclusion of exceptional flood gaugings in the fitting of all rating equations for a station.

Every care was taken to make sure that the rating equations fitted were realistic and appropriate for the site. Most often a straightforward least squares fit gave an acceptable rating. However in many instances this was not acceptable and one or more of the above HYDATA facilities had to be employed. The gauging history table shows when this was necessary.

In Section 4. of this report the 'flagging' of individual gaugings as dubious (?) or as exceptional flood gaugings (+) was described. For each station the 'Gauging History' table lists the gauging numbers which have been assigned either of these flags.

Finally the maximum and minimum mean daily gauge heights since 1960 are given in the table together with the lowest and highest stages at which river gaugings have been made.

The following figures are presented for each station to illustrate the gauging history and various aspects of the fitting and rating stability :

(1) A bar chart that shows the number of gaugings made at each site from 1960 to 1987.

(2) Plot of all gaugings on a linear scale. This shows the scatter and stability of the section as well as showing the range and number of gaugings. (Dubious gaugings, which have not been used in fitting the equations have not been shown here, they are flagged with "?" in the list of gaugings.) The long term average rating equation derived for each site is also shown on this graph.

(3) The second plot shows all rating equations for the station and illustrates the range of ratings and how much shifting takes place on an annual basis.

(3) Finally a series of log-log plots are presented to illustrate the accuracy of the fit to each of the annual rating equations. Note that the upward extension of the rating line on this plot extends to the station maximum stage. This is set at a sensible metre value above the highest recorded stage. Thus if the highest recorded stage was 13.42 metres, the station maximum would be set to 15 metres.

The table of rating equations presents the ratings derived using HYDATA that could be applied today to convert stage data for any period in the station's history. The station average rating equation has been inserted wherever appropriate in this list.

The list of river gaugings presents all river gaugings used in the study and currently available on HYDATA. The 'Comparison' to the right of this table gives the departure in terms of metres from the current rating equation and is used to identify dubious gaugings and shifts in the rating.

C.9.2 Station 10501 - Chiang Saen

Figure C9.2.1 shows the number of gaugings per year from 1960 to 1987 and shows the long term average rating equation for this site which could be used for the period 1963-1967 and from 1976 onwards (ratings B and J respectively). Figure C9.2.2 indicates that all river gaugings exhibit considerable scatter. The comparison of all rating equations on the linear plot given by Figure C9.2.3 identifies large differences between the annual rating curves. However, treated on an annual basis, individual ratings fit fairly well as indicated by the log-log plots of Figures C9.2.4a to C9.2.4i.

Gauging History - 10501 Chiang Saen

Year	Gauging numbers	Number of gaugings	Rating letter	Shifts (Y=yes)	Fitting method
1960	1 - 22	22			
1961	23 - 43	21	A	Y	1
1962	44 - 64	21			
1963#		0	B		2 *
1968	65 - 175	111	C	Y	1
1969	176 - 280	105	D	Y	1
1970	281 - 375	95	E	Y	1
1971	376 - 459	84	F	Y	5 *
1972	460 - 549	90	G	Y	5 *
1973	550 - 625	76	H	Y	1
1974	626 - 678	53			
1975	679 - 697	19	I	Y	1
1976#		0	J		2 *
	Total =	697			

= and subsequent years

Dubious gaugings (HYDATA flag ?) - 346,356
Rare flood gaugings (HYDATA flag +) - None

Observed stage range 0.22 metres to 13.80 metres
Gauged stage range 0.22 metres to 9.78 metres

See Section C.9.1 for description of the table

* Notes on special fitting:

Rating F . Free fit gives "b"=2.907 and "c"=5.16. This value of "b" is somewhat high and "c" unrealistic compared with "c" from earlier ratings. Technique (5) used with "b" fixed at the average exponent of previous ratings. Good fit on log-log plot and reasonable parameters.

Rating G . Same problem as rating F except "b"=3.685 and "c"=6.68, both of which are worse than F. Same technique and similar results as F overcame problem. Technique (2) for two segment rating was tried to improve fit at high stages but this was not statisfactory due to lack of points.

Ratings B and J . These are average ratings for use during periods when no gaugings have been made. A two part rating was required to give a good fit at both low and high flows.

Rating Equations - 010501 Mekong at Chiang Saen

Rating Letter	Date	Parameters (a, c, b)	Maximum Stage
A	from 1 Jan 1960	$Q = 16.314 (h + 3.680)^{2.679}$	15.00 m
B	from 1 Jan 1963	$Q = 282.000 (h + 1.420)^{1.398}$ $Q = 154.878 (h + 1.420)^{1.873}$	2.11 m 15.00 m
C	from 1 Jan 1968	$Q = 47.705 (h + 2.450)^{2.356}$	15.00 m
D	from 1 Jan 1969	$Q = 135.822 (h + 1.790)^{1.899}$	15.00 m
E	from 1 Jan 1970	$Q = 54.817 (h + 2.640)^{2.248}$	15.00 m
F	from 1 Jan 1971	$Q = 43.245 (h + 3.210)^{2.230}$	15.00 m
G	from 1 Jan 1972	$Q = 41.400 (h + 3.070)^{2.230}$	15.00 m
H	from 1 Jan 1973	$Q = 9.266 (h + 4.120)^{2.799}$	15.00 m
I	from 1 Jan 1974	$Q = 77.621 (h + 2.260)^{2.097}$	15.00 m
J	from 1 Jan 1976	$Q = 282.000 (h + 1.420)^{1.398}$ $Q = 154.878 (h + 1.420)^{1.873}$	2.11 m 15.00 m

Ratings B and J are the average rating

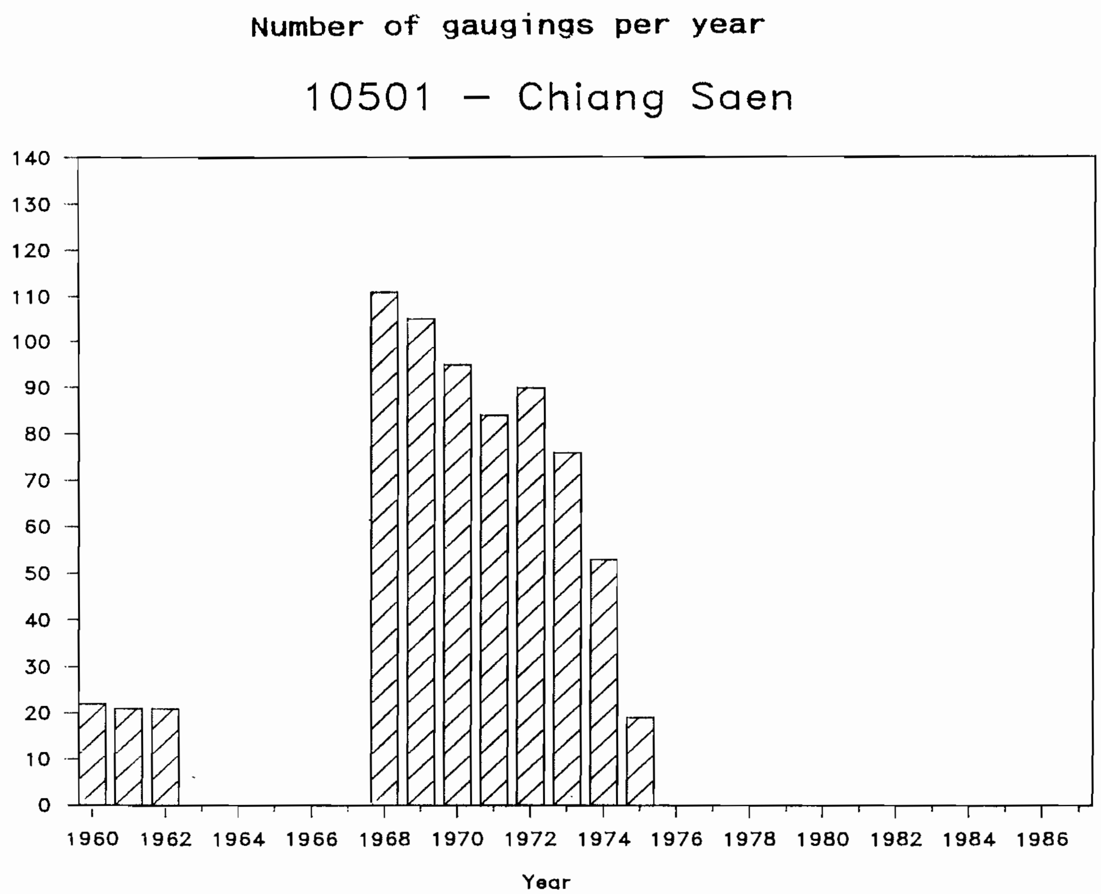

Number of gaugings per year
10501 - Chiang Saen
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
Year

Figure C9.2.1

Rating equations

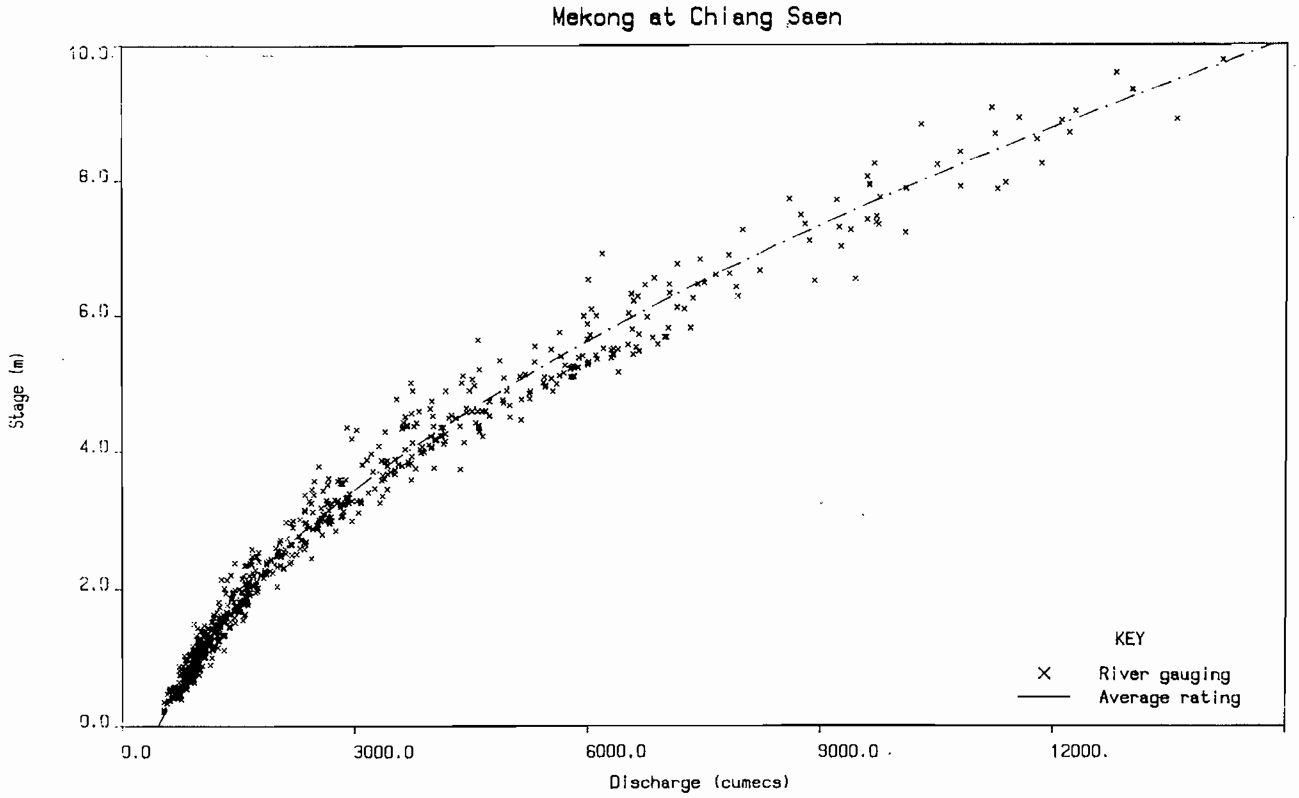


Figure C9.2.2

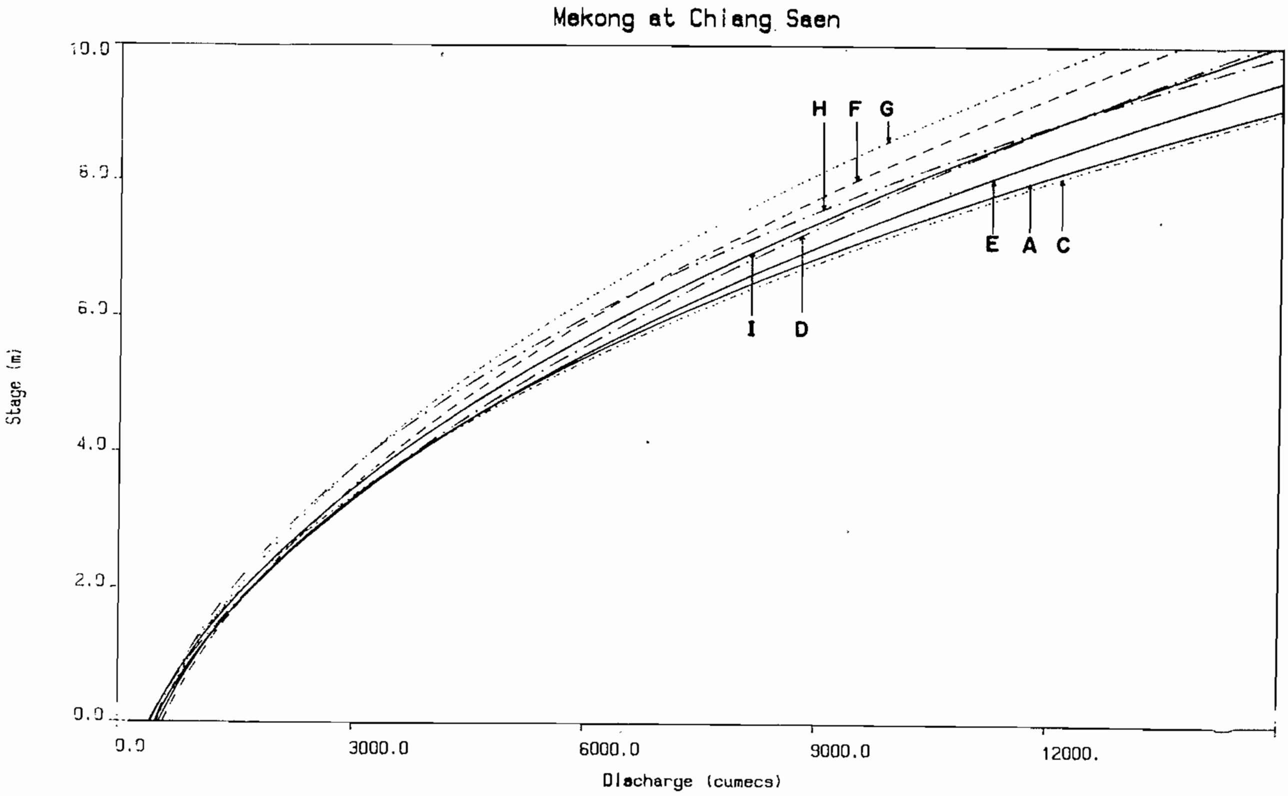


Figure C9.2.3

Rating equations

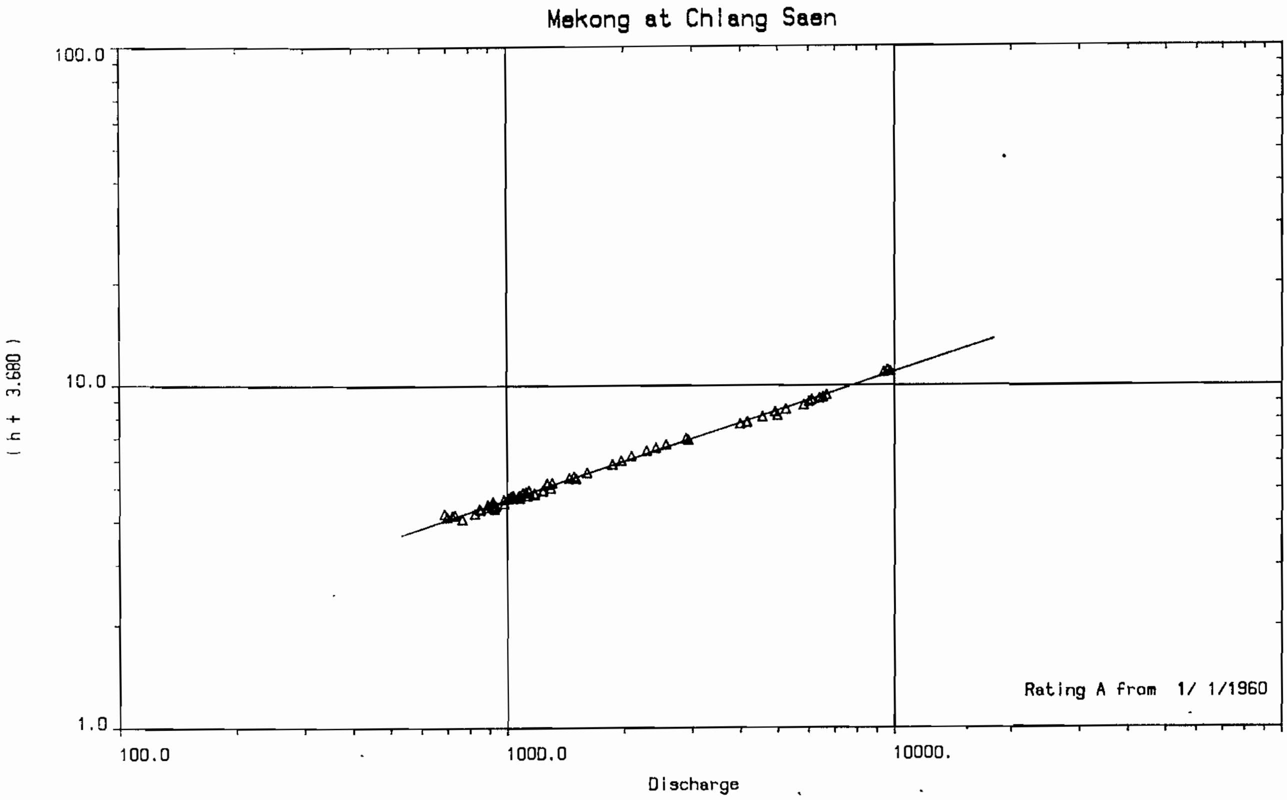


Figure C9.2.4a

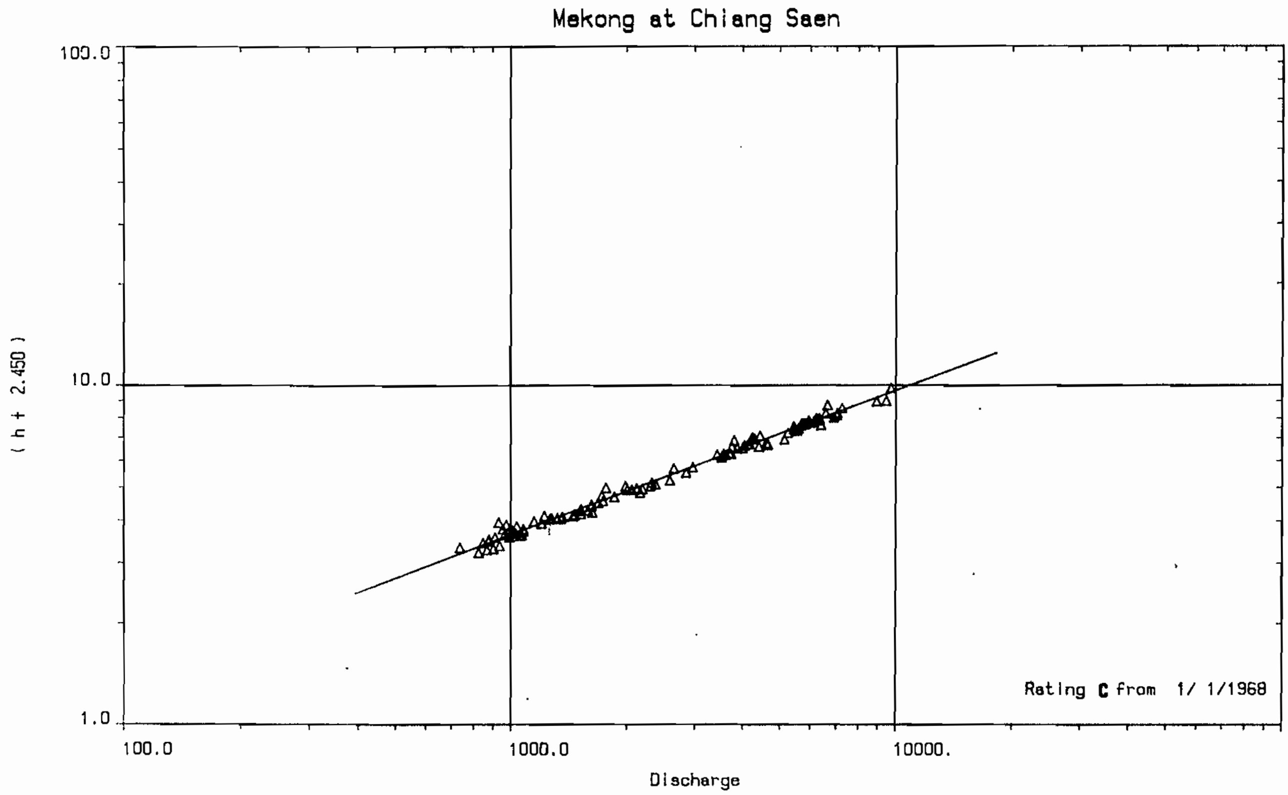


Figure C9.2.4c

Rating equations

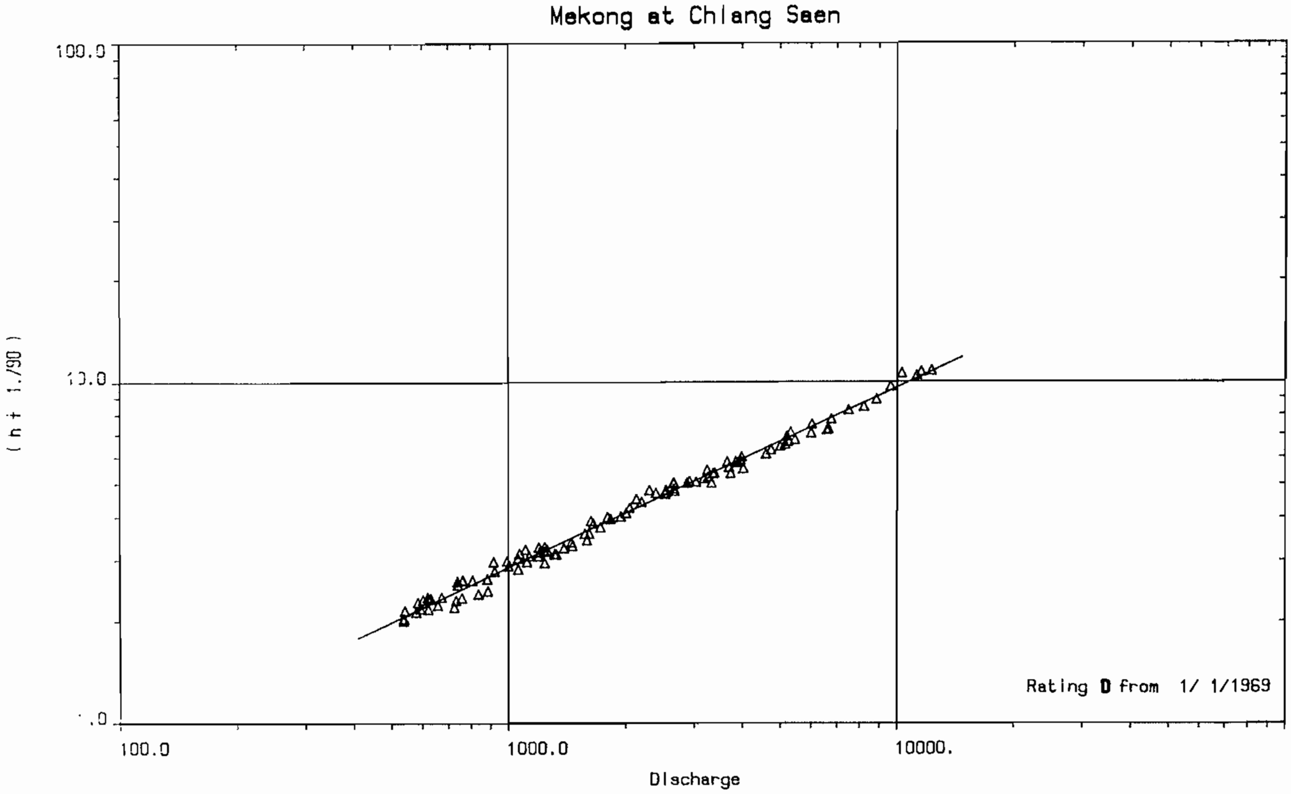


Figure C9.2.4d

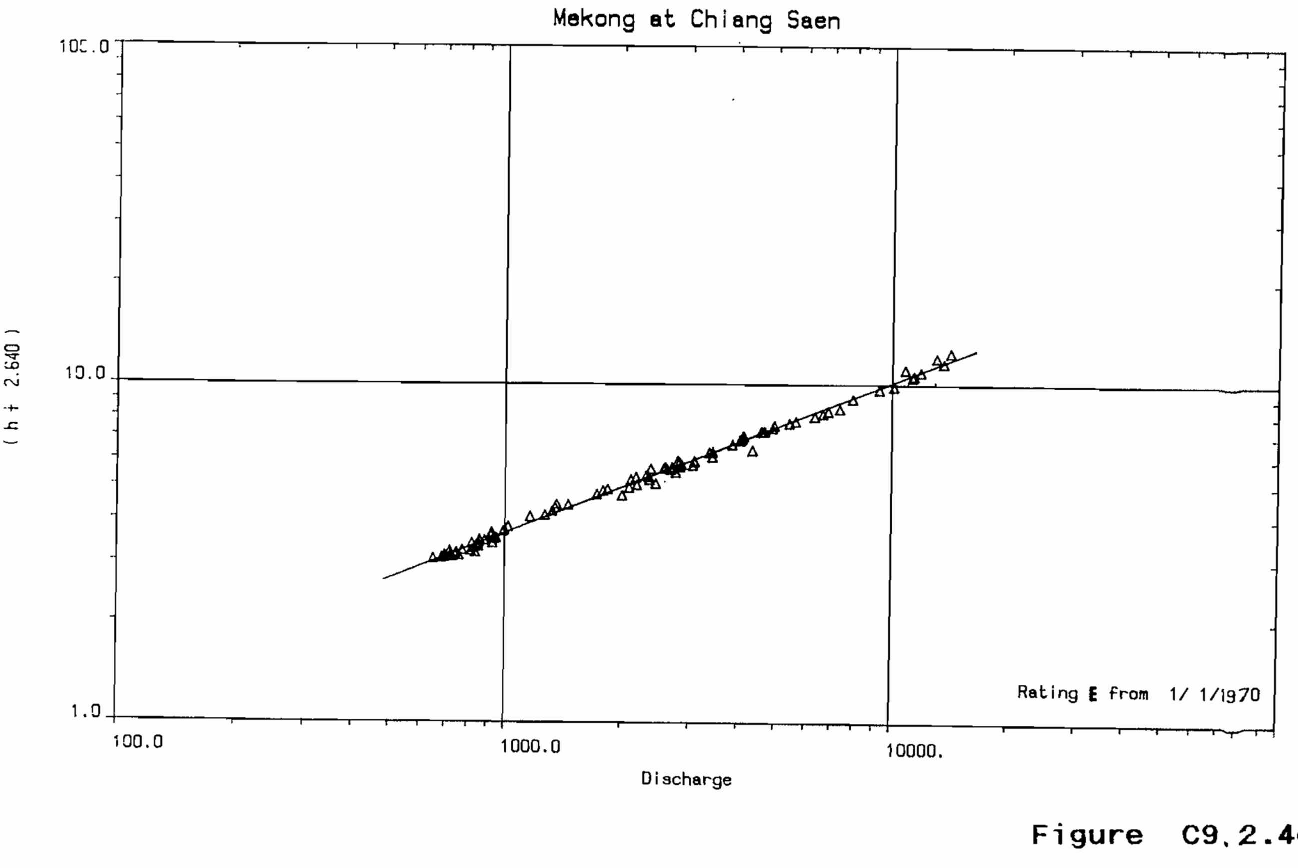


Figure C9.2.4e

Rating equations

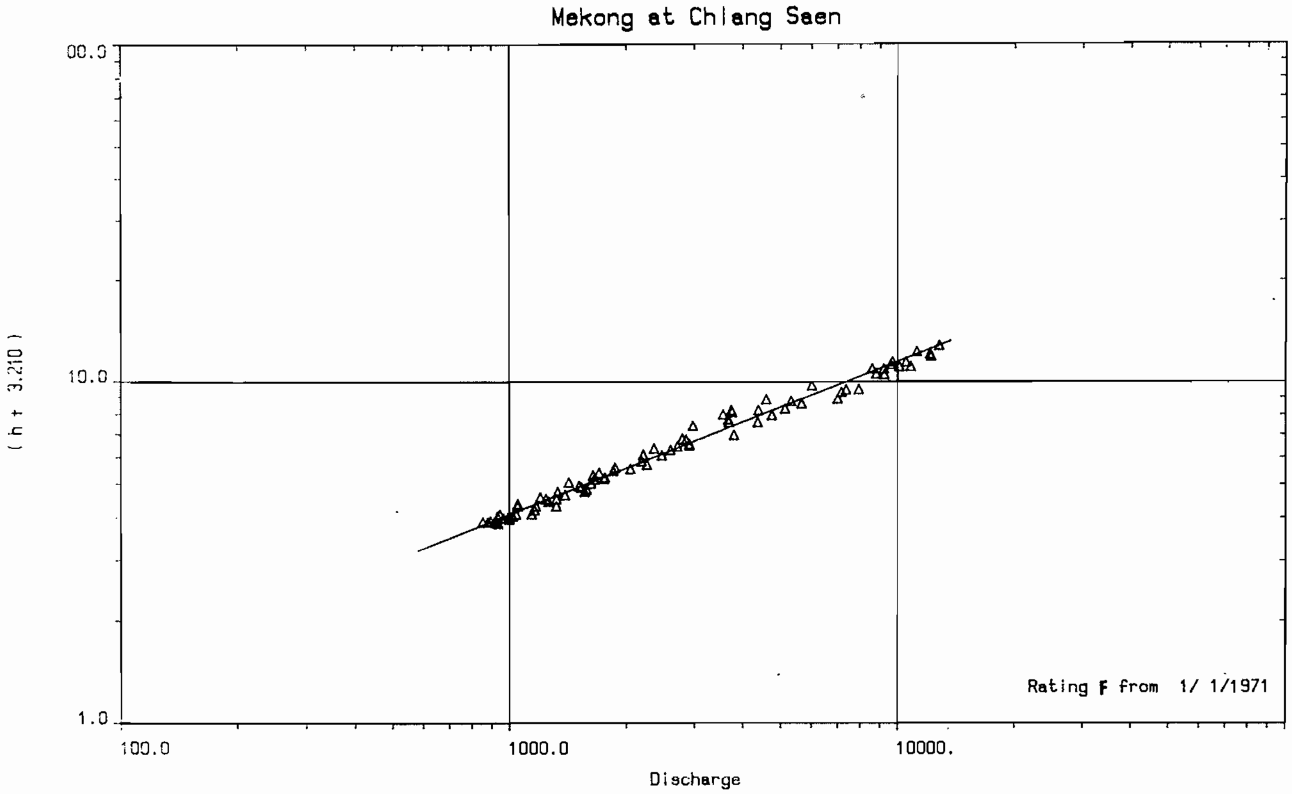


Figure C9.2.4f

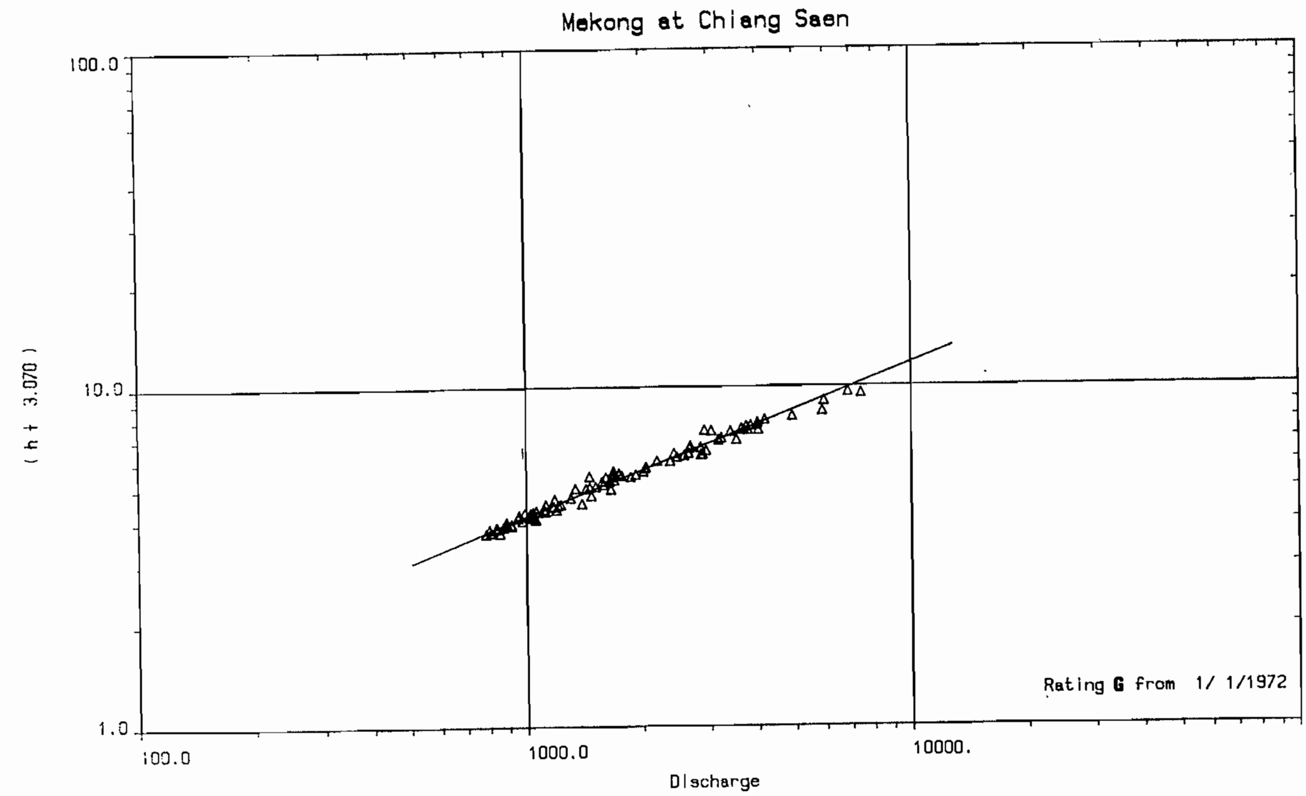


Figure C9.2.4g

Rating equations

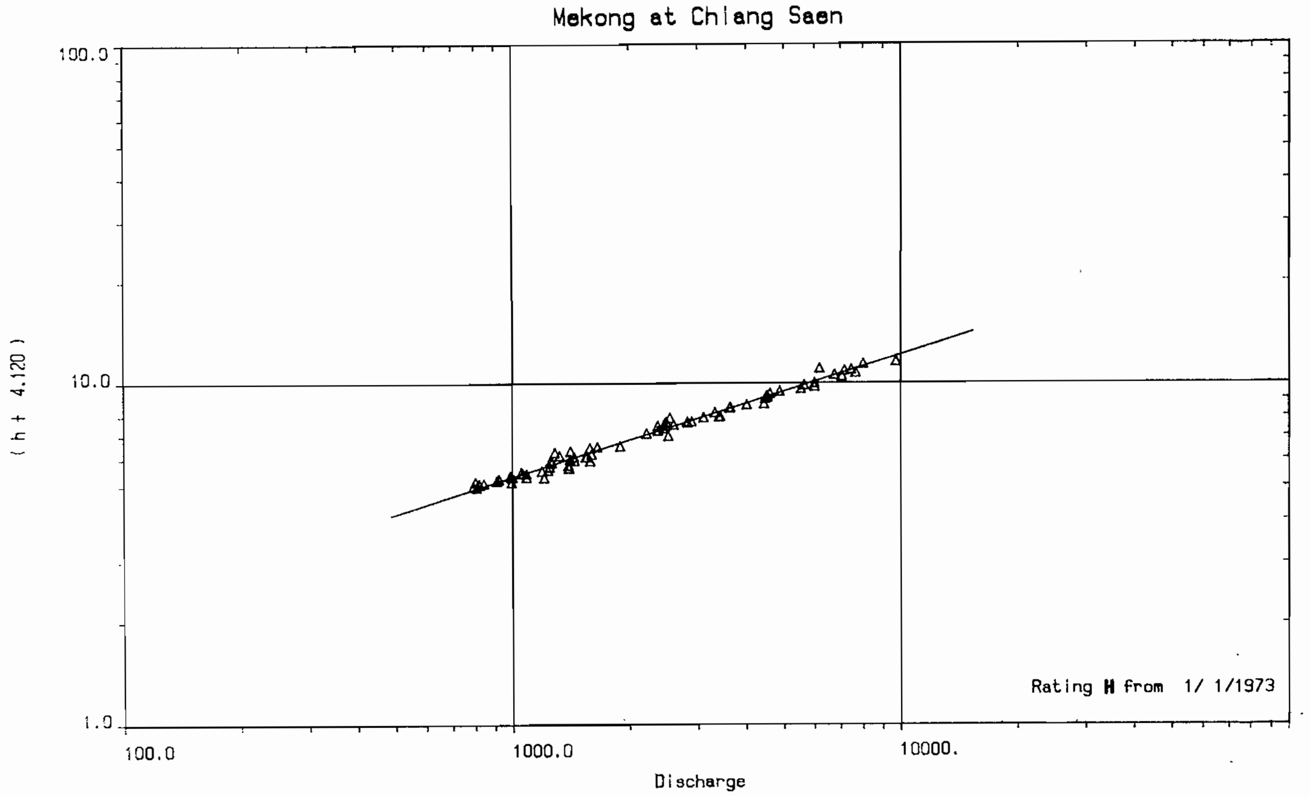


Figure C9.2.4h

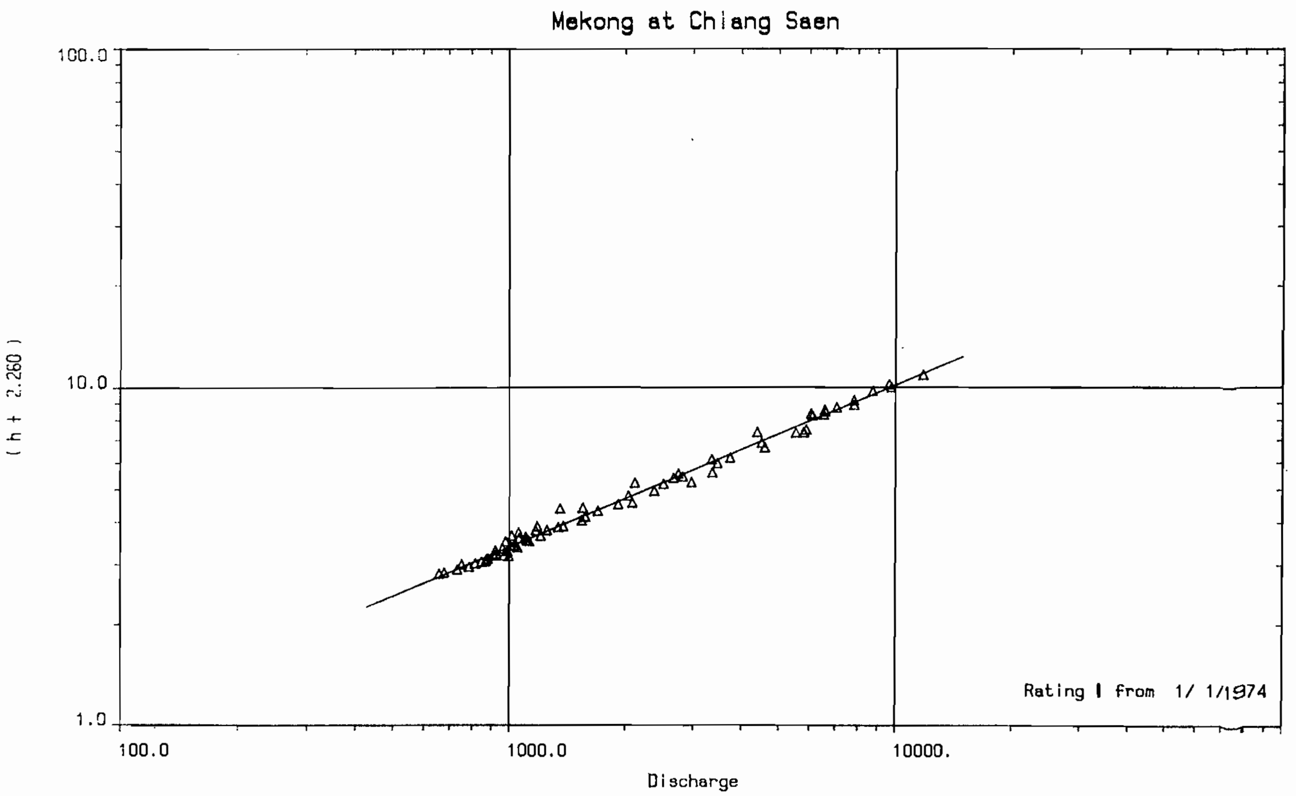


Figure C9.2.4i

River gaugings for station 10501 : Mekong at Chiang Saen

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
1	11 Aug 1960	A	7.410			9600.000	0.28/A	->>>
2	18 Aug 1960	A	7.260			9390.000	0.22/A	->>
3	22 Aug 1960	A	5.510			6400.000	-0.10/A	<-
4	26 Aug 1960	A	4.510			5000.000	-0.28/A	<<<-
5	16 Sep 1960	A	5.580			6530.000	-0.10/A	<-
6	19 Sep 1960	A	5.320			6020.000	-0.08/A	<-
7	23 Sep 1960	A	4.860			5250.000	-0.09/A	<-
8	26 Sep 1960	A	4.430			4560.000	-0.08/A	<-
9	23 Oct 1960	A	3.330			2890.000	0.10/A	->
10	25 Oct 1960	A	3.040			2570.000	0.11/A	->
11	28 Oct 1960	A	2.900			2420.000	0.12/A	->
12	31 Oct 1960	A	2.770			2290.000	0.12/A	->
13	5 Nov 1960	A	2.550			2090.000	0.11/A	->
14	11 Nov 1960	A	2.360			1970.000	0.05/A	->
15	13 Nov 1960	A	2.220			1870.000	0.03/A	->
16	22 Nov 1960	A	1.900			1610.000	0.03/A	->
17	28 Nov 1960	A	1.700			1450.000	0.04/A	->
18	30 Nov 1960	A	1.760			1490.000	0.05/A	->
19	13 Dec 1960	A	1.500			1270.000	0.10/A	->
20	21 Dec 1960	A	1.260			1140.000	0.06/A	->
21	24 Dec 1960	A	1.220			1120.000	0.05/A	->
22	29 Dec 1960	A	1.120			1080.000	0.02/A	-
23	7 Jan 1961	A	0.980			982.000	0.04/A	->
24	17 Jan 1961	A	0.870			918.000	0.05/A	->
25	25 Feb 1961	A	0.460			701.000	0.07/A	->
26	10 Mar 1961	A	0.520			733.000	0.06/A	->
27	16 Mar 1961	A	0.500			722.000	0.06/A	->
28	3 Apr 1961	A	1.100			1040.000	0.06/A	->
29	6 Apr 1961	A	0.820			892.000	0.05/A	->
30	24 Apr 1961	A	1.060			1020.000	0.06/A	->
31	1 May 1961	A	1.530			1310.000	0.07/A	->
32	10 May 1961	A	1.090			1030.000	0.07/A	->
33	15 May 1961	A	1.200			1100.000	0.06/A	->
34	18 Jun 1961	A	4.160			4170.000	-0.08/A	<-
35	17 Jul 1961	A	5.730			6670.000	-0.03/A	<-
36	28 Jul 1961	A	3.260			2930.000	-0.00/A	-
37	5 Aug 1961	A	5.110			5830.000	-0.18/A	<<-
38	8 Aug 1961	A	7.340			9750.000	0.15/A	->>
39	18 Sep 1961	A	4.120			4150.000	-0.11/A	<-
40	26 Sep 1961	A	5.420			6110.000	-0.03/A	<-
41	4 Oct 1961	A	4.720			4920.000	-0.02/A	<-
42	16 Oct 1961	A	4.060			3990.000	-0.05/A	<-
43	29 Dec 1961	A	1.480			1270.000	0.08/A	->
44	2 Jan 1962	A	1.680	1.072	1408.58	1510.000	-0.06/A	<-
45	6 Jan 1962	A	1.350	1.083	1200.37	1300.000	-0.10/A	<-
46	8 Jan 1962	A	1.280	0.976	1270.49	1240.000	-0.08/A	<-
47	11 Jan 1962	A	1.250	0.997	1243.73	1240.000	-0.11/A	<-
48	15 Jan 1962	A	1.180	0.992	1189.52	1180.000	-0.08/A	<-
49	17 Jan 1962	A	1.140	1.018	1159.14	1180.000	-0.12/A	<<-
50	19 Jan 1962	A	1.100	1.032	1094.96	1130.000	-0.08/A	<-
51	23 Jan 1962	A	1.070	0.994	1076.46	1070.000	-0.02/A	-
52	28 Jan 1962	A	1.000			1010.000	0.02/A	-
53	1 Feb 1962	A	1.020			1080.000	-0.08/A	<-
54	8 Feb 1962	A	0.920			920.000	0.10/A	->
55	12 Feb 1962	A	0.850			986.000	-0.09/A	<-
56	19 Feb 1962	A	0.780			937.000	-0.08/A	<-
57	22 Feb 1962	A	0.740			891.000	-0.03/A	<-
58	28 Feb 1962	A	0.760			917.000	-0.06/A	<-
59	2 Mar 1962	A	0.690			849.000	-0.00/A	-
60	6 Mar 1962	A	0.690			930.000	-0.15/A	<<-

River gaugings for station 10501 : Mekong at Chiang Saen

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
61	9 Mar 1962	A	0.660			856.000	-0.05/A	<-
62	13 Mar 1962	A	0.560			827.000	-0.09/A	<-
63	26 Mar 1962	A	0.550			690.000	0.18/A	->>
64	29 Mar 1962	A	0.400			767.000	-0.13/A	<<-
65	1 Feb 1968	C	1.500	0.865	1076.54	931.209	0.42/C	->>>>
66	4 Feb 1968	C	1.440	0.829	1176.87	975.627	0.29/C	->>>
67	6 Feb 1968	C	1.400	0.853	1218.24	1039.156	0.15/C	->>
68	9 Feb 1968	C	1.330	0.801	1192.13	954.893	0.21/C	->>
69	14 Feb 1968	C	1.330	0.890	1213.96	1080.421	0.02/C	->
70	17 Feb 1968	C	1.530	0.926	1243.16	1151.162	0.12/C	->
71	20 Feb 1968	C	1.270	0.899	1204.27	1082.642	-0.04/C	<-
72	23 Feb 1968	C	1.220	0.871	1184.29	1031.513	-0.02/C	-
73	1 Mar 1968	C	1.280	0.922	1095.71	1010.248	0.08/C	->
74	4 Mar 1968	C	1.180	0.924	1042.03	962.836	0.05/C	->
75	8 Mar 1968	C	1.120	0.886	1028.77	911.490	0.07/C	->
76	11 Mar 1968	C	1.070	0.872	1007.86	878.850	0.08/C	->
77	14 Mar 1968	C	1.050	0.885	990.73	876.799	0.06/C	->
78	23 Mar 1968	C	1.030	0.860	1018.80	876.168	0.04/C	->
79	25 Mar 1968	C	0.990	0.848	999.04	847.183	0.05/C	->
80	30 Mar 1968	C	0.880	0.786	937.77	737.091	0.13/C	->>
81	6 Apr 1968	C	0.770	0.894	922.99	825.154	-0.13/C	<<-
82	7 Apr 1968	C	0.830	0.908	956.04	868.087	-0.15/C	<<-
83	11 Apr 1968	C	0.920	0.948	987.98	936.605	-0.17/C	<<-
84	12 Apr 1968	C	0.850	0.933	966.84	902.058	-0.18/C	<<-
85	18 Apr 1968	C	1.470	1.040	1158.42	1204.757	-0.02/C	-
86	21 Apr 1968	C	1.170	0.998	1073.14	1070.993	-0.13/C	<<-
87	22 Apr 1968	C	1.120	0.961	1034.75	994.394	-0.06/C	<-
88	27 Apr 1968	C	1.160	0.993	1066.95	1059.478	-0.12/C	<-
89	1 May 1968	C	1.620	1.094	1210.55	1324.340	-0.03/C	<-
90	3 May 1968	C	1.860	1.165	1307.84	1523.639	-0.04/C	<-
91	7 May 1968	C	2.520	1.307	1623.43	2121.826	-0.04/C	<-
92	10 May 1968	C	2.720	1.324	1753.58	2321.737	-0.03/C	<-
93	12 May 1968	C	2.480	1.242	1660.86	2062.784	-0.02/C	-
94	13 May 1968	C	2.480	1.215	1650.74	2005.645	0.04/C	->
95	17 May 1968	C	1.960	1.153	1404.26	1619.111	-0.05/C	<-
96	20 May 1968	C	1.680	0.958	1277.82	1224.154	0.17/C	->>
97	26 May 1968	C	1.280	0.902	1101.37	993.432	0.10/C	->
98	27 May 1968	C	1.230	0.903	1090.01	984.279	0.07/C	->
99	28 May 1968	C	1.300	0.899	1125.04	1011.413	0.09/C	->
100	31 May 1968	C	1.620	0.997	1282.82	1278.975	0.03/C	->
101	3 Jun 1968	C	1.780	1.093	1492.61	1631.428	-0.25/C	<<<-
102	5 Jun 1968	C	1.730	1.038	1469.13	1524.959	-0.17/C	<<-
103	7 Jun 1968	C	1.680	1.052	1381.08	1452.898	-0.13/C	<<-
104	8 Jun 1968	C	1.600	1.011	1337.92	1352.640	-0.09/C	<-
105	12 Jun 1968	C	3.250	1.357	1952.66	2649.759	0.20/C	->>
106	14 Jun 1968	C	3.290	1.453	2040.65	2965.067	-0.03/C	<-
107	19 Jun 1968	C	2.600	1.274	1559.11	1986.309	0.18/C	->>
108	21 Jun 1968	C	2.280	1.114	1547.88	1724.334	0.15/C	->>
109	22 Jun 1968	C	2.540	1.140	1549.79	1766.759	0.36/C	->>>>
110	24 Jun 1968	C	3.800	1.618	2235.83	3617.579	-0.03/C	<-
111	26 Jun 1968	C	3.840	1.620	2302.61	3730.221	-0.07/C	<-
112	29 Jun 1968	C	4.140	1.566	2394.38	3749.603	0.21/C	->>
113	1 Jul 1968	C	4.080	1.568	2470.37	3873.542	0.07/C	->
114	4 Jul 1968	C	3.800	1.428	2401.72	3429.657	0.11/C	->
115	5 Jul 1968	C	3.860	1.512	2443.12	3693.992	-0.03/C	<-
116	8 Jul 1968	C	4.540	1.704	2492.45	4247.132	0.27/C	->>>
117	9 Jul 1968	C	4.270	1.678	2485.25	4170.244	0.05/C	->
118	10 Jul 1968	C	4.200	1.634	2475.97	4045.740	0.07/C	->
119	11 Jul 1968	C	4.430	1.575	2413.77	3801.687	0.47/C	->>>>
120	12 Jul 1968	C	5.240	1.828	3190.76	5832.705	-0.00/C	-

River gaugings for station 10501 : Mekong at Chiang Saen

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
121	13 Jul 1968	C	5.270	1.798	3176.07	5710.569	0.10/C	->
122	18 Jul 1968	C	5.100	1.772	3073.01	5445.380	0.08/C	->
123	22 Jul 1968	C	4.500	1.563	2698.95	4218.466	0.25/C	->>>
124	26 Jul 1968	C	4.080	1.617	2472.39	3997.856	-0.02/C	<-
125	27 Jul 1968	C	3.820	1.462	2438.54	3565.141	0.03/C	->
126	29 Jul 1968	C	3.740	1.486	2373.56	3527.115	-0.02/C	<-
127	4 Aug 1968	C	5.430	1.823	3476.06	6336.855	-0.09/C	<-
128	9 Aug 1968	C	4.640	1.749	2539.54	4441.651	0.24/C	->>>
129	13 Aug 1968	C	6.510	2.301	3877.82	8922.873	-0.25/C	<<<-
130	15 Aug 1968	C	7.370	2.322	4185.74	9719.296	0.27/C	->>>
131	19 Aug 1968	C	6.280	1.787	3723.12	6653.216	0.60/C	->>>>
132	20 Aug 1968	C	5.800	1.870	3519.22	6580.932	0.16/C	->>
133	22 Aug 1968	C	4.500	1.741	2473.05	4305.575	0.19/C	->>
134	31 Aug 1968	C	5.410	1.958	3033.55	5939.691	0.11/C	->
135	2 Sep 1968	C	5.520	1.954	3244.83	6340.398	0.00/C	-
136	5 Sep 1968	C	5.500	1.951	3235.29	6312.050	-0.00/C	-
137	7 Sep 1968	C	6.100	1.980	3664.05	7254.822	0.11/C	->
138	13 Sep 1968	C	5.160	1.821	3128.01	5696.111	-0.00/C	-
139	15 Sep 1968	C	5.240	1.801	3216.65	5793.192	0.02/C	->
140	17 Sep 1968	C	5.300	1.821	3295.63	6001.348	-0.03/C	<-
141	20 Sep 1968	C	5.220	1.886	3064.44	5779.535	0.01/C	-
142	21 Sep 1968	C	4.960	1.848	2950.76	5452.999	-0.06/C	<-
143	26 Sep 1968	C	5.360	1.901	3223.91	6128.645	-0.04/C	<-
144	28 Sep 1968	C	5.000	1.827	3067.19	5603.759	-0.11/C	<-
145	1 Oct 1968	C	5.260	1.992	2918.12	5812.903	0.03/C	->
146	10 Oct 1968	C	4.230	1.798	2587.82	4652.902	-0.31/C	<<<-
147	14 Oct 1968	C	4.470	1.827	2816.80	5146.287	-0.37/C	<<<<-
148	17 Oct 1968	C	5.820	2.212	3186.62	7048.798	-0.06/C	<-
149	19 Oct 1968	C	5.170	1.939	3303.56	6405.606	-0.38/C	<<<<-
150	21 Oct 1968	C	4.890	1.873	2962.78	5549.285	-0.19/C	<<-
151	23 Oct 1968	C	4.300	1.666	2765.26	4606.918	-0.21/C	<<-
152	26 Oct 1968	C	4.140	1.743	2530.74	4411.087	-0.24/C	<<<-
153	28 Oct 1968	C	5.580	2.197	3146.26	6912.340	-0.24/C	<<<-
154	29 Oct 1968	C	6.540	2.555	3698.85	9450.557	-0.45/C	<<<<-
155	31 Oct 1968	C	5.690	2.439	2880.22	7024.862	-0.18/C	<<-
156	1 Nov 1968	C	5.520	1.910	3252.98	6213.200	0.07/C	->
157	3 Nov 1968	C	4.780	1.843	2852.03	5256.300	-0.13/C	<<-
158	5 Nov 1968	C	4.240	1.626	2538.74	4127.987	0.05/C	->
159	9 Nov 1968	C	3.680	1.496	2355.44	3523.736	-0.08/C	<-
160	18 Nov 1968	C	3.080	1.231	2317.43	2852.755	-0.15/C	<<-
161	23 Nov 1968	C	2.800	1.216	2127.16	2586.629	-0.20/C	<<-
162	25 Nov 1968	C	2.660	1.146	2074.04	2376.855	-0.14/C	<<-
163	26 Nov 1968	C	2.600	1.129	2039.09	2302.135	-0.13/C	<<-
164	28 Nov 1968	C	2.500	1.120	1961.00	2196.325	-0.13/C	<<-
165	2 Dec 1968	C	2.380	1.108	1955.60	2166.802	-0.22/C	<<<-
166	6 Dec 1968	C	2.240	1.013	1834.57	1858.417	-0.04/C	<-
167	10 Dec 1968	C	2.120	1.010	1721.80	1739.019	-0.03/C	<-
168	11 Dec 1968	C	2.060	1.007	1677.35	1689.090	-0.03/C	<-
169	13 Dec 1968	C	2.000	0.997	1627.62	1622.739	-0.02/C	-
170	18 Dec 1968	C	1.840	0.982	1618.92	1589.779	-0.14/C	<<-
171	19 Dec 1968	C	1.830	0.941	1613.22	1518.043	-0.06/C	<-
172	23 Dec 1968	C	1.720	0.930	1571.18	1461.195	-0.10/C	<-
173	24 Dec 1968	C	1.700	0.942	1562.80	1472.155	-0.14/C	<<-
174	26 Dec 1968	C	1.660	0.956	1427.73	1364.910	-0.04/C	<-
175	30 Dec 1968	C	1.590	0.903	1401.01	1265.113	0.02/C	-
176	3 Jan 1969	D	1.500	0.906	1369.29	1240.580	0.08/D	->
177	6 Jan 1969	D	1.430	0.963	1308.78	1260.353	-0.01/D	-
178	9 Jan 1969	D	1.380	0.919	1308.84	1202.823	0.02/D	-
179	10 Jan 1969	D	1.400	0.909	1362.93	1238.901	-0.01/D	-
180	16 Jan 1969	D	1.300	0.892	1339.86	1195.151	-0.05/D	<-

River gaugings for station 10501 : Mekong at Chiang Saen

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
181	19 Jan 1969	D	1.250	0.831	1274.62	1059.207	0.09/D	->
182	22 Jan 1969	D	1.200	0.913	1088.60	993.888	0.14/D	->>
183	23 Jan 1969	D	1.180	0.832	1101.41	916.372	0.24/D	->>>
184	5 Feb 1969	D	1.040	0.900	1179.28	1061.350	-0.12/D	<<-
185	7 Feb 1969	D	1.000	0.816	1130.72	922.665	0.05/D	->
186	13 Feb 1969	D	0.860	0.821	1075.42	882.922	-0.03/D	<-
187	15 Feb 1969	D	0.840	0.751	1015.93	762.964	0.15/D	->>
188	17 Feb 1969	D	0.820	0.764	966.94	738.744	0.17/D	->>
189	20 Feb 1969	D	0.760	0.769	962.54	740.196	0.11/D	->
190	6 Mar 1969	D	0.560	0.661	935.70	618.501	0.13/D	->>
191	7 Mar 1969	D	0.540	0.688	917.81	631.450	0.08/D	->
192	13 Mar 1969	D	0.530	0.694	897.81	623.083	0.09/D	->
193	25 Mar 1969	D	0.480	0.663	881.35	584.335	0.11/D	->
194	3 Apr 1969	D	0.390	0.671	885.50	594.168	0.00/D	-
195	7 Apr 1969	D	0.440	0.740	888.90	657.786	-0.06/D	<-
196	10 Apr 1969	D	0.560	0.747	900.00	672.302	0.03/D	->
197	11 Apr 1969	D	0.520	0.678	888.47	602.382	0.12/D	->
198	20 Apr 1969	D	0.550	0.754	1006.38	758.809	-0.13/D	<<-
199	21 Apr 1969	D	0.610	0.800	1046.02	836.819	-0.21/D	<<-
200	24 Apr 1969	D	0.660	0.885	1001.54	886.360	-0.24/D	<<<-
201	28 Apr 1969	D	0.840	0.787	1025.64	807.177	0.07/D	->
202	2 May 1969	D	0.380	0.682	912.08	622.036	-0.06/D	<-
203	5 May 1969	D	0.250	0.613	878.70	538.645	-0.03/D	<-
204	8 May 1969	D	0.220	0.603	891.42	537.529	-0.05/D	<-
205	12 May 1969	D	0.360	0.677	799.18	541.046	0.08/D	->
206	14 May 1969	D	0.340	0.661	875.86	578.942	-0.02/D	-
207	19 May 1969	D	0.410	0.740	980.15	725.308	-0.22/D	<<-
208	20 May 1969	D	0.510	0.719	1019.09	732.729	-0.13/D	<<-
209	23 May 1969	D	0.840	0.800	951.32	761.056	0.15/D	->>
210	27 May 1969	D	1.160	1.050	1181.49	1240.566	-0.26/D	<<<-
211	29 May 1969	D	1.100	0.882	1135.52	1001.532	0.03/D	->
212	2 Jun 1969	D	1.490	0.947	1265.82	1198.735	0.13/D	->>
213	6 Jun 1969	D	1.350	0.888	1204.38	1069.489	0.18/D	->>
214	11 Jun 1969	D	1.440	0.923	1200.47	1108.032	0.21/D	->>
215	16 Jun 1969	D	2.120	1.161	1406.26	1632.669	0.21/D	->>
216	19 Jun 1969	D	3.260	1.362	1952.49	2659.288	0.26/D	->>>
217	21 Jun 1969	D	3.590	1.505	2229.87	3355.955	-0.03/D	<-
218	23 Jun 1969	D	3.260	1.570	2121.41	3330.611	-0.34/D	<<<<-
219	25 Jun 1969	D	3.590	1.562	2389.85	3732.952	-0.35/D	<<<<-
220	28 Jun 1969	D	3.020	1.244	1850.20	2301.645	0.37/D	->>>>
221	3 Jul 1969	D	2.740	1.207	1768.85	2134.998	0.26/D	->>>
222	7 Jul 1969	D	2.900	1.274	1986.57	2530.891	0.02/D	->
223	12 Jul 1969	D	4.350	1.696	2709.18	4594.776	-0.25/D	<<<-
224	15 Jul 1969	D	4.770	1.709	3014.70	5152.122	-0.22/D	<<<-
225	18 Jul 1969	D	4.040	1.509	2547.32	3843.899	0.02/D	-
226	21 Jul 1969	D	5.140	1.797	2892.56	5197.936	0.11/D	->
227	28 Jul 1969	D	5.280	1.956	3073.36	6011.491	-0.29/D	<<<-
228	5 Aug 1969	D	7.100	2.188	4047.28	8855.439	-0.13/D	<<-
229	6 Aug 1969	D	6.660	2.157	3809.03	8216.075	-0.22/D	<<<-
230	9 Aug 1969	D	5.980	1.873	3616.83	6774.317	-0.07/D	<-
231	15 Aug 1969	D	8.680	2.355	4774.57	11244.114	0.24/D	->>>
232	18 Aug 1969	D	8.820	2.184	4710.51	10287.746	0.85/D	->>>>
233	20 Aug 1969	D	9.020	2.418	5077.83	12278.191	0.09/D	->
234	22 Aug 1969	D	8.920	2.404	4802.67	11545.614	0.33/D	->>>>
235	24 Aug 1969	D	7.920	2.198	4381.21	9629.905	0.28/D	->>>
236	26 Aug 1969	D	6.480	1.994	3763.34	7504.103	0.00/D	-
237	27 Aug 1969	D	5.720	1.753	3442.38	6034.495	0.14/D	->>
238	1 Sep 1969	D	5.430	1.869	3528.99	6595.691	-0.51/D	<<<<-
239	5 Sep 1969	D	4.980	1.683	3246.57	5463.978	-0.23/D	<<<-
240	8 Sep 1969	D	4.680	1.665	3003.41	5000.681	-0.21/D	<<-

River gaugings for station 10501 : Mekong at Chiang Saen

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
241	9 Sep 1969	D	4.530	1.595	2971.46	4739.478	-0.17/D	<<-
242	13 Sep 1969	D	4.890	1.732	3040.44	5266.045	-0.18/D	<<-
243	15 Sep 1969	D	5.480	2.017	3306.52	6669.257	-0.50/D	<<<<-
244	17 Sep 1969	D	5.320	1.853	2871.48	5320.855	0.21/D	->>
245	23 Sep 1969	D	4.230	1.791	2225.37	3985.636	0.09/D	->
246	25 Sep 1969	D	4.110	1.912	2069.56	3956.990	-0.00/D	-
247	26 Sep 1969	D	4.040	1.976	1849.88	3655.367	0.17/D	->>
248	30 Sep 1969	D	4.000	2.177	1791.12	3899.273	-0.07/D	<-
249	6 Oct 1969	D	3.720	1.451	2233.78	3241.211	0.19/D	->>
250	8 Oct 1969	D	3.410	1.540	2066.42	3182.293	-0.06/D	<-
251	11 Oct 1969	D	3.290	1.638	1852.92	3035.076	-0.05/D	<-
252	13 Oct 1969	D	3.470	1.570	2080.08	3265.731	-0.08/D	<-
253	16 Oct 1969	D	3.770	1.660	2425.89	4026.981	-0.40/D	<<<<-
254	17 Oct 1969	D	3.820	1.603	2305.65	3695.952	-0.09/D	<-
255	18 Oct 1969	D	3.610	1.495	2266.28	3388.086	-0.04/D	<-
256	20 Oct 1969	D	3.260	1.360	2115.33	2876.849	0.06/D	->
257	22 Oct 1969	D	3.060	1.365	1951.15	2663.322	0.06/D	->
258	25 Oct 1969	D	2.990	1.314	2035.24	2674.307	-0.02/D	<-
259	27 Oct 1969	D	2.940	1.330	1905.47	2534.271	0.06/D	->
260	28 Oct 1969	D	3.020	1.304	1950.00	2542.801	0.13/D	->>
261	3 Nov 1969	D	3.320	1.393	2096.67	2920.666	0.08/D	->
262	5 Nov 1969	D	2.930	1.213	1972.55	2392.699	0.19/D	->>
263	7 Nov 1969	D	2.650	1.210	1818.84	2200.795	0.11/D	->
264	10 Nov 1969	D	2.480	1.171	1750.52	2049.857	0.09/D	->
265	12 Nov 1969	D	2.330	1.226	1638.11	2008.319	-0.01/D	-
266	15 Nov 1969	D	2.220	1.153	1561.02	1799.861	0.11/D	->
267	17 Nov 1969	D	2.170	1.180	1552.91	1832.434	0.02/D	->
268	19 Nov 1969	D	2.240	1.246	1561.91	1946.137	-0.03/D	<-
269	22 Nov 1969	D	2.050	1.113	1487.77	1655.885	0.11/D	->
270	24 Nov 1969	D	1.960	1.175	1469.49	1726.655	-0.06/D	<-
271	27 Nov 1969	D	1.800	1.135	1386.95	1574.186	-0.04/D	<-
272	2 Dec 1969	D	1.800	1.149	1406.93	1616.565	-0.09/D	<-
273	6 Dec 1969	D	1.650	1.109	1436.90	1593.521	-0.22/D	<<-
274	8 Dec 1969	D	1.600	1.102	1320.70	1455.409	-0.10/D	<-
275	11 Dec 1969	D	1.520	1.139	1284.89	1463.488	-0.19/D	<<-
276	13 Dec 1969	D	1.470	1.063	1309.24	1391.721	-0.15/D	<<-
277	16 Dec 1969	D	1.340	1.069	1231.86	1316.858	-0.18/D	<<-
278	22 Dec 1969	D	1.340	1.044	1274.84	1330.934	-0.20/D	<<-
279	25 Dec 1969	D	1.300	1.006	1126.37	1133.133	0.03/D	->
280	29 Dec 1969	D	1.180	1.014	1102.79	1118.229	-0.06/D	<-
281	5 Jan 1970	E	1.080	1.019	980.86	999.493	0.08/E	->
282	8 Jan 1970	E	1.040	1.024	968.71	991.956	0.05/E	->
283	15 Jan 1970	E	1.010	0.938	986.42	925.263	0.13/E	->>
284	19 Jan 1970	E	0.920	0.972	965.18	938.156	0.02/E	->
285	23 Jan 1970	E	0.840	0.942	913.11	860.148	0.08/E	->
286	26 Jan 1970	E	0.880	1.013	939.54	951.750	-0.04/E	<-
287	30 Jan 1970	E	0.820	0.965	918.66	886.504	0.01/E	-
288	3 Feb 1970	E	0.760	1.023	910.19	931.123	-0.13/E	<<-
289	4 Feb 1970	E	0.750	0.944	869.70	820.993	0.06/E	->
290	6 Feb 1970	E	0.720	0.982	859.60	844.128	-0.01/E	-
291	11 Feb 1970	E	0.680	0.986	866.94	854.801	-0.07/E	<-
292	13 Feb 1970	E	0.650	0.962	864.21	831.372	-0.06/E	<-
293	16 Feb 1970	E	0.600	0.950	815.84	775.047	-0.01/E	-
294	20 Feb 1970	E	0.550	0.932	803.24	748.620	-0.01/E	-
295	24 Feb 1970	E	0.500	0.957	776.37	742.990	-0.05/E	<-
296	27 Feb 1970	E	0.490	0.902	773.73	697.901	0.03/E	->
297	2 Mar 1970	E	0.590	1.005	811.88	815.935	-0.09/E	<-
298	4 Mar 1970	E	0.550	1.025	817.75	838.194	-0.17/E	<<-
299	9 Mar 1970	E	0.480	0.976	779.54	760.830	-0.10/E	<-
300	14 Mar 1970	E	0.460	1.001	727.74	728.466	-0.06/E	<-

River gaugings for station 10501 : Mekong at Chiang Saen

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
301	17 Mar 1970	E	0.420	0.885	735.83	651.208	0.05/E	->
302	19 Mar 1970	E	0.490	0.953	756.73	721.163	-0.02/E	-
303	23 Mar 1970	E	0.440	0.935	733.43	685.760	0.00/E	-
304	30 Mar 1970	E	0.580	0.940	765.11	719.202	0.08/E	->
305	2 Apr 1970	E	0.480	0.942	744.98	701.774	0.01/E	-
306	6 Apr 1970	E	1.460	1.109	1146.01	1270.923	0.05/E	->
307	7 Apr 1970	E	1.420	1.098	1060.92	1164.885	0.17/E	->>
308	9 Apr 1970	E	1.160	1.026	996.28	1022.187	0.13/E	->>
309	11 Apr 1970	E	0.860	1.002	935.85	937.724	-0.04/E	<-
310	17 Apr 1970	E	0.940	1.029	897.98	924.022	0.07/E	->
311	20 Apr 1970	E	0.760	1.305	655.70	855.691	0.00/E	-
312	6 May 1970	E	1.760	1.130	1292.34	1460.346	0.09/E	->
313	9 May 1970	E	1.580	1.104	1202.39	1327.443	0.09/E	->
314	13 May 1970	E	1.680	1.153	1171.03	1350.192	0.16/E	->>
315	16 May 1970	E	1.780	1.142	1191.93	1361.100	0.25/E	->>>
316	19 May 1970	E	2.680	1.417	1658.58	2350.206	-0.00/E	-
317	22 May 1970	E	3.240	1.483	1901.48	2819.892	0.11/E	->
318	25 May 1970	E	2.720	1.319	1754.82	2314.603	0.07/E	->
319	26 May 1970	E	2.580	1.330	1588.61	2112.851	0.14/E	->>
320	2 Jun 1970	E	2.250	1.250	1473.87	1842.333	0.11/E	->
321	6 Jun 1970	E	2.080	1.177	1469.08	1729.103	0.08/E	->
322	11 Jun 1970	E	2.200	1.221	1469.11	1793.782	0.12/E	->>
323	17 Jun 1970	E	3.040	1.374	1887.73	2593.735	0.12/E	->
324	20 Jun 1970	E	2.660	1.265	1722.76	2179.295	0.15/E	->>
325	22 Jun 1970	E	3.000	1.365	1881.92	2568.827	0.10/E	->
326	3 Jul 1970	E	4.240	1.576	2604.41	4104.549	0.06/E	->
327	7 Jul 1970	E	3.990	1.610	2397.15	3859.418	-0.01/E	-
328	9 Jul 1970	E	3.660	1.500	2244.52	3366.775	0.06/E	->
329	11 Jul 1970	E	4.360	1.610	2556.07	4115.279	0.17/E	->>
330	13 Jul 1970	E	4.360	1.560	2657.51	4145.709	0.15/E	->>
331	20 Jul 1970	E	7.020	2.304	4021.18	9264.792	-0.14/E	<<-
332	23 Jul 1970	E	8.240	2.430	4873.53	11842.687	-0.05/E	<-
333	27 Jul 1970	E	7.960	2.426	4689.89	11377.670	-0.13/E	<<-
334	29 Jul 1970	E	7.860	2.378	4742.14	11276.806	-0.19/E	<<-
335	4 Aug 1970	E	7.220	2.363	4271.90	10094.493	-0.32/E	<<<-
336	8 Aug 1970	E	8.900	2.531	5365.96	13581.249	-0.07/E	<-
337	13 Aug 1970	E	9.780	2.440	5799.29	14150.266	0.59/E	->>>>
338	14 Aug 1970	E	9.340	2.337	5565.81	13007.292	0.59/E	->>>>
339	15 Aug 1970	E	8.410	2.292	4709.04	10793.123	0.57/E	->>>>
340	19 Aug 1970	E	6.420	2.257	3506.22	7913.545	-0.07/E	<-
341	21 Aug 1970	E	5.540	2.088	3176.23	6631.973	-0.26/E	<<<-
342	26 Aug 1970	E	5.680	2.137	3203.35	6845.555	-0.24/E	<<<-
343	28 Aug 1970	E	5.380	1.995	3164.31	6312.798	-0.24/E	<<<-
344	2 Sep 1970	E	5.820	2.159	3396.57	7333.187	-0.37/E	<<<<-
345	5 Sep 1970	E	5.120	1.932	2918.99	5639.495	-0.10/E	<-
346	7 Sep 1970	?	5.680	2.012	2702.96	5438.352	0.59/E	->>>>
347	12 Sep 1970	E	4.600	1.643	2791.98	4587.224	0.07/E	->
348	14 Sep 1970	E	5.020	1.774	3059.78	5428.046	-0.06/E	<-
349	19 Sep 1970	E	4.900	1.682	2950.10	4962.069	0.12/E	->
350	21 Sep 1970	E	4.600	1.638	2838.12	4648.833	0.03/E	->
351	23 Sep 1970	E	4.600	1.670	2807.76	4688.952	0.00/E	-
352	28 Sep 1970	E	4.760	1.670	2940.12	4910.000	0.01/E	-
353	2 Oct 1970	E	4.180	1.530	2653.59	4060.000	0.03/E	->
354	6 Oct 1970	E	4.180	1.499	2695.13	4040.000	0.05/E	->
355	12 Oct 1970	E	3.680	1.401	2448.25	3430.000	0.02/E	->
356	19 Oct 1970	?	4.620	1.308	2385.32	3120.000	1.22/E	->>>>
357	21 Oct 1970	E	3.300	1.268	2200.32	2790.000	0.20/E	->>
358	26 Oct 1970	E	2.980	1.150	2069.57	2380.000	0.27/E	->>>
359	28 Oct 1970	E	3.000	1.306	2075.04	2710.000	-0.03/E	<-
360	30 Oct 1970	E	3.060	1.266	2132.70	2700.000	0.04/E	->

River gaugings for station 10501 : Mekong at Chiang Saen

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
361	2 Nov 1970	E	2.990	1.271	2061.37	2620.000	0.04/E	->
362	5 Nov 1970	E	3.460	1.470	2333.33	3430.000	-0.20/E	<<-
363	12 Nov 1970	E	2.850	1.406	1963.02	2760.000	-0.23/E	<<<-
364	17 Nov 1970	E	2.960	1.354	1979.32	2680.000	-0.04/E	<-
365	19 Nov 1970	E	3.060	1.376	2056.69	2830.000	-0.08/E	<-
366	23 Nov 1970	E	2.580	1.330	1774.44	2360.000	-0.11/E	<-
367	26 Nov 1970	E	2.400	1.239	1767.55	2190.000	-0.12/E	<-
368	4 Dec 1970	E	3.140	1.365	2095.11	2859.821	-0.03/E	<-
369	9 Dec 1970	E	3.260	1.409	2191.20	3087.400	-0.11/E	<-
370	11 Dec 1970	E	3.120	1.415	2157.66	3053.082	-0.22/E	<<-
371	15 Dec 1970	E	3.300	1.453	2119.36	3079.429	-0.06/E	<-
372	17 Dec 1970	E	3.750	1.797	2427.85	4362.846	-0.62/E	<<<<-
373	22 Dec 1970	E	2.450	1.396	1754.44	2449.194	-0.33/E	<<<<-
374	24 Dec 1970	E	2.300	1.290	1620.39	2090.303	-0.11/E	<-
375	29 Dec 1970	E	2.050	1.312	1529.67	2006.930	-0.27/E	<<<-
376	5 Jan 1971	F	1.820	1.164	1391.75	1620.000	-0.05/F	<-
377	8 Jan 1971	F	1.690	1.162	1316.70	1530.000	-0.05/F	<-
378	12 Jan 1971	F	1.560	1.157	1348.31	1560.000	-0.22/F	<<<-
379	15 Jan 1971	F	1.540	1.087	1223.55	1330.000	0.10/F	->
380	18 Jan 1971	F	1.450	1.107	1255.65	1390.000	-0.08/F	<-
381	23 Jan 1971	F	1.380	1.010	1188.12	1200.000	0.15/F	->>
382	26 Jan 1971	F	1.330	1.078	1150.28	1240.000	0.04/F	->
383	3 Feb 1971	F	1.260	1.104	1141.30	1260.000	-0.07/F	<-
384	9 Feb 1971	F	1.180	0.918	1143.79	1050.000	0.21/F	->>
385	13 Feb 1971	F	1.120	1.006	1043.74	1050.000	0.15/F	->>
386	22 Feb 1971	F	0.890	1.002	1037.92	1040.000	-0.06/F	<-
387	26 Feb 1971	F	0.830	0.999	932.93	932.000	0.08/F	->
388	3 Mar 1971	F	0.760	1.076	929.37	1000.000	-0.12/F	<-
389	6 Mar 1971	F	0.700	0.980	912.24	894.000	0.02/F	->
390	9 Mar 1971	F	0.680	1.010	904.95	914.000	-0.04/F	<-
391	16 Mar 1971	F	0.680	0.998	881.76	880.000	0.03/F	->
392	20 Mar 1971	F	0.830	1.060	943.40	1000.000	-0.05/F	<-
393	22 Mar 1971	F	0.780	1.012	953.56	965.000	-0.03/F	<-
394	5 Apr 1971	F	0.660	0.996	928.71	925.000	-0.08/F	<-
395	10 Apr 1971	F	0.640	1.008	928.57	936.000	-0.12/F	<<-
396	13 Apr 1971	F	0.840	1.021	999.02	1020.000	-0.08/F	<-
397	16 Apr 1971	F	0.900	1.040	1096.15	1140.000	-0.23/F	<<<-
398	21 Apr 1971	F	1.120	1.115	1183.86	1320.000	-0.30/F	<<<-
399	26 Apr 1971	F	0.680	0.971	878.48	853.000	0.08/F	->
400	5 May 1971	F	0.880	0.976	969.26	946.000	0.10/F	->
401	8 May 1971	F	0.860	1.017	981.32	998.000	-0.02/F	-
402	12 May 1971	F	1.120	1.032	1133.72	1170.000	-0.06/F	<-
403	18 May 1971	F	1.010	1.064	1090.23	1160.000	-0.15/F	<<-
404	22 May 1971	F	1.320	1.098	1202.19	1320.000	-0.10/F	<-
405	25 May 1971	F	1.630	1.174	1345.83	1580.000	-0.18/F	<<-
406	2 Jun 1971	F	2.880	1.314	1879.76	2470.000	-0.04/F	<-
407	9 Jun 1971	F	2.350	1.236	1658.58	2050.000	-0.08/F	<-
408	11 Jun 1971	F	3.100	1.287	2020.20	2600.000	0.03/F	->
409	15 Jun 1971	F	3.250	1.288	2104.04	2710.000	0.06/F	->
410	18 Jun 1971	F	3.760	1.607	2358.43	3790.000	-0.46/F	<<<<-
411	25 Jun 1971	F	4.380	1.629	2676.49	4360.000	-0.33/F	<<<<-
412	28 Jun 1971	F	4.740	1.726	2746.23	4740.000	-0.27/F	<<<-
413	2 Jul 1971	F	5.690	1.955	3580.56	7000.000	-0.89/F	<<<<-
414	12 Jul 1971	F	5.400	1.659	3411.69	5660.000	-0.29/F	<<<-
415	15 Jul 1971	F	5.550	1.549	3434.47	5320.000	0.11/F	->
416	17 Jul 1971	F	6.280	2.039	3894.07	7940.000	-0.87/F	<<<<-
417	23 Jul 1971	F	6.250	1.994	3691.07	7360.000	-0.55/F	<<<<-
418	26 Jul 1971	F	8.700	2.505	4870.26	12200.001	-0.65/F	<<<<-
419	28 Jul 1971	F	7.900	2.296	4703.83	10800.000	-0.78/F	<<<<-

River gaugings for station 10501 : Mekong at Chiang Saen

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
420	30 Jul 1971	F	7.870	2.120	4764.15	10100.001	-0.46/F	<<<<-
421	3 Aug 1971	F	8.050	2.155	4454.76	9600.000	-0.02/F	-
422	5 Aug 1971	F	7.700	2.031	4534.71	9210.001	-0.16/F	<<-
423	9 Aug 1971	F	7.300	2.211	4179.10	9240.000	-0.57/F	<<<<-
424	11 Aug 1971	F	8.230	2.320	4525.86	10500.000	-0.30/F	<<<-
425	14 Aug 1971	F	7.720	1.980	4338.38	8590.000	0.20/F	->>
426	19 Aug 1971	F	8.880	2.446	4946.85	12100.000	-0.42/F	<<<<-
427	22 Aug 1971	F	9.590	2.544	5031.45	12800.000	-0.03/F	<-
428	24 Aug 1971	F	8.240	2.217	4370.77	9690.001	0.13/F	->>
429	3 Sep 1971	F	9.070	2.304	4861.11	11200.001	0.20/F	->>
430	6 Sep 1971	F	7.350	2.236	3935.60	8800.001	-0.28/F	<<<-
431	9 Sep 1971	F	6.530	1.832	3280.57	6010.000	0.60/F	->>>>
432	16 Sep 1971	F	5.650	1.586	2894.07	4590.000	0.76/F	->>>>
433	20 Sep 1971	F	6.120	2.162	3311.75	7160.000	-0.56/F	<<<<-
434	24 Sep 1971	F	5.110	1.649	3110.98	5130.000	-0.19/F	<<-
435	28 Sep 1971	F	5.020	1.450	3020.69	4380.000	0.30/F	->>>
436	6 Oct 1971	F	4.780	1.252	2835.46	3550.000	0.77/F	->>>>
437	8 Oct 1971	F	5.020	1.248	2988.78	3730.000	0.85/F	->>>>
438	11 Oct 1971	F	4.900	1.279	2931.98	3750.000	0.71/F	->>>>
439	14 Oct 1971	F	4.520	1.275	2870.59	3660.000	0.41/F	->>>>
440	18 Oct 1971	F	4.200	1.164	2551.55	2970.000	0.75/F	->>>>
441	27 Oct 1971	F	3.580	1.209	2307.69	2790.000	0.31/F	->>>
442	2 Nov 1971	F	4.380	1.383	2658.71	3677.000	0.26/F	->>>
443	6 Nov 1971	F	3.540	1.129	2524.36	2850.000	0.21/F	->>
444	8 Nov 1971	F	3.350	1.262	2305.86	2910.000	-0.04/F	<-
445	12 Nov 1971	F	3.300	1.251	2326.14	2910.000	-0.09/F	<-
446	15 Nov 1971	F	3.160	1.108	2129.96	2360.000	0.36/F	->>>>
447	18 Nov 1971	F	2.900	1.145	1930.13	2210.000	0.27/F	->>>
448	22 Nov 1971	F	2.640	1.121	1953.61	2190.000	0.04/F	->
449	25 Nov 1971	F	2.510	1.119	2019.66	2260.000	-0.17/F	<<-
450	29 Nov 1971	F	2.390	1.067	1752.58	1870.000	0.19/F	->>
451	2 Dec 1971	F	2.280	1.076	1717.47	1848.000	0.10/F	->
452	6 Dec 1971	F	2.200	0.998	1703.41	1700.000	0.22/F	->>>
453	9 Dec 1971	F	2.100	1.041	1575.41	1640.000	0.20/F	->>
454	13 Dec 1971	F	1.960	1.062	1553.67	1650.000	0.05/F	->
455	17 Dec 1971	F	1.860	0.956	1485.36	1420.000	0.28/F	->>>
456	20 Dec 1971	F	1.990	1.123	1558.33	1750.000	-0.06/F	<-
457	24 Dec 1971	F	2.030	1.094	1608.78	1760.000	-0.03/F	<-
458	27 Dec 1971	F	1.820	1.058	1531.19	1620.000	-0.05/F	<-
459	29 Dec 1971	F	1.740	1.041	1450.53	1510.000	0.03/F	->
460	4 Jan 1972	G	1.710	1.100	1340.00	1474.000	-0.18/G	<<-
461	13 Jan 1972	G	1.460	1.117	1247.99	1394.000	-0.31/G	<<<-
462	17 Jan 1972	G	1.420	0.984	1231.71	1212.000	-0.06/G	<-
463	20 Jan 1972	G	1.380	0.993	1185.30	1177.000	-0.04/G	<-
464	24 Jan 1972	G	1.300	0.969	1147.57	1112.000	-0.00/G	-
465	27 Jan 1972	G	1.250	0.969	1094.94	1061.000	0.04/G	->
466	4 Feb 1972	G	1.220	0.955	1091.10	1042.000	0.04/G	->
467	7 Feb 1972	G	1.130	0.932	1026.82	957.000	0.11/G	->
468	10 Feb 1972	G	1.240	1.008	1112.10	1121.000	-0.08/G	<-
469	15 Feb 1972	G	1.080	0.968	1084.71	1050.000	-0.11/G	<-
470	18 Feb 1972	G	1.010	1.012	1046.44	1059.000	-0.20/G	<<-
471	21 Feb 1972	G	0.980	1.005	972.14	977.000	-0.08/G	<-
472	24 Feb 1972	G	0.880	0.956	957.11	915.000	-0.06/G	<-
473	2 Mar 1972	G	0.800	0.904	925.88	837.000	0.02/G	-
474	6 Mar 1972	G	0.840	0.965	949.22	916.000	-0.10/G	<-
475	9 Mar 1972	G	0.820	0.933	936.76	874.000	-0.04/G	<-
476	13 Mar 1972	G	0.780	0.940	887.23	834.000	0.01/G	-
477	18 Mar 1972	G	0.800	0.968	897.73	869.000	-0.05/G	<-
478	20 Mar 1972	G	0.750	0.917	874.59	802.000	0.04/G	->
479	23 Mar 1972	G	0.650	0.899	873.19	785.000	-0.02/G	<-

River gaugings for station 10501 : Mekong at Chiang Saen

Order Number	Date	Rating	Stage (m)	Velocity (ms-1)	Area (m2)	Discharge (m3s-1)	--- Comparison --- Diff./Rat.	Plot
480	27 Mar 1972	G	0.780	0.959	878.00	842.000	-0.01/G	-
481	3 Apr 1972	G	0.940	0.956	929.92	889.000	0.05/G	->
482	7 Apr 1972	G	1.180	1.015	1009.85	1025.000	0.03/G	->
483	10 Apr 1972	G	1.200	1.008	983.13	991.000	0.12/G	->
484	20 Apr 1972	G	0.680	0.973	831.45	809.000	-0.04/G	<-
485	23 Apr 1972	G	0.660	0.960	890.63	855.000	-0.16/G	<<-
486	27 Apr 1972	G	0.870	1.036	857.14	888.000	-0.01/G	-
487	1 May 1972	G	1.600	1.055	1122.27	1184.000	0.17/G	->>
488	4 May 1972	G	1.440	1.088	1032.17	1123.000	0.12/G	->
489	8 May 1972	G	1.060	1.052	903.99	951.000	0.05/G	->
490	11 May 1972	G	1.060	1.075	968.37	1041.000	-0.12/G	<-
491	15 May 1972	G	1.110	1.095	929.68	1018.000	-0.02/G	<-
492	18 May 1972	G	1.290	1.147	1044.46	1198.000	-0.16/G	<<-
493	23 May 1972	G	1.640	1.135	1148.90	1304.000	0.01/G	-
494	29 May 1972	G	1.440	1.188	1035.35	1230.000	-0.07/G	<-
495	5 Jun 1972	G	2.400	1.237	1430.88	1770.000	0.08/G	->
496	8 Jun 1972	G	2.410	1.196	1394.65	1668.000	0.23/G	->>>
497	12 Jun 1972	G	1.950	1.137	1178.54	1340.000	0.26/G	->>>
498	16 Jun 1972	G	2.080	1.247	1270.25	1584.000	0.02/G	->
499	19 Jun 1972	G	1.950	1.173	1217.39	1428.000	0.13/G	->>
500	23 Jun 1972	G	2.470	1.200	1448.33	1738.000	0.20/G	->>
501	26 Jun 1972	G	2.360	1.190	1407.56	1675.000	0.17/G	->>
502	29 Jun 1972	G	2.000	1.125	1298.67	1461.000	0.13/G	->>
503	3 Jul 1972	G	2.480	1.188	1466.33	1742.000	0.20/G	->>
504	6 Jul 1972	G	2.350	1.157	1389.80	1608.000	0.26/G	->>>
505	10 Jul 1972	G	2.580	1.100	1530.00	1683.000	0.38/G	->>>>
506	13 Jul 1972	G	2.200	1.173	1403.24	1646.000	0.06/G	->
507	18 Jul 1972	G	3.620	1.358	1967.60	2672.000	0.21/G	->>
508	20 Jul 1972	G	4.370	1.323	2199.55	2910.000	0.71/G	->>>>
509	25 Jul 1972	G	4.330	1.314	2308.98	3034.000	0.54/G	->>>>
510	29 Jul 1972	G	6.000	1.762	3376.84	5950.000	-0.21/G	<<-
511	1 Aug 1972	G	6.550	1.917	3579.55	6862.000	-0.27/G	<<<-
512	4 Aug 1972	G	6.460	2.004	3705.59	7426.000	-0.72/G	<<<<-
513	10 Aug 1972	G	5.380	1.876	3138.59	5888.000	-0.79/G	<<<<-
514	14 Aug 1972	G	4.570	1.363	2743.95	3740.000	0.11/G	->
515	18 Aug 1972	G	4.300	1.316	2584.35	3401.000	0.15/G	->>
516	21 Aug 1972	G	3.980	1.307	2464.42	3221.000	0.00/G	-
517	25 Aug 1972	G	4.900	1.468	2844.69	4176.000	0.05/G	->
518	28 Aug 1972	G	4.750	1.476	2710.03	4000.000	0.05/G	->
519	4 Sep 1972	G	4.440	1.432	2539.11	3636.000	0.07/G	->
520	7 Sep 1972	G	5.090	1.666	2956.78	4926.000	-0.37/G	<<<<-
521	11 Sep 1972	G	4.380	1.487	2535.98	3771.000	-0.11/G	<-
522	14 Sep 1972	G	3.900	1.407	2505.33	3525.000	-0.37/G	<<<<-
523	18 Sep 1972	G	3.400	1.363	2157.01	2940.000	-0.29/G	<<<-
524	21 Sep 1972	G	3.300	1.375	1922.91	2644.000	-0.08/G	<-
525	25 Sep 1972	G	3.530	1.276	2083.07	2658.000	0.14/G	->>
526	28 Sep 1972	G	4.380	1.459	2755.31	4020.000	-0.33/G	<<<<-
527	2 Oct 1972	G	4.640	1.427	2789.77	3981.000	-0.04/G	<-
528	5 Oct 1972	G	3.890	1.375	2301.82	3165.000	-0.03/G	<-
529	9 Oct 1972	G	3.240	1.383	2083.15	2881.000	-0.39/G	<<<<-
530	12 Oct 1972	G	3.190	1.277	2014.10	2572.000	-0.11/G	<-
531	16 Oct 1972	G	3.240	1.433	1989.53	2851.000	-0.36/G	<<<<-
532	19 Oct 1972	G	3.550	1.343	2116.90	2843.000	-0.04/G	<-
533	24 Oct 1972	G	2.970	1.241	1763.90	2189.000	0.11/G	->
534	27 Oct 1972	G	2.960	1.304	1815.95	2368.000	-0.11/G	<-
535	1 Nov 1972	G	2.380	1.072	1361.01	1459.000	0.51/G	->>>>
536	6 Nov 1972	G	2.200	1.169	1344.74	1572.000	0.16/G	->>
537	9 Nov 1972	G	4.400	1.468	2509.54	3684.000	-0.01/G	-
538	13 Nov 1972	G	3.290	1.379	1755.62	2421.000	0.16/G	->>
539	16 Nov 1972	G	2.560	1.247	1614.27	2013.000	-0.08/G	<-
540	20 Nov 1972	G	2.360	1.208	1546.36	1868.000	-0.09/G	<-

River gaugings for station 10501 : Mekong at Chiang Saen

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
541	23 Nov 1972	G	3.130	1.314	1876.71	2466.000	-0.05/G	<-
542	27 Nov 1972	G	2.480	1.168	1442.64	1685.000	0.28/G	->>>
543	4 Dec 1972	G	4.600	1.440	2666.67	3840.000	0.05/G	->
544	11 Dec 1972	G	2.680	1.237	1647.53	2038.000	0.01/G	-
545	15 Dec 1972	G	2.720	1.190	1721.85	2049.000	0.04/G	->
546	18 Dec 1972	G	2.440	1.218	1579.64	1924.000	-0.08/G	<-
547	21 Dec 1972	G	2.240	1.107	1528.46	1692.000	0.03/G	->
548	25 Dec 1972	G	2.010	1.119	1352.10	1513.000	0.06/G	->
549	28 Dec 1972	G	1.920	1.190	1391.60	1656.000	-0.24/G	<<<-
550	4 Jan 1973	H	1.650	1.092	1276.28	1393.700	-0.23/H	<<<-
551	9 Jan 1973	H	1.590	1.131	1102.83	1247.300	-0.05/H	<-
552	12 Jan 1973	H	1.540	1.211	1155.66	1399.500	-0.35/H	<<<<-
553	16 Jan 1973	H	1.430	1.116	1067.38	1191.200	-0.12/H	<-
554	22 Jan 1973	H	1.380	1.076	977.88	1052.200	0.08/H	->
555	25 Jan 1973	H	1.330	1.069	1015.72	1085.800	-0.03/H	<-
556	29 Jan 1973	H	1.240	1.046	941.59	984.900	0.06/H	->
557	1 Feb 1973	H	1.220	1.066	933.58	995.200	0.02/H	->
558	5 Feb 1973	H	1.210	1.091	996.06	1086.700	-0.16/H	<<-
559	8 Feb 1973	H	1.200	1.066	939.12	1001.100	-0.01/H	-
560	12 Feb 1973	H	1.080	1.003	908.57	911.300	0.05/H	->
561	15 Feb 1973	H	1.030	1.051	947.29	995.600	-0.17/H	<<-
562	20 Feb 1973	H	1.040	0.941	852.82	802.500	0.24/H	->>>
563	23 Feb 1973	H	0.930	0.946	869.66	822.700	0.08/H	->
564	27 Feb 1973	H	0.880	1.007	785.50	791.000	0.10/H	->
565	5 Mar 1973	H	0.850	0.992	814.92	808.400	0.03/H	->
566	9 Mar 1973	H	1.330	1.019	1042.98	1062.800	0.01/H	-
567	12 Mar 1973	H	1.970	1.165	1334.25	1554.400	-0.14/H	<<-
568	9 Apr 1973	H	0.970	1.031	794.86	819.500	0.13/H	->>
569	12 Apr 1973	H	0.980	1.043	808.82	843.600	0.09/H	->
570	17 Apr 1973	H	1.180	1.220	988.61	1206.100	-0.39/H	<<<<-
571	20 Apr 1973	H	1.460	1.204	1025.33	1234.500	-0.16/H	<<-
572	23 Apr 1973	H	1.820	1.357	1168.46	1585.600	-0.34/H	<<<<-
573	30 Apr 1973	H	1.120	1.084	851.75	923.300	0.06/H	->
574	3 May 1973	H	1.270	1.028	965.86	992.900	0.08/H	->
575	9 May 1973	H	1.820	1.010	1239.51	1251.900	0.17/H	->>
576	11 May 1973	H	1.750	1.030	1226.99	1263.800	0.08/H	->
577	14 May 1973	H	1.980	1.153	1339.03	1543.900	-0.12/H	<-
578	17 May 1973	H	1.880	1.105	1274.12	1407.900	-0.02/H	-
579	21 May 1973	H	1.970	1.105	1304.52	1441.500	0.02/H	->
580	24 May 1973	H	2.020	1.054	1253.98	1321.700	0.26/H	->>>
581	28 May 1973	H	2.150	0.996	1290.36	1285.200	0.44/H	->>>>
582	31 May 1973	H	2.210	1.047	1346.90	1410.200	0.31/H	->>>
583	4 Jun 1973	H	2.380	1.145	1444.19	1653.600	0.13/H	->>
584	7 Jun 1973	H	2.340	1.083	1461.68	1583.000	0.18/H	->>
585	11 Jun 1973	H	3.000	1.265	1748.77	2212.200	0.05/H	->
586	14 Jun 1973	H	3.550	1.395	2024.01	2823.500	-0.05/H	<-
587	18 Jun 1973	H	3.820	1.413	2195.40	3102.100	-0.04/H	<-
588	25 Jun 1973	H	3.600	1.295	2174.36	2815.800	0.01/H	-
589	29 Jun 1973	H	4.090	1.442	2301.94	3319.400	0.03/H	->
590	2 Jul 1973	H	4.380	1.513	2402.64	3635.200	0.05/H	->
591	6 Jul 1973	H	4.530	1.509	2657.65	4010.400	-0.10/H	<-
592	9 Jul 1973	H	3.860	1.421	2392.61	3399.900	-0.27/H	<<<-
593	12 Jul 1973	H	4.900	1.528	2931.74	4479.700	-0.08/H	<-
594	14 Jul 1973	H	5.070	1.543	2927.54	4517.200	0.06/H	->
595	16 Jul 1973	H	4.980	1.528	2972.45	4541.900	-0.04/H	<-
596	19 Jul 1973	H	5.760	1.641	3436.38	5639.100	0.00/H	-
597	26 Jul 1973	H	3.880	1.424	2406.74	3427.200	-0.27/H	<<<-
598	30 Jul 1973	H	6.600	2.074	3690.89	7654.900	-0.30/H	<<<-
599	2 Aug 1973	H	6.450	1.826	3693.54	6744.400	0.04/H	->
600	9 Aug 1973	H	6.760	1.820	3933.79	7159.500	0.12/H	->>

River gaugings for station 10501 : Mekong at Chiang Saen

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
601	13 Aug 1973	H	7.260	1.897	4216.24	7998.200	0.19/H	->>
602	16 Aug 1973	H	5.880	1.731	3466.03	5999.700	-0.10/H	<-
603	20 Aug 1973	H	5.510	1.730	3200.35	5536.600	-0.19/H	<<-
604	23 Aug 1973	H	6.330	2.021	3493.17	7059.700	-0.26/H	<<<-
605	28 Aug 1973	H	5.340	1.807	2696.02	4871.700	0.08/H	->
606	7 Sep 1973	H	7.460	2.349	4139.80	9724.401	-0.42/H	<<<<-
607	10 Sep 1973	H	6.830	1.986	3753.17	7453.800	0.03/H	->
608	17 Sep 1973	H	6.920	1.773	3490.86	6189.300	0.83/H	->>>>
609	20 Sep 1973	H	5.660	1.855	3235.20	6001.300	-0.32/H	<<<<-
610	28 Sep 1973	H	5.210	1.701	2706.88	4604.400	0.14/H	->>
611	11 Oct 1973	H	3.800	1.273	1997.49	2542.800	0.49/H	->>>>
612	16 Oct 1973	H	3.460	1.251	1962.19	2454.700	0.24/H	->>>
613	19 Oct 1973	H	3.380	1.216	1944.74	2364.800	0.26/H	->>>
614	22 Oct 1973	H	3.440	1.312	1979.34	2596.900	0.07/H	->
615	26 Oct 1973	H	3.580	1.208	2057.86	2485.900	0.33/H	->>>>
616	29 Oct 1973	H	4.350	1.504	2407.18	3620.400	0.04/H	->
617	2 Nov 1973	H	3.380	1.259	1967.67	2477.300	0.14/H	->>
618	5 Nov 1973	H	3.140	1.241	1907.65	2367.400	0.01/H	-
619	9 Nov 1973	H	3.260	1.252	1956.95	2450.100	0.04/H	->
620	12 Nov 1973	H	4.580	1.632	2722.79	4443.600	-0.37/H	<<<<-
621	19 Nov 1973	H	3.600	1.329	2173.74	2888.900	-0.06/H	<-
622	4 Dec 1973	H	2.880	1.288	1954.89	2517.900	-0.41/H	<<<<-
623	14 Dec 1973	H	2.420	1.135	1666.87	1891.900	-0.15/H	<<-
624	22 Dec 1973	H	2.080	1.049	1523.74	1598.400	-0.10/H	<-
625	28 Dec 1973	H	1.830	1.032	1399.90	1444.700	-0.12/H	<<-
626	4 Jan 1974	I	1.640	1.068	1297.66	1385.900	-0.05/I	<-
627	17 Jan 1974	I	1.400	1.042	1161.23	1210.000	-0.05/I	<-
628	26 Jan 1974	I	1.290	0.939	1185.20	1112.900	-0.01/I	-
629	7 Feb 1974	I	1.040	0.912	1085.42	989.900	-0.07/I	<-
630	19 Feb 1974	I	0.940	0.919	1057.24	971.600	-0.14/I	<<-
631	4 Mar 1974	I	0.750	0.827	911.25	753.600	0.05/I	->
632	13 Mar 1974	I	0.770	0.894	913.76	816.900	-0.04/I	<-
633	18 Mar 1974	I	0.650	0.853	860.73	734.200	-0.01/I	-
634	29 Mar 1974	I	0.810	0.909	955.67	868.700	-0.09/I	<-
635	1 Apr 1974	I	1.120	1.001	1051.55	1052.600	-0.09/I	<-
636	9 Apr 1974	I	1.050	0.964	956.85	922.400	0.05/I	->
637	17 Apr 1974	I	0.940	0.996	917.47	913.800	-0.04/I	<-
638	29 Apr 1974	I	1.340	1.074	990.60	1063.900	0.12/I	->
639	7 May 1974	I	1.350	1.055	1051.18	1109.000	0.06/I	->
640	14 May 1974	I	1.640	1.054	1124.29	1185.000	0.23/I	->>>
641	20 May 1974	I	1.370	0.059	18740.68	1105.700	0.08/I	->
642	28 May 1974	I	2.140	1.135	1198.33	1360.100	0.48/I	->>>>
643	5 Jun 1974	I	2.160	1.140	1365.44	1556.600	0.24/I	->>>
644	10 Jun 1974	I	2.980	1.185	1789.96	2121.100	0.40/I	->>>>
645	17 Jun 1974	I	2.940	1.023	2456.50	2513.000	-0.05/I	<-
646	26 Jun 1974	I	3.310	1.242	2212.08	2747.400	0.09/I	->
647	8 Jul 1974	I	3.940	1.446	2586.24	3739.700	-0.15/I	<<-
648	15 Jul 1974	I	3.880	1.412	2373.80	3351.800	0.12/I	->
649	22 Jul 1974	I	5.120	1.586	2772.00	4396.400	0.52/I	->>>>
650	30 Jul 1974	I	6.620	1.997	3922.43	7833.100	-0.15/I	<<-
651	6 Aug 1974	I	6.460	2.053	3436.04	7054.200	0.13/I	->>
652	9 Aug 1974	I	7.940	2.223	4331.62	9629.201	0.24/I	->>>
653	12 Aug 1974	I	6.890	2.068	3780.51	7818.100	0.13/I	->>
654	15 Aug 1974	I	6.000	1.858	3289.40	6111.700	0.24/I	->>>
655	24 Aug 1974	I	4.600	1.677	2691.29	4513.300	-0.08/I	<-
656	26 Aug 1974	I	5.100	1.963	2961.23	5812.900	-0.47/I	<<<<-
657	29 Aug 1974	I	7.480	2.127	4111.28	8744.701	0.22/I	->>>
658	31 Aug 1974	I	8.600	2.513	4687.86	11780.600	-0.11/I	<-
659	2 Sep 1974	I	7.740	2.295	4254.42	9763.901	-0.03/I	<-
660	7 Sep 1974	I	6.320	1.895	3466.28	6568.600	0.28/I	->>>

River gaugings for station 10501 : Mekong at Chiang Saen

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
661	9 Sep 1974	I	6.100	1.904	3177.73	6050.400	0.38/I	->>>>
662	14 Sep 1974	I	6.220	2.003	3294.41	6598.700	0.16/I	->>
663	16 Sep 1974	I	6.040	2.001	3265.92	6535.100	0.02/I	-
664	20 Sep 1974	I	5.100	2.023	2859.47	5784.700	-0.45/I	<<<<-
665	24 Sep 1974	I	5.240	1.934	3040.74	5880.800	-0.38/I	<<<<-
666	30 Sep 1974	I	5.080	2.034	2721.14	5534.800	-0.31/I	<<<-
667	1 Oct 1974	I	4.390	1.654	2779.99	4598.100	-0.35/I	<<<<-
668	15 Oct 1974	I	3.710	1.477	2347.26	3466.900	-0.15/I	<<-
669	21 Oct 1974	I	3.360	1.455	2312.37	3364.500	-0.41/I	<<<<-
670	28 Oct 1974	I	3.000	1.393	2131.80	2969.600	-0.43/I	<<<<-
671	4 Nov 1974	I	3.200	1.307	2157.46	2819.800	-0.09/I	<-
672	12 Nov 1974	I	2.700	1.214	1961.29	2381.000	-0.16/I	<<-
673	18 Nov 1974	I	3.160	1.288	2071.20	2667.700	0.02/I	-
674	25 Nov 1974	I	2.550	1.128	1808.78	2040.300	0.06/I	->
675	2 Dec 1974	I	2.270	1.111	1728.08	1919.900	-0.09/I	<-
676	9 Dec 1974	I	2.070	1.140	1491.93	1700.800	-0.03/I	<-
677	16 Dec 1974	I	1.800	1.075	1439.07	1547.000	-0.11/I	<-
678	23 Dec 1974	I	1.620	1.014	1326.04	1344.600	-0.02/I	-
679	13 Jan 1975	I	2.320	1.249	1672.71	2089.220	-0.23/I	<<<-
680	20 Jan 1975	I	1.540	0.977	1202.33	1174.680	0.15/I	->>
681	27 Jan 1975	I	1.270	0.995	1134.75	1129.080	-0.05/I	<-
682	3 Feb 1975	I	1.170	0.999	1032.75	1031.720	-0.00/I	-
683	10 Feb 1975	I	1.100	0.972	990.28	962.550	0.04/I	->
684	17 Feb 1975	I	1.160	0.987	1022.38	1009.090	0.02/I	->
685	24 Feb 1975	I	0.920	0.999	1000.29	999.290	-0.20/I	<<-
686	4 Mar 1975	I	0.850	0.943	927.25	874.400	-0.06/I	<-
687	10 Mar 1975	I	0.800	0.930	911.75	847.930	-0.07/I	<-
688	17 Mar 1975	I	0.700	0.911	864.22	787.300	-0.06/I	<-
689	25 Mar 1975	I	0.570	0.847	777.36	658.420	0.06/I	->
690	1 Apr 1975	I	0.590	0.882	769.35	678.570	0.04/I	->
691	7 Apr 1975	I	0.870	0.958	920.82	882.150	-0.06/I	<-
692	21 Apr 1975	I	1.480	0.962	1101.84	1059.971	0.26/I	->>>
693	29 Apr 1975	I	0.980	0.926	1001.67	927.550	-0.02/I	<-
694	7 May 1975	I	1.400	0.992	1024.91	1016.710	0.25/I	->>>
695	12 May 1975	I	1.540	1.088	1154.03	1255.590	0.03/I	->
696	19 May 1975	I	1.260	0.970	1009.53	979.240	0.17/I	->>
697	26 May 1975	I	1.900	1.128	1399.92	1579.110	-0.05/I	<-

C.9.3 Station 11201 - Luang Prabang

Figure C9.3.1 shows the number of gaugings per year from 1960 to 1987. Figure C9.3.2 indicates a set of gaugings with considerable scatter, much of which is due to data from 1968 when discharge measurements were made by the moving boat method of river gauging. The scatter at this site and other sites on the Mekong casts doubt upon the validity of these gaugings. A single average rating (Figure C9.3.1) was derived for Luang Prabang for use during periods when river gaugings have not been made. The moving boat gaugings, plotted on this figure, form a broad band generally above other gaugings and they have therefore not been used in the derivation of a rating. The final grouping of rating equations shown in Figure C9.3.3 illustrates the grouping of the ratings, with the moving boat rating departing from ratings B, D and F at high flows. The fit of individual ratings, as indicated by Figures C9.3.4b to C9.3.4h are good.

Luang Prabang is one of the sites where recent gaugings have been undertaken and these are represented by rating H. Figure C9.3.3 shows that there has been a significant change between rating H and ratings B, D and F (ignoring the dubious moving boat rating). This change is significant at low and medium flows, but it should be noted that rating H is not well defined at high flows with the highest gauged stage only at 12 metres. Stages of over 22 metres have been recorded at Luang Prabang. Rating H should therefore be used with caution until more flood gaugings have been made. Nevertheless the new gaugings are worthwhile and have demonstrated that the rating has changed significantly.

It was not possible to extend the rating into the high flood flow region using exceptional flood gaugings from other periods because of changes in rating at high flows.

Gauging History - 11201 Luang Prabang

Year	Gauging numbers	Number of gaugings	Rating letter	Shifts (Y=yes)	Fitting method
1939/		0	A		1
1960	1 - 8	8			
1961	9 - 113	105	B	Y	1
1962/		0	C		1
1967	114 - 143	30	D	Y	1
1968	144 - 229	86	Not used	Y	1
1968/		0	E		1
1971	230 - 244	15			
1972	245 - 252	8	F	Y	1
1973	253 - 254	2			
1974#		0	G		1
1986	255 - 266	12			
1987	267 - 294	28	H		1
	Total =	294			

= and subsequent years

Dubious gaugings (HYDATA flag ?) - 244
Rare flood gaugings (HYDATA flag +) - None

Observed stage range 2.50 metres to 22.36 metres
Gauged stage range 3.00 metres to 14.40 metres

See Section C.9.1 for description of the table

* Notes on special fitting :

No special fitting required at this station.

Rating Equations - 011201 Luang Prabang

Rating Letter	Date	Parameters a	c	b	Maximum Stage
A from	1 Jan 1939	Q = 7.249	(h + 3.590)	$^{2.615}$	25.00 m
B from	1 Jan 1960	Q = 12.006	(h + 3.080)	$^{2.469}$	25.00 m
C from	1 Jan 1962	Q = 7.249	(h + 3.590)	$^{2.615}$	25.00 m
D from	1 Jan 1967	Q = 36.026	(h + 1.490)	$^{2.154}$	25.00 m
E from	1 Jan 1968	Q = 7.249	(h + 3.590)	$^{2.615}$	25.00 m
F from	1 Jan 1971	Q = 24.750	(h + 1.850)	$^{2.260}$	25.00 m
G from	1 Jan 1974	Q = 7.249	(h + 3.590)	$^{2.615}$	25.00 m
H from	1 Jan 1986	Q = 13.042	(h + 2.880)	$^{2.403}$	25.00 m
Ratings A,C,E and G are the average rating					

Number of gaugings per year

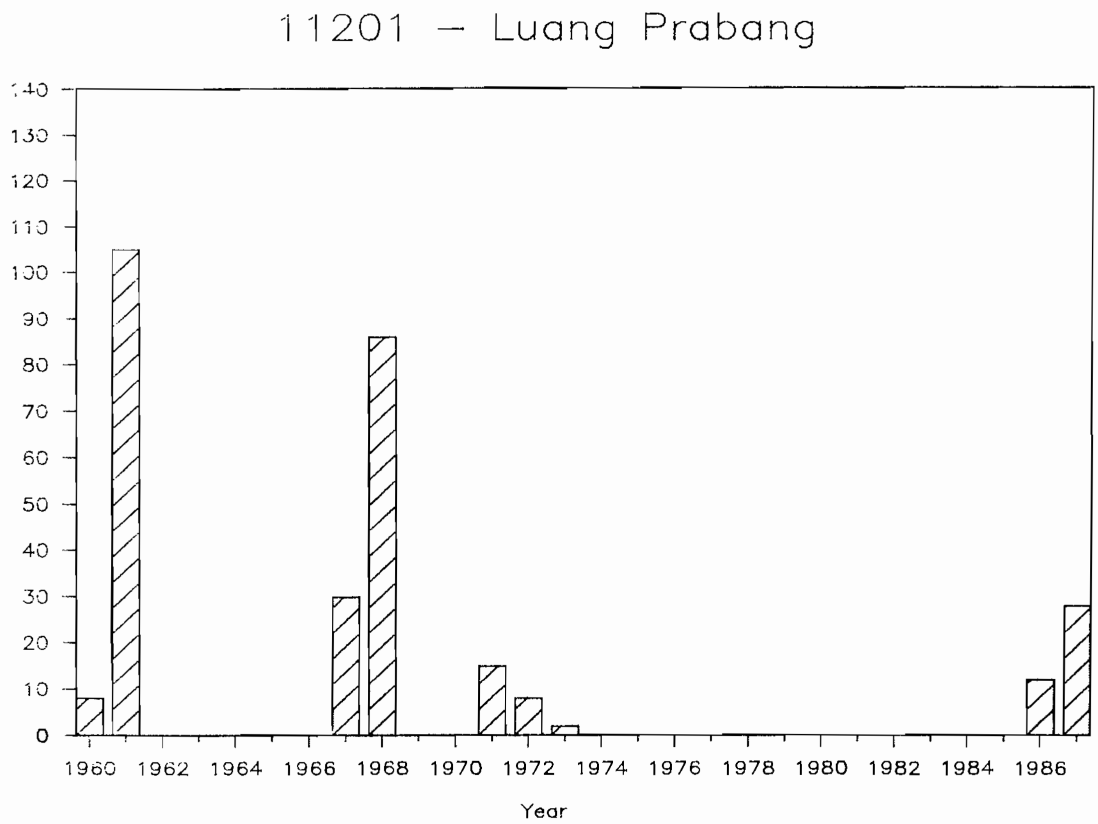


Figure C9.3.1

Rating equations

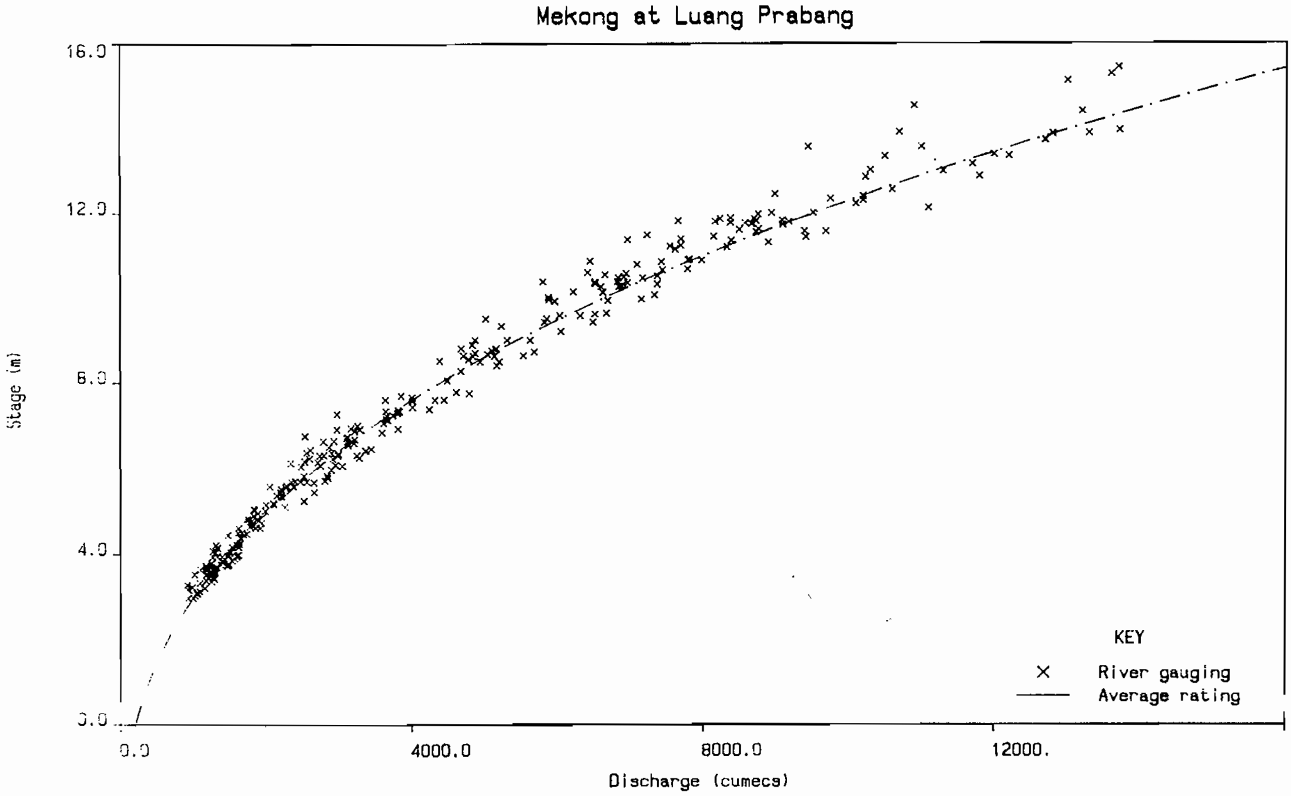


Figure C9.3.2

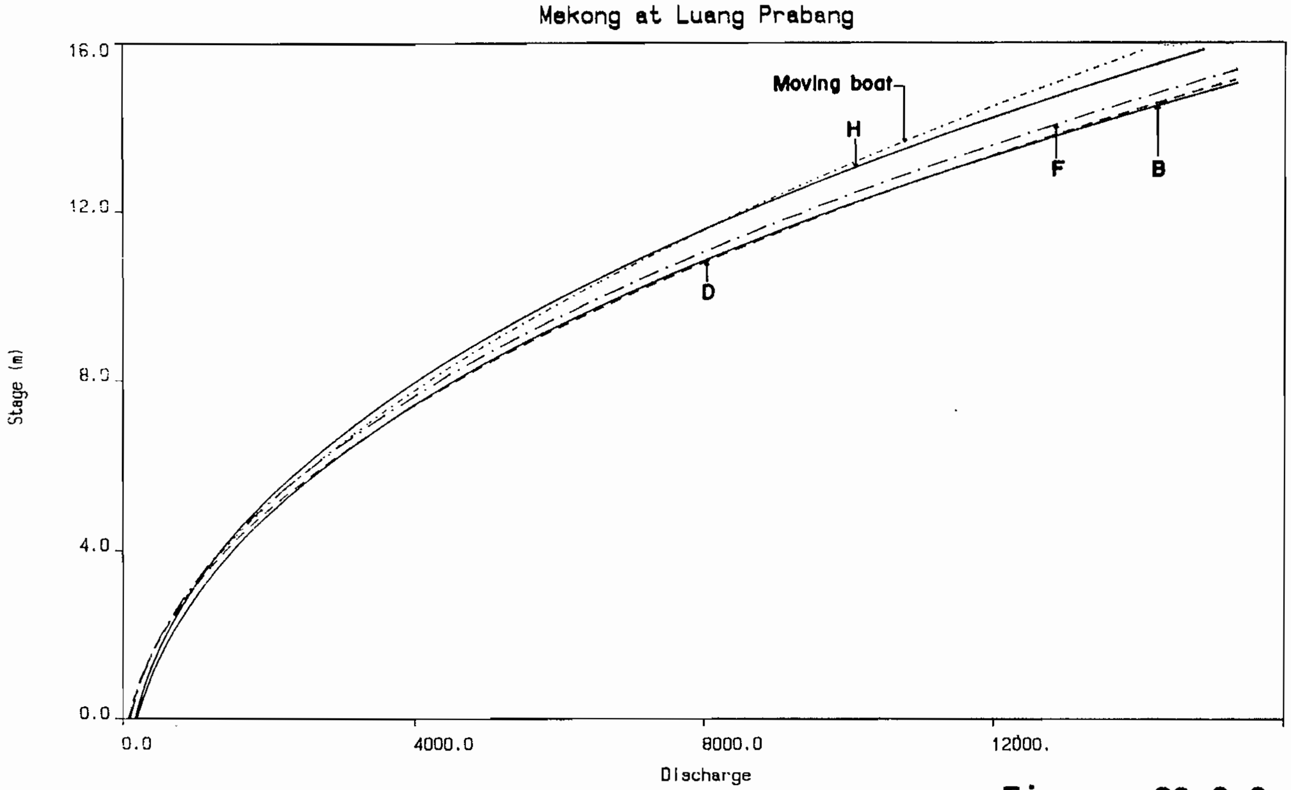


Figure C9.3.3

Rating equations

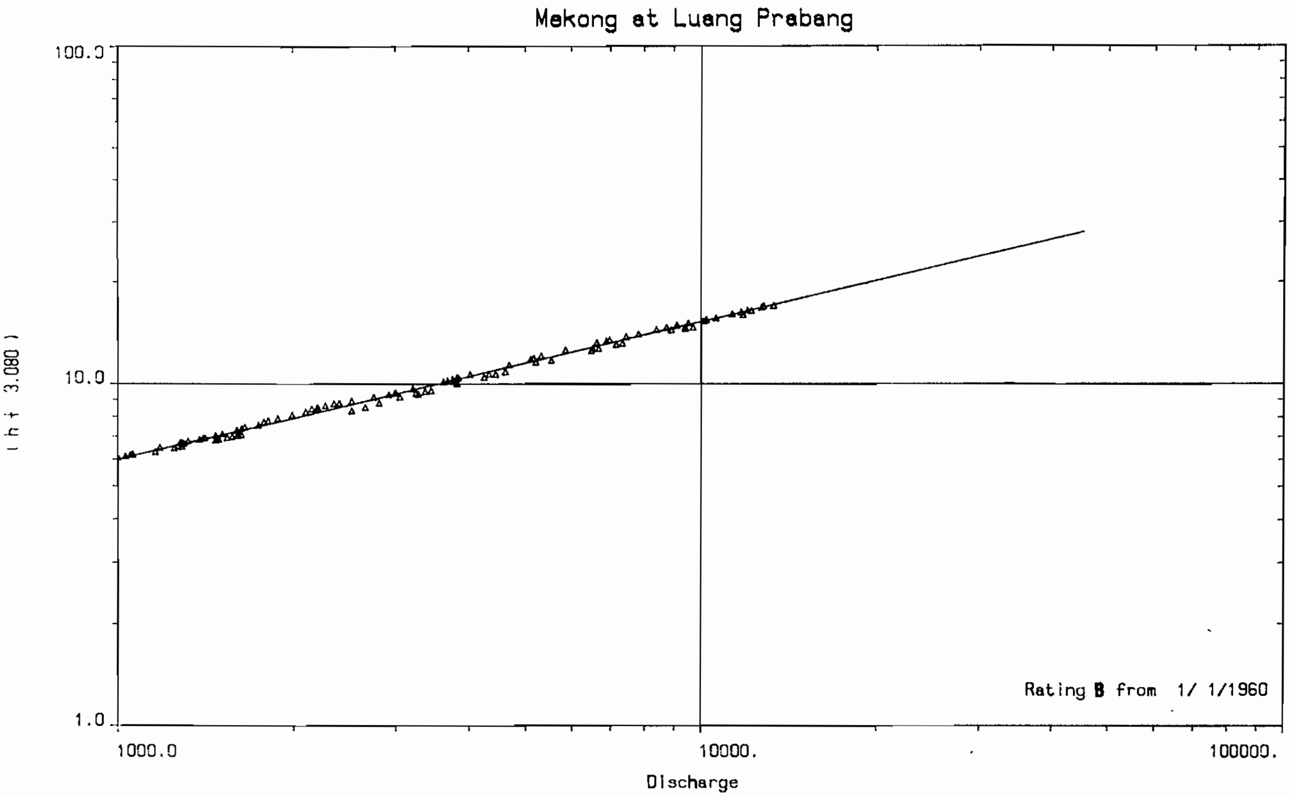


Figure C9.3.4b

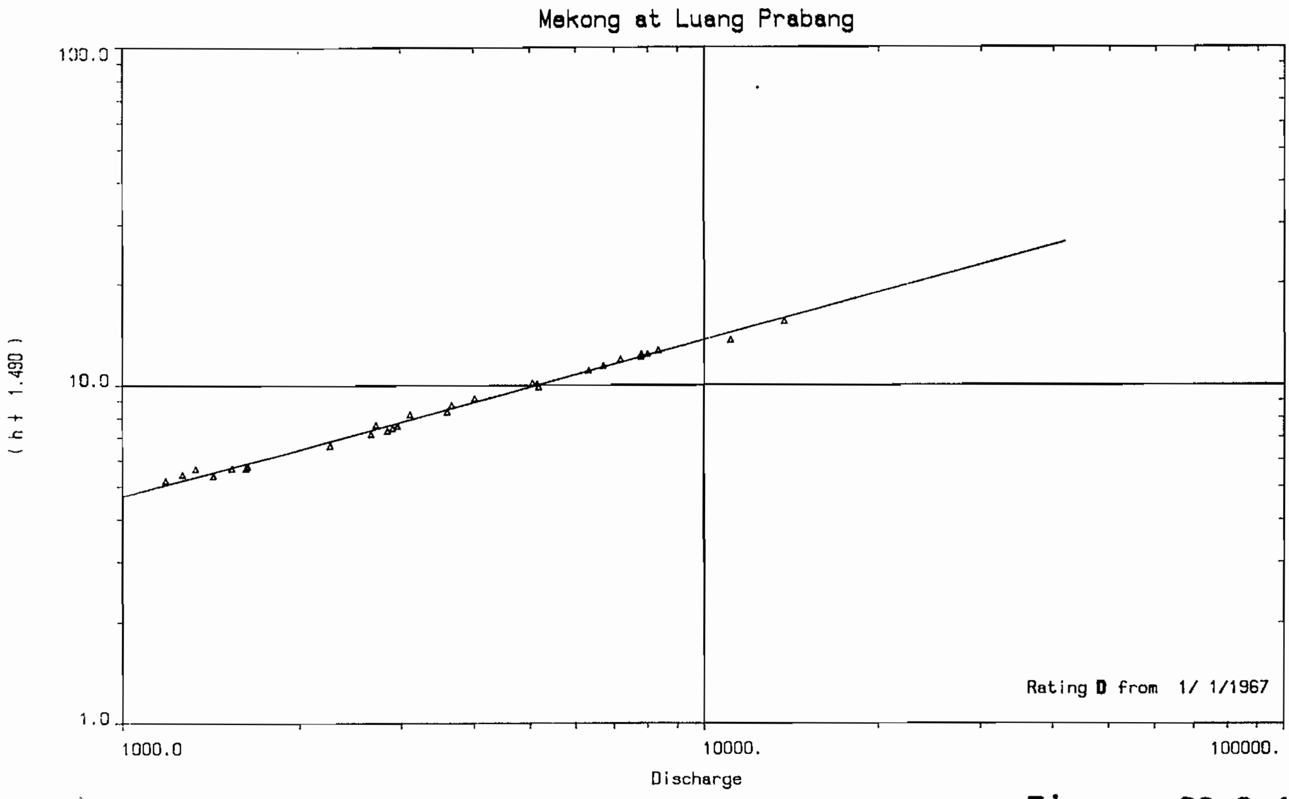


Figure C9.3.4d

Rating equations

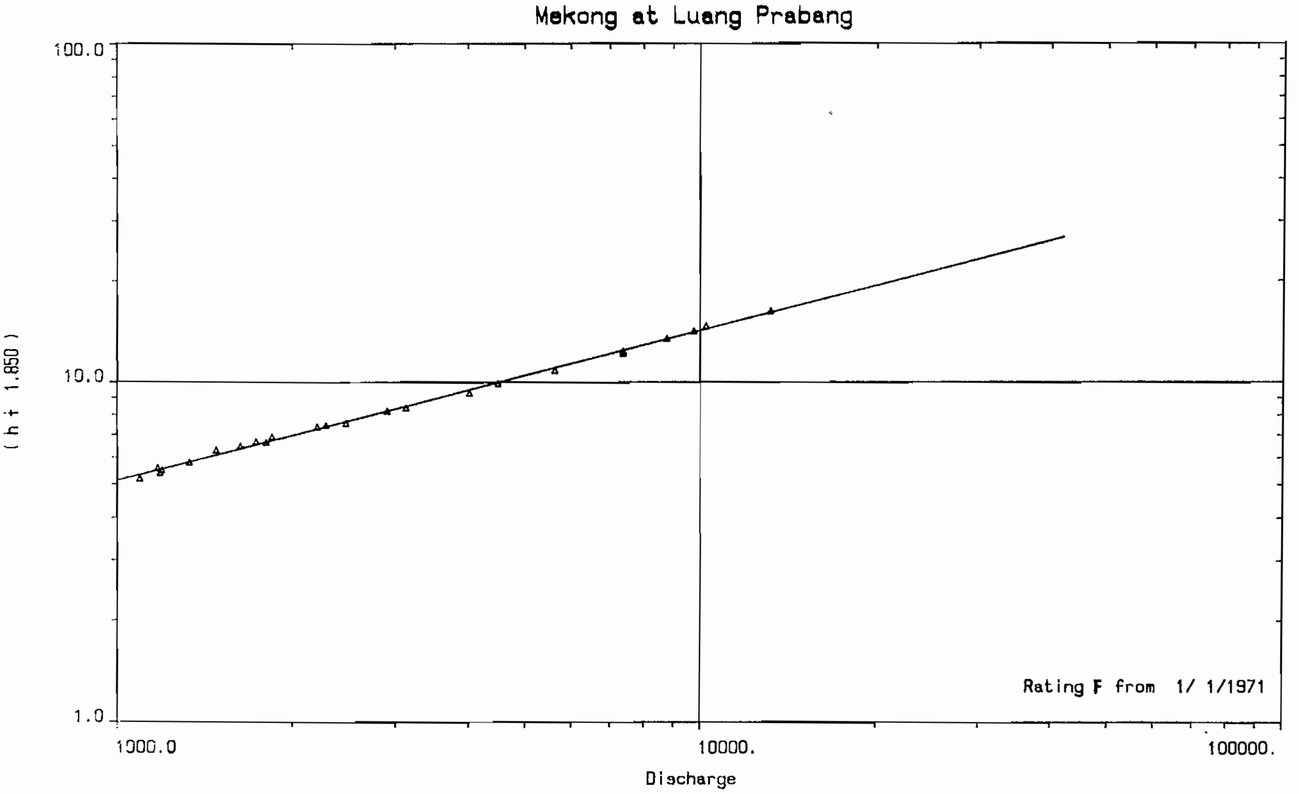


Figure C9.3.4f

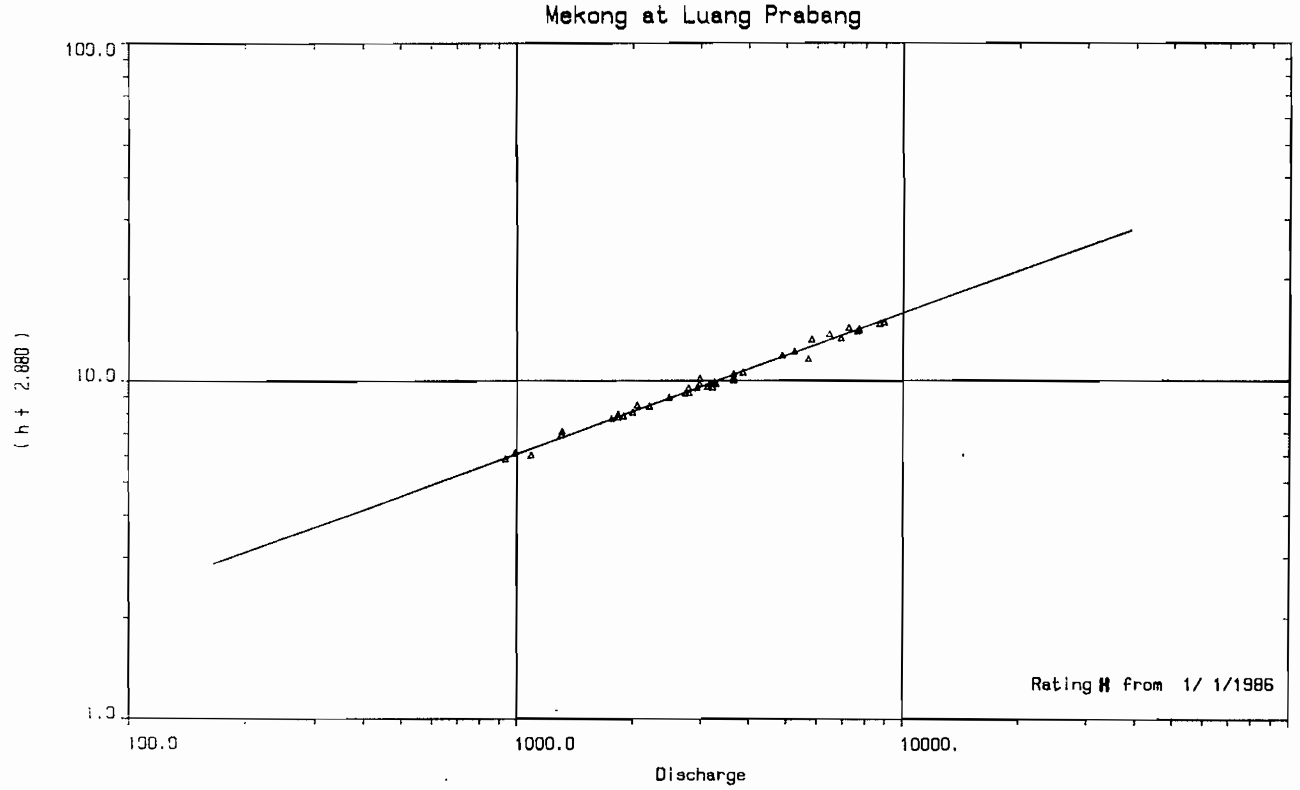


Figure C9.3.4h

River gaugings for station 11201 : Mekong at Luang Prabang

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
1	20 Sep 1960	B	11.820			9090.000	0.24/B	->>>
2	13 Dec 1960	B	5.380			2210.000	0.19/B	->>
3	16 Dec 1960	B	5.210			2100.000	0.19/B	->>
4	20 Dec 1960	B	5.040			1990.000	0.20/B	->>
5	23 Dec 1960	B	4.850			1880.000	0.19/B	->>
6	26 Dec 1960	B	4.720			1810.000	0.17/B	->>
7	28 Dec 1960	B	4.670			1780.000	0.18/B	->>
8	30 Dec 1960	B	4.500			1740.000	0.08/B	->
9	4 Jan 1961	B	4.400			1650.000	0.14/B	->>
10	6 Jan 1961	B	4.330			1630.000	0.10/B	->
11	10 Jan 1961	B	4.240			1600.000	0.07/B	->
12	12 Jan 1961	B	4.230			1600.000	0.06/B	->
13	17 Jan 1961	B	4.060			1510.000	0.05/B	->
14	20 Jan 1961	B	3.980			1470.000	0.05/B	->
15	26 Jan 1961	B	3.860			1410.000	0.05/B	->
16	27 Jan 1961	B	3.840			1400.000	0.05/B	->
17	1 Feb 1961	B	3.710			1320.000	0.08/B	->
18	3 Feb 1961	B	3.650			1290.000	0.08/B	->
19	6 Feb 1961	B	3.640			1280.000	0.09/B	->
20	10 Feb 1961	B	3.780			1380.000	0.03/B	->
21	14 Feb 1961	B	3.600			1300.000	0.01/B	-
22	16 Feb 1961	B	3.570			1290.000	0.00/B	-
23	22 Feb 1961	B	3.410			1180.000	0.08/B	->
24	3 Mar 1961	B	3.110			1060.000	0.05/B	->
25	6 Mar 1961	B	3.050			1030.000	0.06/B	->
26	11 Mar 1961	B	3.110			1060.000	0.05/B	->
27	13 Mar 1961	B	3.110			1060.000	0.05/B	->
28	18 Mar 1961	B	3.100			1050.000	0.06/B	->
29	25 Mar 1961	B	3.000			1000.000	0.08/B	->
30	1 Apr 1961	B	3.490			1270.000	-0.04/B	<-
31	5 Apr 1961	B	3.870			1540.000	-0.19/B	<<-
32	8 Apr 1961	B	3.450			1290.000	-0.12/B	<-
33	11 Apr 1961	B	3.230			1160.000	-0.06/B	<-
34	20 Apr 1961	B	3.390			1250.000	-0.09/B	<-
35	3 May 1961	B	3.990			1610.000	-0.20/B	<<-
36	6 May 1961	B	3.970			1600.000	-0.20/B	<<-
37	9 May 1961	B	3.790			1490.000	-0.18/B	<<-
38	12 May 1961	B	3.750			1470.000	-0.18/B	<<-
39	16 May 1961	B	3.770			1480.000	-0.18/B	<<-
40	18 May 1961	B	3.920			1570.000	-0.20/B	<<-
41	22 May 1961	B	3.750			1470.000	-0.18/B	<<-
42	25 May 1961	B	4.000			1630.000	-0.23/B	<<<-
43	2 Jun 1961	B	5.270			2520.000	-0.37/B	<<<<-
44	3 Jun 1961	B	5.470			2660.000	-0.36/B	<<<<-
45	7 Jun 1961	B	6.470			3450.000	-0.35/B	<<<<-
46	10 Jun 1961	B	6.260			3280.000	-0.36/B	<<<<-
47	13 Jun 1961	B	7.600			4450.000	-0.30/B	<<<-
48	16 Jun 1961	B	9.960			7160.000	-0.27/B	<<<-
49	20 Jun 1961	B	8.630			5540.000	-0.29/B	<<<-
50	23 Jun 1961	B	7.390			4250.000	-0.30/B	<<<-
51	26 Jun 1961	B	6.320			3250.000	-0.27/B	<<<-
52	28 Jun 1961	B	6.070			3050.000	-0.27/B	<<<-
53	1 Jul 1961	B	5.730			2810.000	-0.30/B	<<<-
54	3 Jul 1961	B	6.430			3370.000	-0.30/B	<<<-
55	8 Jul 1961	B	6.420			3370.000	-0.31/B	<<<-
56	10 Jul 1961	B	6.940			3820.000	-0.30/B	<<<-
57	12 Jul 1961	B	7.780			4620.000	-0.29/B	<<<-
58	15 Jul 1961	B	9.420			6490.000	-0.29/B	<<<-
59	17 Jul 1961	B	10.060			7340.000	-0.30/B	<<<-
60	20 Jul 1961	B	11.560			9390.000	-0.21/B	<<-

River gaugings for station 11201 : Mekong at Luang Prabang

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge ($m^3 s^{-1}$)	--- Comparison --- Diff./Rat.	Plot
61	22 Jul 1961	B	11.300			8900.001	-0.15/B	<<-
62	24 Jul 1961	B	9.610			6520.000	-0.12/B	<<-
63	26 Jul 1961	B	8.490			5210.000	-0.13/B	<<-
64	31 Jul 1961	B	7.600			4330.000	-0.18/B	<<-
65	2 Aug 1961	B	9.630			6680.000	-0.23/B	<<<-
66	5 Aug 1961	B	11.420			9410.001	-0.37/B	<<<<-
67	6 Aug 1961	B	11.560			9690.001	-0.40/B	<<<<-
68	9 Aug 1961	B	12.860			11800.000	-0.35/B	<<<<-
69	12 Aug 1961	B	13.880			13300.000	-0.14/B	<<-
70	14 Aug 1961	B	13.340			12200.001	-0.10/B	<-
71	16 Aug 1961	B	13.150			11700.000	-0.01/B	-
72	19 Aug 1961	B	12.220			10100.001	0.00/B	-
73	21 Aug 1961	B	12.300			10200.001	0.02/B	-
74	23 Aug 1961	B	12.980			11300.001	0.05/B	->
75	26 Aug 1961	B	13.870			12800.000	0.11/B	->
76	28 Aug 1961	B	13.380			12000.000	0.05/B	->
77	30 Aug 1961	B	12.540			10600.000	0.02/B	-
78	13 Sep 1961	B	12.390			10200.001	0.11/B	->
79	14 Sep 1961	B	12.000			9510.000	0.15/B	->>
80	16 Sep 1961	B	11.540			8730.000	0.20/B	->>
81	18 Sep 1961	B	11.340			8390.001	0.23/B	->>>
82	20 Sep 1961	B	10.900			7820.000	0.19/B	->>
83	23 Sep 1961	B	11.720			9100.000	0.13/B	->>
84	26 Sep 1961	B	13.720			12700.000	0.01/B	-
85	9 Oct 1961	B	10.640			7450.000	0.20/B	->>
86	12 Oct 1961	B	10.270			6890.000	0.25/B	->>>
87	14 Oct 1961	B	10.340			6970.000	0.26/B	->>>
88	16 Oct 1961	B	10.120			6630.000	0.30/B	->>>
89	18 Oct 1961	B	9.500			5860.000	0.31/B	->>>
90	21 Oct 1961	B	9.000			5320.000	0.28/B	->>>
91	26 Oct 1961	B	8.750			5110.000	0.22/B	->>>
92	28 Oct 1961	B	8.800			5170.000	0.22/B	->>
93	30 Oct 1961	B	8.780			5160.000	0.20/B	->>
94	2 Nov 1961	B	8.280			4690.000	0.15/B	->>
95	6 Nov 1961	B	7.580			4020.000	0.13/B	->>
96	8 Nov 1961	B	7.360			3820.000	0.12/B	->>
97	11 Nov 1961	B	7.250			3750.000	0.09/B	->
98	13 Nov 1961	B	7.340			3840.000	0.08/B	->
99	15 Nov 1961	B	7.300			3810.000	0.07/B	->
100	18 Nov 1961	B	7.070			3620.000	0.05/B	->
101	25 Nov 1961	B	6.320			2990.000	0.06/B	->
102	27 Nov 1961	B	6.240			2920.000	0.06/B	->
103	29 Nov 1961	B	6.600			3210.000	0.06/B	->
104	2 Dec 1961	B	7.140			3680.000	0.06/B	->
105	4 Dec 1961	B	6.360			3000.000	0.08/B	->
106	6 Dec 1961	B	6.060			2750.000	0.13/B	->>
107	9 Dec 1961	B	5.840			2520.000	0.20/B	->>
108	11 Dec 1961	B	5.720			2400.000	0.25/B	->>>
109	13 Dec 1961	B	5.700			2350.000	0.30/B	->>>
110	16 Dec 1961	B	5.580			2270.000	0.30/B	->>>
111	18 Dec 1961	B	5.460			2200.000	0.29/B	->>>
112	20 Dec 1961	B	5.460			2200.000	0.29/B	->>>
113	23 Dec 1961	B	5.390			2150.000	0.29/B	->>>
114	21 Feb 1967	D	4.160	0.731	1823.53	1333.000	0.30/D	->>>
115	6 Mar 1967	D	3.950	0.730	1734.25	1266.000	0.22/D	->>>
116	21 Mar 1967	D	3.720	0.716	1655.03	1185.000	0.15/D	->>
117	24 Apr 1967	D	4.180	0.846	1816.78	1537.000	-0.04/D	<-
118	5 May 1967	D	3.900	0.890	1606.74	1430.000	-0.13/D	<<-
119	16 May 1967	D	4.250	0.930	1759.14	1636.000	-0.14/D	<<-
120	25 May 1967	D	4.180	0.930	1746.24	1624.000	-0.19/D	<<-

River gaugings for station 11201 : Mekong at Luang Prabang

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge ($m^3 s^{-1}$)	--- Comparison --- Diff./Rat.	Plot
121	6 Jun 1967	D	5.130	1.070	2112.15	2260.000	-0.21/D	<<-
122	14 Jun 1967	D	5.850	1.160	2448.28	2840.000	-0.26/D	<<<-
123	20 Jun 1967	D	5.990	1.180	2455.93	2898.000	-0.19/D	<<-
124	27 Jun 1967	D	5.690	1.120	2374.11	2659.000	-0.19/D	<<-
125	4 Jul 1967	D	6.100	1.180	2504.24	2955.000	-0.15/D	<<-
126	12 Jul 1967	D	6.090	1.170	2526.50	2956.000	-0.16/D	<<-
127	14 Jul 1967	D	6.850	1.290	2790.70	3600.000	-0.14/D	<<-
128	24 Jul 1967	D	8.400	1.430	3620.98	5178.000	-0.15/D	<<-
129	28 Jul 1967	D	12.120	2.100	5285.24	11099.001	-0.69/D	<<<<-
130	8 Aug 1967	D	8.620	1.370	3756.20	5146.000	0.10/D	->
131	16 Aug 1967	D	10.670	1.590	4901.89	7794.000	0.02/D	->
132	22 Aug 1967	D	13.950	2.190	6263.01	13716.001	-0.34/D	<<<<-
133	28 Aug 1967	D	10.450	1.500	4785.33	7178.000	0.26/D	->>>
134	5 Sep 1967	D	9.570	1.430	4417.48	6317.000	0.05/D	->
135	14 Sep 1967	D	10.880	1.600	4992.50	7988.000	0.09/D	->
136	20 Sep 1967	D	10.890	1.530	5095.42	7796.000	0.24/D	->>>
137	27 Sep 1967	D	11.190	1.750	4761.14	8332.000	0.16/D	->>
138	10 Oct 1967	D	9.930	1.480	4526.35	6699.000	0.11/D	->
139	17 Oct 1967	D	8.670	1.290	3913.95	5049.000	0.24/D	->>>
140	26 Oct 1967	D	7.660	1.090	3682.57	4014.000	0.23/D	->>>
141	3 Nov 1967	D	7.240	1.110	3300.00	3663.000	0.18/D	->>
142	10 Nov 1967	D	6.720	0.990	3138.38	3107.000	0.29/D	->>>
143	5 Dec 1967	D	6.160	1.000	2712.00	2712.000	0.22/D	->>
144	9 Jan 1968	?	4.520	0.850	1902.35	1617.000	0.20/E	->>
145	19 Jan 1968	?	4.530	0.870	1922.99	1673.000	0.11/E	->
146	19 Jan 1968	?	4.530	0.870	1922.99	1673.000	0.11/E	->
147	5 Feb 1968	?	3.960	0.840	1666.67	1400.000	0.07/E	->
148	22 Feb 1968	?	3.720	0.870	1521.84	1324.000	-0.02/E	-
149	5 Mar 1968	?	3.580	0.820	1574.39	1291.000	-0.09/E	<-
150	10 Mar 1968	?	3.550			1020.000	0.51/E	->>>>
151	10 Mar 1968	?	3.540			1180.000	0.12/E	->
152	27 Mar 1968	?	3.200			932.000	0.38/E	->>>>
153	13 Apr 1968	?	3.300			921.000	0.51/E	->>>>
154	23 Apr 1968	?	3.670	0.830	1554.22	1290.000	0.01/E	-
155	1 May 1968	?	4.080			1270.000	0.46/E	->>>>
156	10 May 1968	?	5.200			2110.000	0.03/E	->
157	30 May 1968	?	3.660			1100.000	0.43/E	->>>>
158	31 May 1968	?	3.680			1180.000	0.26/E	->>>
159	1 Jun 1968	?	3.800			1250.000	0.22/E	->>>
160	2 Jun 1968	?	3.990			1490.000	-0.08/E	<-
161	3 Jun 1968	?	4.480			1700.000	0.01/E	-
162	4 Jun 1968	?	4.760			1940.000	-0.13/E	<<-
163	5 Jun 1968	?	4.640			1860.000	-0.11/E	<-
164	6 Jun 1968	?	4.640			1920.000	-0.21/E	<<-
165	21 Jun 1968	?	5.800			2850.000	-0.43/E	<<<<-
166	22 Jun 1968	?	5.710			2560.000	-0.13/E	<<-
167	23 Jun 1968	?	5.600			2380.000	0.02/E	->
168	11 Jul 1968	?	8.540			4790.000	0.15/E	->>
169	12 Jul 1968	?	8.490			4950.000	-0.05/E	<-
170	13 Jul 1968	?	8.620			4850.000	0.17/E	->>
171	14 Jul 1968	?	9.420			5830.000	0.10/E	->
172	25 Jul 1968	?	8.690			4880.000	0.22/E	->>
173	28 Jul 1968	?	7.750			4800.000	-0.65/E	<<<<-
174	3 Aug 1968	?	8.510			4390.000	0.51/E	->>>>
175	4 Aug 1968	?	9.580			6040.000	0.08/E	->
176	5 Aug 1968	?	10.260			6850.000	0.12/E	->
177	5 Aug 1968	?	10.370			6830.000	0.24/E	->>>
178	6 Aug 1968	?	10.460			6840.000	0.32/E	->>>>
179	7 Aug 1968	?	10.330			6520.000	0.44/E	->>>>
180	8 Aug 1968	?	10.000			5880.000	0.63/E	->>>>

River gaugings for station 11201 : Mekong at Luang Prabang

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge ($m^3 s^{-1}$)	--- Comparison --- Diff./Rat.	Plot
181	9 Aug 1968	?	9.950			5890.000	0.58/E	->>>>
182	11 Aug 1968	?	10.560			6950.000	0.34/E	->>>>
183	12 Aug 1968	?	11.790			9180.001	0.02/E	-
184	13 Aug 1968	?	13.560			11000.001	0.69/E	->>>>
185	14 Aug 1968	?	13.330			10500.000	0.75/E	->>>>
186	15 Aug 1968	?	15.280			13600.000	1.02/E	->>>>
187	16 Aug 1968	?	15.440			13700.000	1.13/E	->>>>
188	17 Aug 1968	?	15.120			13000.001	1.16/E	->>>>
189	18 Aug 1968	?	14.520			10900.001	1.71/E	->>>>
190	19 Aug 1968	?	13.910			10700.000	1.21/E	->>>>
191	20 Aug 1968	?	13.560			9440.001	1.62/E	->>>>
192	21 Aug 1968	?	13.000			10300.000	0.54/E	->>>>
193	22 Aug 1968	?	12.440			8990.001	0.79/E	->>>>
194	23 Aug 1968	?	11.810			7660.000	1.07/E	->>>>
195	24 Aug 1968	?	11.210			7550.000	0.54/E	->>>>
196	6 Sep 1968	?	11.860			8240.001	0.71/E	->>>>
197	7 Sep 1968	?	11.800			8170.000	0.70/E	->>>>
198	8 Sep 1968	?	11.880			8380.001	0.63/E	->>>>
199	9 Sep 1968	?	11.970			8760.001	0.47/E	->>>>
200	11 Sep 1968	?	11.770			8380.001	0.52/E	->>>>
201	12 Sep 1968	?	11.740			8670.001	0.30/E	->>>
202	13 Sep 1968	?	11.810			8730.000	0.33/E	->>>>
203	15 Sep 1968	?	11.440			8150.000	0.35/E	->>>>
204	17 Sep 1968	?	11.600			8500.000	0.27/E	->>>
205	18 Sep 1968	?	11.760			8580.000	0.38/E	->>>>
206	3 Oct 1968	?	10.780			7100.000	0.45/E	->>>>
207	4 Oct 1968	?	10.530			6660.000	0.53/E	->>>>
208	5 Oct 1968	?	10.360			6520.000	0.47/E	->>>>
209	6 Oct 1968	?	10.320			6520.000	0.43/E	->>>>
210	7 Oct 1968	?	10.250			6600.000	0.30/E	->>>
211	8 Oct 1968	?	10.130			6220.000	0.48/E	->>>>
212	9 Oct 1968	?	9.910			5970.000	0.47/E	->>>>
213	24 Oct 1968	?	9.200			6060.000	-0.32/E	<<<-
214	25 Oct 1968	?	8.890			4840.000	0.45/E	->>>>
215	26 Oct 1968	?	8.630			4720.000	0.31/E	->>>
216	28 Oct 1968	?	8.800			4690.000	0.51/E	->>>>
217	30 Oct 1968	?	10.840			7430.000	0.26/E	->>>
218	1 Nov 1968	?	11.360			6970.000	1.12/E	->>>>
219	3 Nov 1968	?	10.580			6420.000	0.77/E	->>>>
220	5 Nov 1968	?	9.500			5030.000	0.89/E	->>>>
221	25 Nov 1968	?	6.880			3220.000	0.18/E	->>
222	26 Nov 1968	?	6.770			2540.000	0.96/E	->>>>
223	27 Nov 1968	?	6.650			3120.000	0.07/E	->
224	28 Nov 1968	?	6.520			2870.000	0.26/E	->>>
225	29 Nov 1968	?	6.450			2610.000	0.54/E	->>>>
226	30 Nov 1968	?	6.390			2560.000	0.55/E	->>>>
227	2 Dec 1968	?	6.250			2600.000	0.36/E	->>>>
228	3 Dec 1968	?	6.190			2530.000	0.40/E	->>>>
229	4 Dec 1968	?	6.140			2340.000	0.62/E	->>>>
230	18 Jan 1971	F	4.840			1732.540	0.14/F	->>
231	10 Sep 1971	F	14.400			13205.930	0.15/F	->>
232	15 Sep 1971	F	12.840			10233.191	0.31/F	->>>
233	20 Sep 1971	F	12.330			9749.401	0.11/F	->
234	27 Sep 1971	F	11.620			8765.711	0.04/F	->
235	29 Sep 1971	F	10.500			7378.370	-0.09/F	<-
236	8 Oct 1971	F	10.310			7376.990	-0.28/F	<<<-
237	19 Oct 1971	F	8.990			5634.580	-0.20/F	<<-
238	26 Oct 1971	F	8.060			4499.600	-0.09/F	<-
239	15 Nov 1971	F	7.440			4019.750	-0.22/F	<<-
240	26 Nov 1971	F	6.560			3130.330	-0.10/F	<-

River gaugings for station 11201 : Mekong at Luang Prabang

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
241	30 Nov 1971	F	6.380			2904.590	-0.01/F	-
242	20 Dec 1971	F	5.620			2281.410	0.07/F	->
243	24 Dec 1971	F	5.720			2470.360	-0.10/F	<-
244	30 Dec 1971	?	5.440			4146.140	-2.35/F	<<<<-
245	11 Jan 1972	F	5.060			1846.570	0.17/F	->>
246	25 Jan 1972	F	4.640			1626.630	0.12/F	->
247	23 Feb 1972	F	3.960			1329.580	-0.02/F	-
248	28 Feb 1972	F	3.750			1171.210	0.09/F	->
249	7 Mar 1972	F	3.660			1191.700	-0.04/F	<-
250	15 Mar 1972	F	3.560			1183.920	-0.13/F	<<-
251	27 Mar 1972	F	3.350			1092.960	-0.14/F	<<-
252	28 Dec 1972	F	5.540			2205.000	0.10/F	->
253	12 Jan 1973	F	4.800			1804.000	-0.02/F	<-
254	22 Jan 1973	F	4.470			1478.000	0.21/F	->>
255	1 Nov 1986	H	6.950			3170.000	-0.01/H	-
256	5 Nov 1986	H	7.345	1.090	3348.62	3650.000	-0.21/H	<<-
257	7 Nov 1986	H	7.010	1.110	2936.94	3260.000	-0.06/H	<-
258	11 Nov 1986	H	6.920	1.035	3178.74	3290.000	-0.19/H	<<-
259	14 Nov 1986	H	7.280	1.064	2800.75	2980.000	0.57/H	->>>>
260	17 Nov 1986	H	7.600	1.104	3303.44	3647.000	0.05/H	->
261	20 Nov 1986	H	6.920	1.105	2694.12	2977.000	0.22/H	->>
262	22 Nov 1986	H	6.660	0.999	2934.93	2932.000	0.02/H	-
263	25 Nov 1986	H	6.330	0.971	2881.57	2798.000	-0.13/H	<<-
264	28 Nov 1986	H	6.060	0.938	2647.12	2483.000	0.05/H	->
265	9 Dec 1986	H	5.535	0.877	2516.53	2207.000	-0.04/H	<-
266	20 Dec 1986	H	5.180	0.879	2274.18	1999.000	-0.06/H	<-
267	6 Jan 1987	H	5.600	0.904	2271.02	2053.000	0.27/H	->>>
268	28 Jan 1987	H	4.220	0.812	1614.53	1311.000	0.29/H	->>>
269	9 Feb 1987	H	4.050	0.828	1576.09	1305.000	0.13/H	->>
270	21 Mar 1987	H	3.255	0.670	1476.12	989.000	0.08/H	->
271	9 Apr 1987	H	3.000			934.000	-0.03/H	<-
272	3 Jun 1987	H	3.160			1090.000	-0.27/H	<<<-
273	12 Jun 1987	H	4.980			1890.000	-0.07/H	<-
274	17 Jun 1987	H	4.920			1830.000	-0.03/H	<-
275	19 Jun 1987	H	5.080			1830.000	0.13/H	->>
276	23 Jun 1987	H	6.320			2740.000	-0.06/H	<-
277	2 Jul 1987	H	4.850			1760.000	0.03/H	->
278	10 Jul 1987	H	6.650			2790.000	0.20/H	->>
279	14 Jul 1987	H	6.750			3120.000	-0.14/H	<<-
280	17 Jul 1987	H	6.690			3220.000	-0.33/H	<<<<-
281	21 Jul 1987	H	7.160			3650.000	-0.39/H	<<<<-
282	24 Jul 1987	H	7.700			3860.000	-0.10/H	<-
283	28 Jul 1987	H	9.000			4880.000	0.11/H	->
284	3 Aug 1987	H	8.720			5690.000	-0.95/H	<<<<-
285	7 Aug 1987	H	9.330			5240.000	0.09/H	->
286	14 Aug 1987	H	10.370			5810.000	0.59/H	->>>>
287	29 Aug 1987	H	11.230			7700.000	-0.12/H	<-
288	31 Aug 1987	H	11.480			7240.000	0.49/H	->>>>
289	5 Sep 1987	H	10.860			6450.000	0.52/H	->>>>
290	12 Sep 1987	H	11.380			7700.000	0.03/H	->
291	17 Sep 1987	H	11.140			7620.000	-0.15/H	<<-
292	21 Sep 1987	H	10.480			6920.000	-0.25/H	<<<-
293	25 Sep 1987	H	12.000			8940.001	-0.26/H	<<<-
294	29 Sep 1987	H	11.870			8700.001	-0.22/H	<<<-

C.9.4 Station 11901 - Vientiane

Figure C9.4.1 shows the number of gaugings per year from 1960 to 1987. There is a moderate ammount of scatter in these gaugings (Figure C9.4.2), but as with Luang Prabang, much of this can be attributed to 1973 when the moving boat method was used. Whenever this method has been applied at sites on the Mekong there is a tendancy to underestimate flows, particularly at higher water levels. For these reasons the moving boat gaugings have not been used either in defining a recommended rating curve for 1973 or in deriving the average rating curve. The use of the average rating curve, shown in Figure C9.4.2, is recommended for use in 1988 since gaugings stopped in 1987.

The ratings are compared on a linear scale in Figure C9.4.3 (note the incompatibility of the moving boat rating). Although in some years there are insufficient gaugings, Figures C9.4.4b to C9.4.4j show the fitted ratings which are generally good, particularly for rating B, using 1960/61 gaugings. In order to give a realistic fit at high discharges, two flood gaugings over 20,000 cubic metres per second made in August 1971, were used in the fitting of all ratings.

Vientiane is one of the sites where recent gaugings (rating J) have been made. Although this rating falls within the broad spread of earlier ratings, the new rating is somewhat different to its predecessor, rating H. As with other ratings at Vientiane, the two flood gaugings over 20,000 cubic metres per second have been used to help extend the rating to high discharges.

Gauging History - 11901 Vientiane

Year	Gauging numbers	Number of gaugings	Rating letter	Shifts (Y=yes)	Fitting method	
1913#		0	A		1	
1960	1 - 3	3				
1961	4 - 98	95	B	Y	10	*
1962#		0	C		1	
1967	99 - 128	30	D		10	*
1968	129 - 159	31	E	Y	10	*
1969	160 - 173	14	F	Y	10	*
1970	174 - 189	16	G	Y	10	*
1971	190 - 201	12	H	Y	1	
1972		0	I		1	
1973	202 - 213	12	Not used	Y	10,4	*
1987	214 - 242	29	J	Y	10	*
1988#		0	K		1	
	Total =	242				

= and subsequent years

Dubious gaugings (HYDATA flag ?) - 170,171,174,178
Rare flood gaugings (HYDATA flag +) - 200,198

Observed stage range -0.28 metres to 12.70 metres
Gauged stage range 0.15 metres to 12.42 metres

See Section C.9.1 for description of the table

* Notes on special fitting :

Ratings B,D,E,F,G,J . Two flood gaugings over 20,000 cubic metres per second made in August 1971 used to improve the high flow region of all of these ratings.

Rating Equations - 11901 Mekong at Vientiane

Rating Letter	Date	Parameters: Equation $Q = a(h + c)^b$	Maximum Stage
A from	1 Jan 1913	$Q = 42.803 (h + 3.950)^{2.207}$	15.00 m
B from	1 Jan 1960	$Q = 70.315 (h + 3.520)^{2.056}$	15.00 m
C from	1 Jan 1962	$Q = 42.803 (h + 3.950)^{2.207}$	15.00 m
D from	1 Jan 1967	$Q = 48.395 (h + 3.740)^{2.176}$	15.00 m
E from	1 Jan 1968	$Q = 42.966 (h + 4.000)^{2.197}$	15.00 m
F from	1 Jan 1969	$Q = 7.515 (h + 5.850)^{2.721}$	15.00 m
G from	1 Jan 1970	$Q = 90.480 (h + 2.820)^{1.977}$	15.00 m
H from	1 Jan 1971	$Q = 68.976 (h + 2.930)^{2.079}$	15.00 m
I from	1 Jan 1972	$Q = 42.803 (h + 3.950)^{2.207}$	15.00 m
J from	1 Jan 1987	$Q = 41.404 (h + 3.340)^{2.260}$	15.00 m
K from	1 Jan 1988	$Q = 42.803 (h + 3.950)^{2.207}$	15.00 m

Ratings A,C,I and K are the average rating

Number of gaugings per year

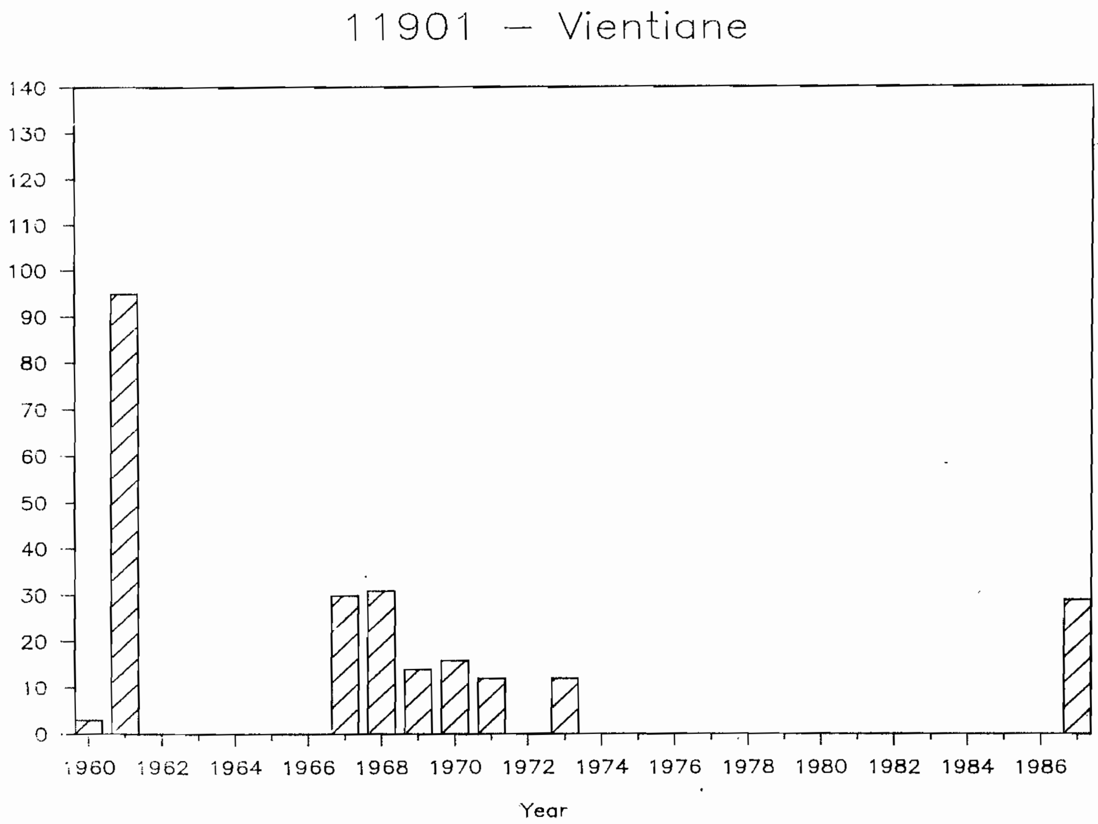


Figure C9.4.1

Rating equations

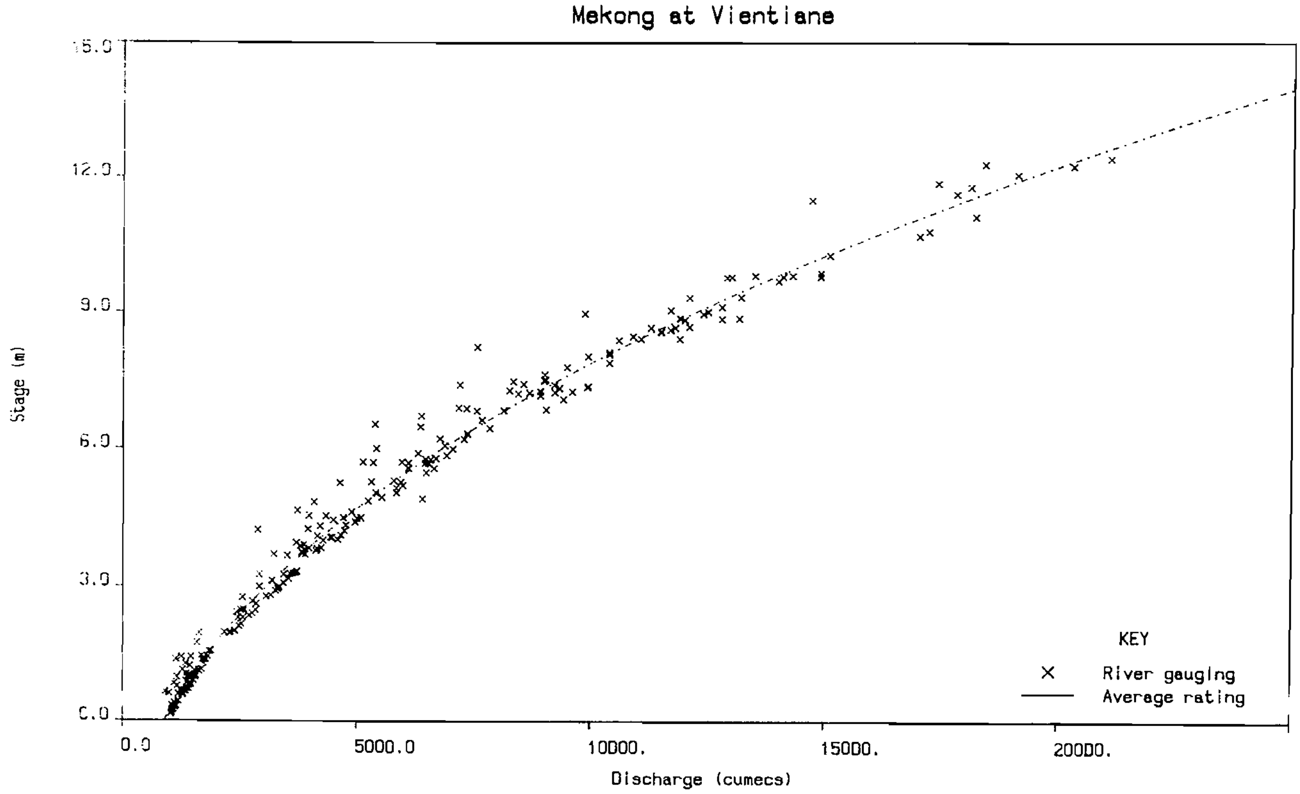


Figure C9.4.2

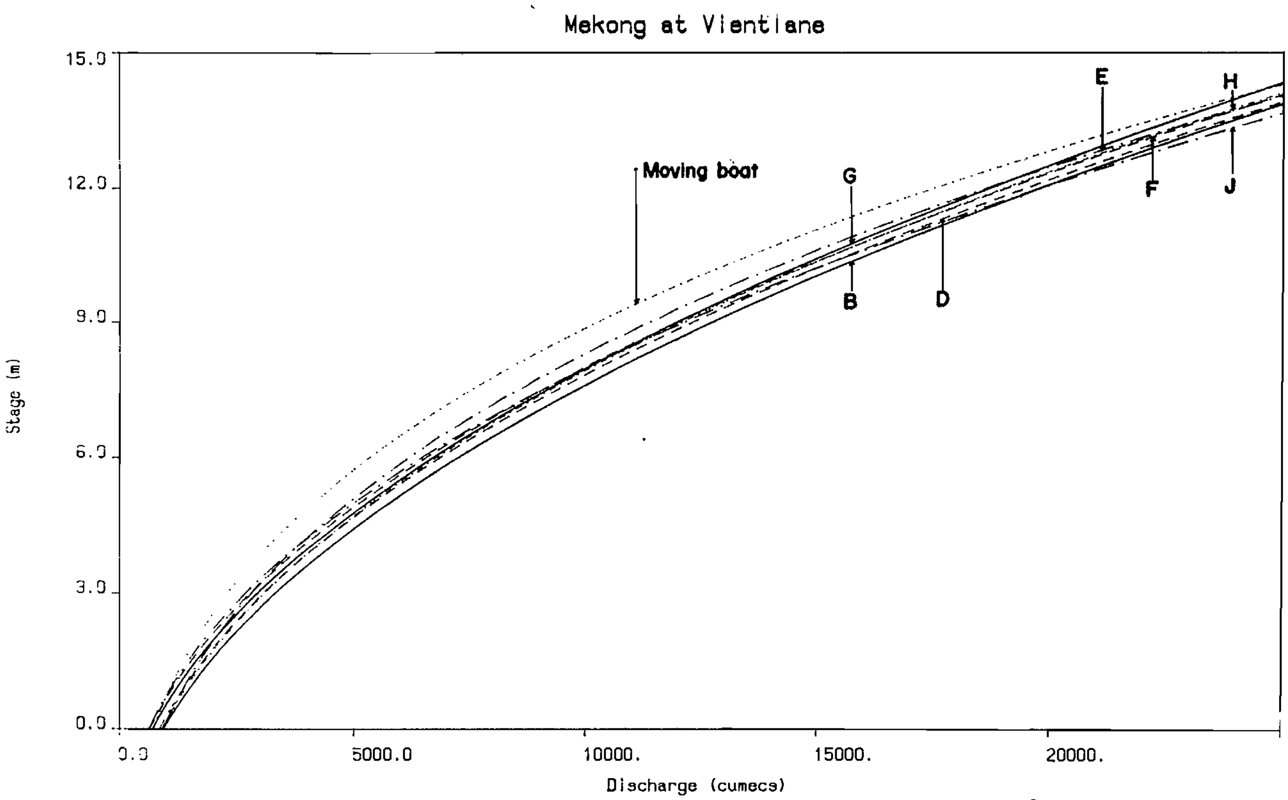


Figure C9.4.3

Rating equations

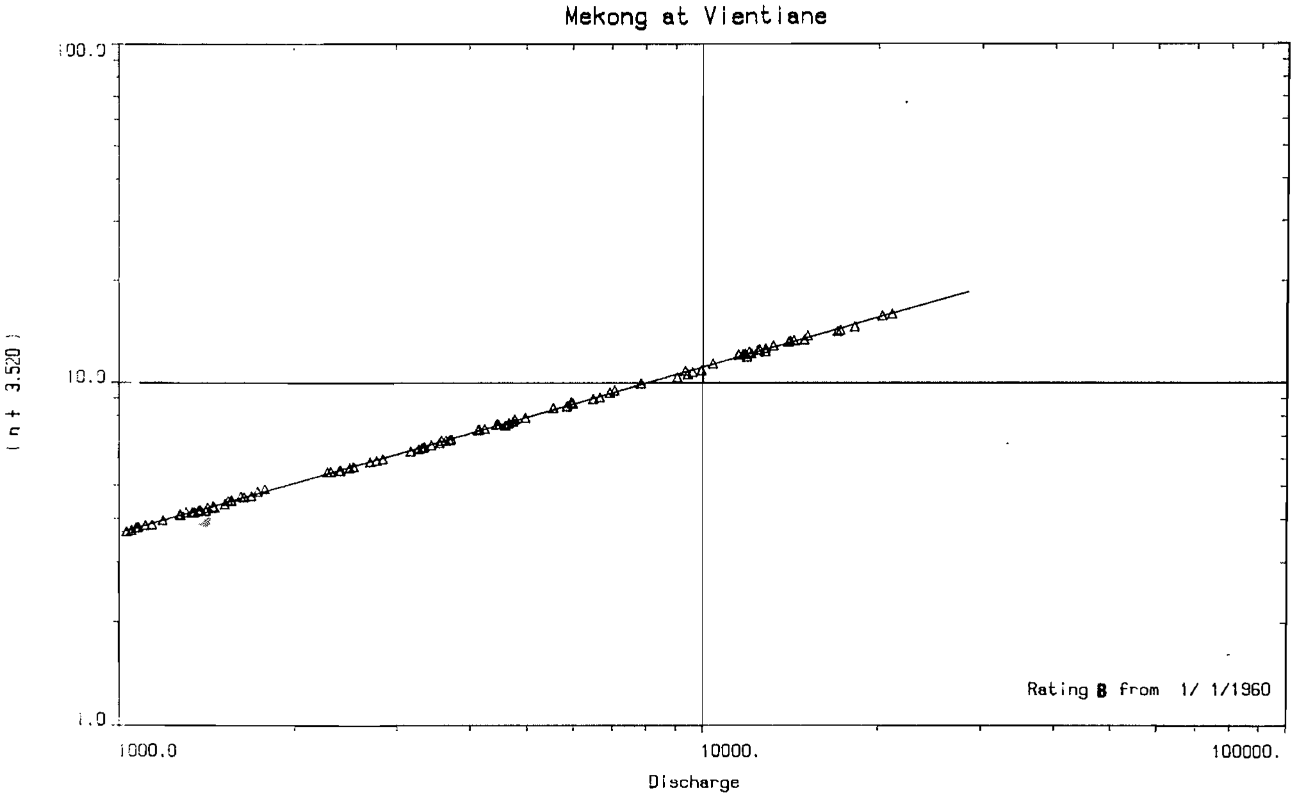


Figure C9.4.4b

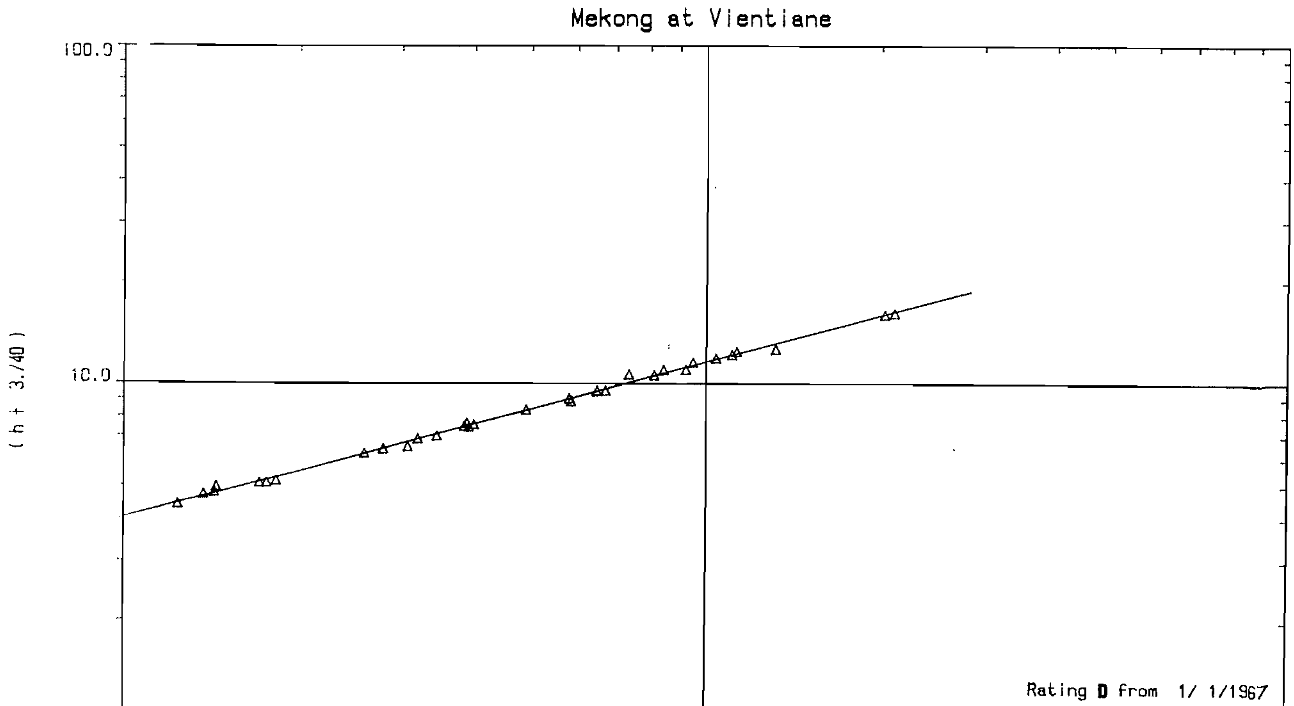


Figure C9.4.4d

Rating equations

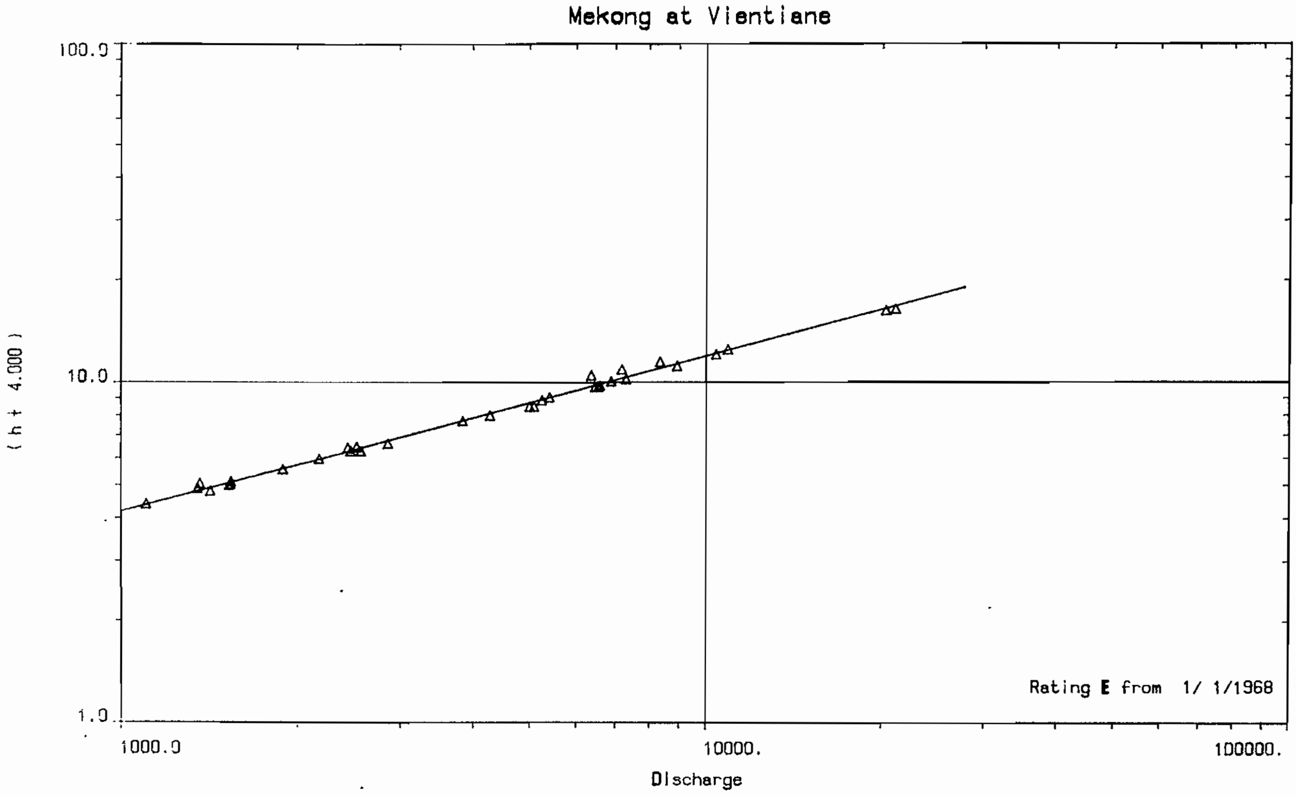


Figure C9.4.4e

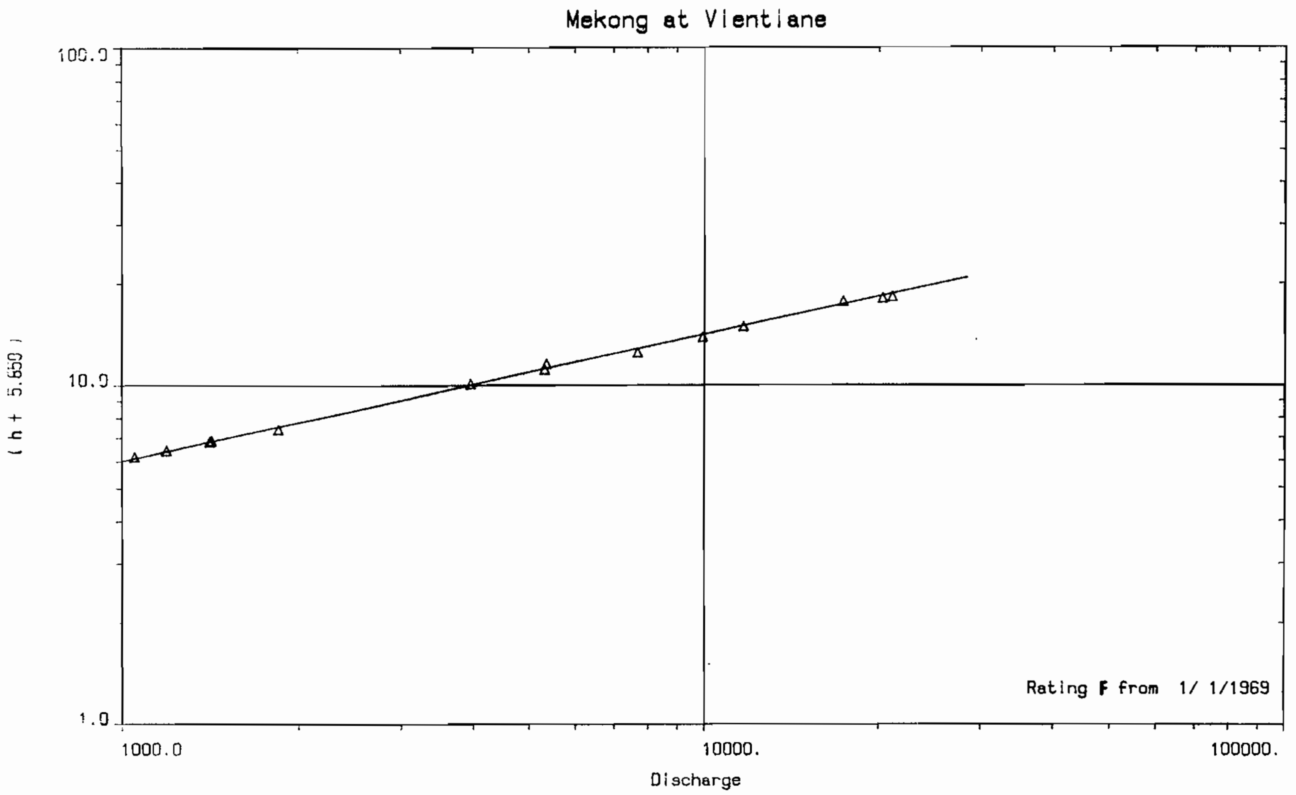


Figure C9.4.4f

Rating equations

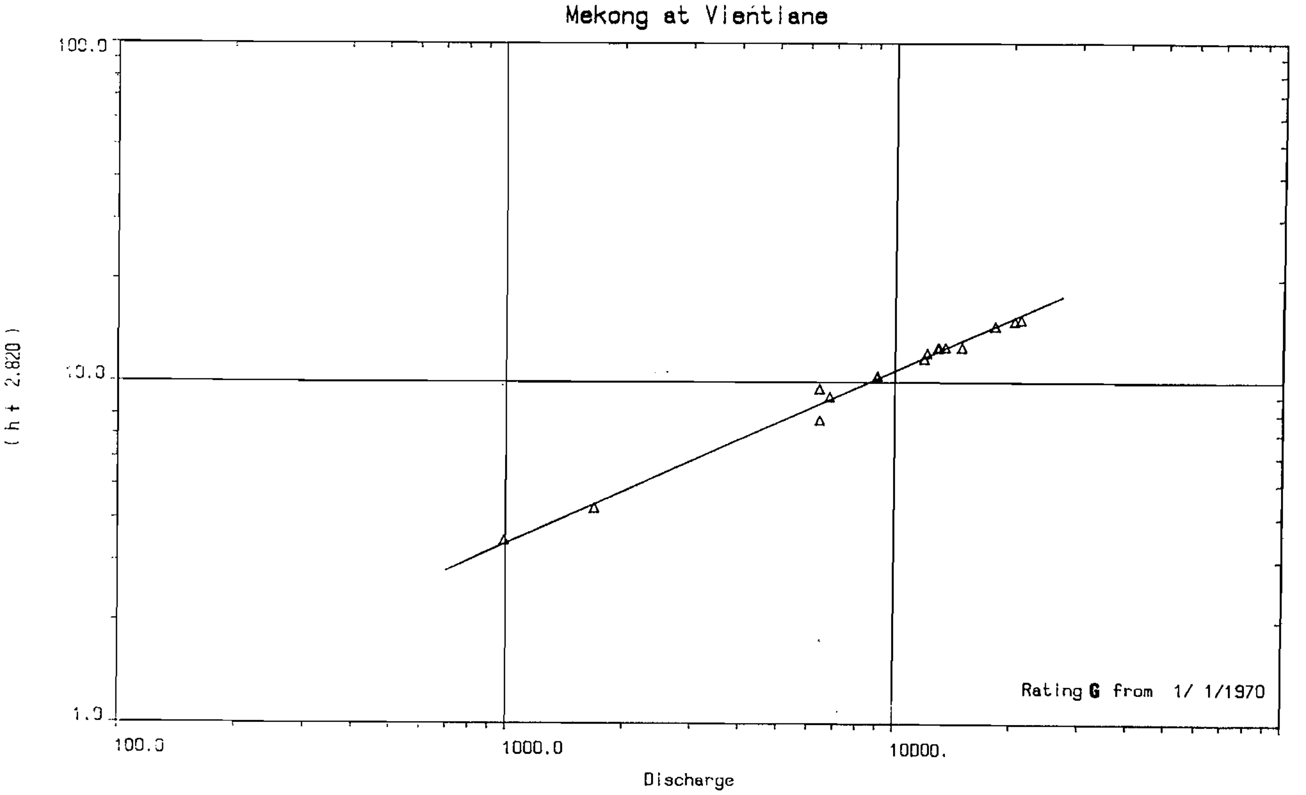


Figure C9.4.4g

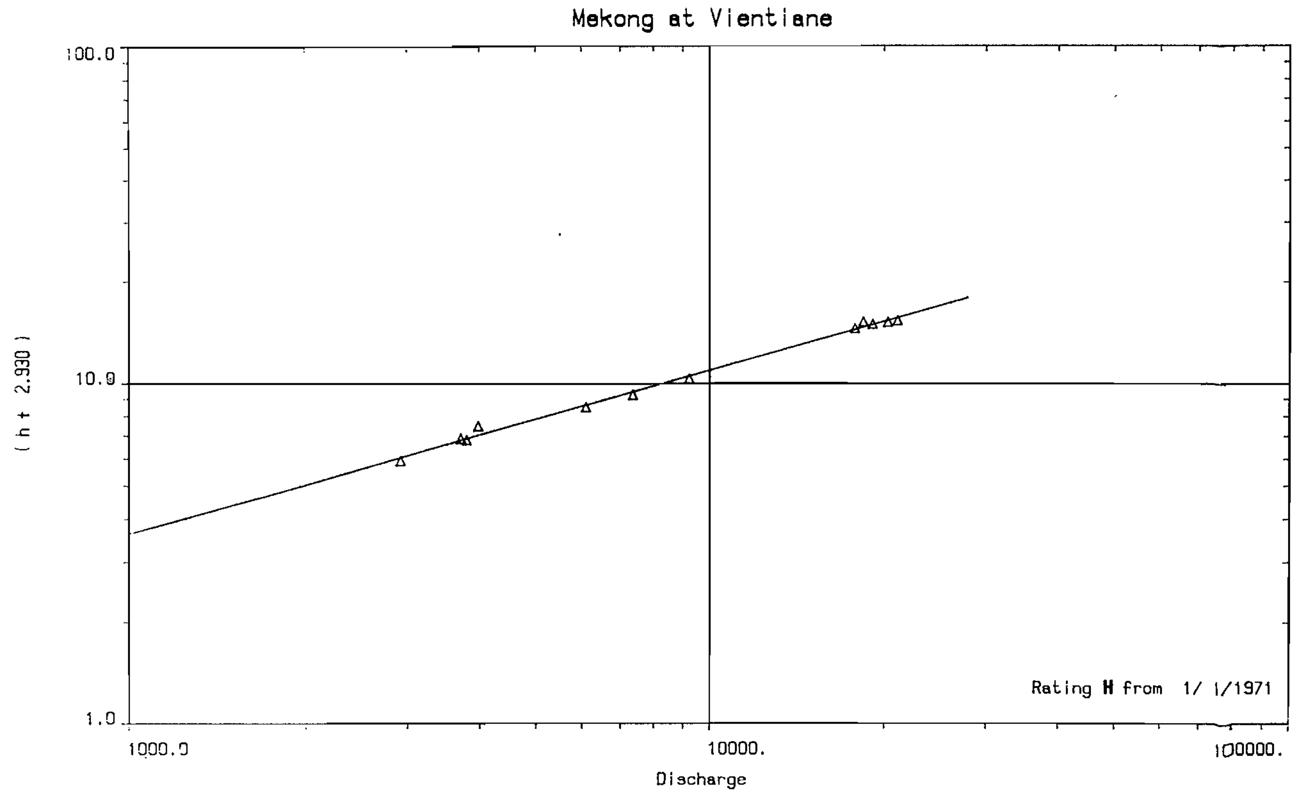


Figure C9.4.4h

Rating equations

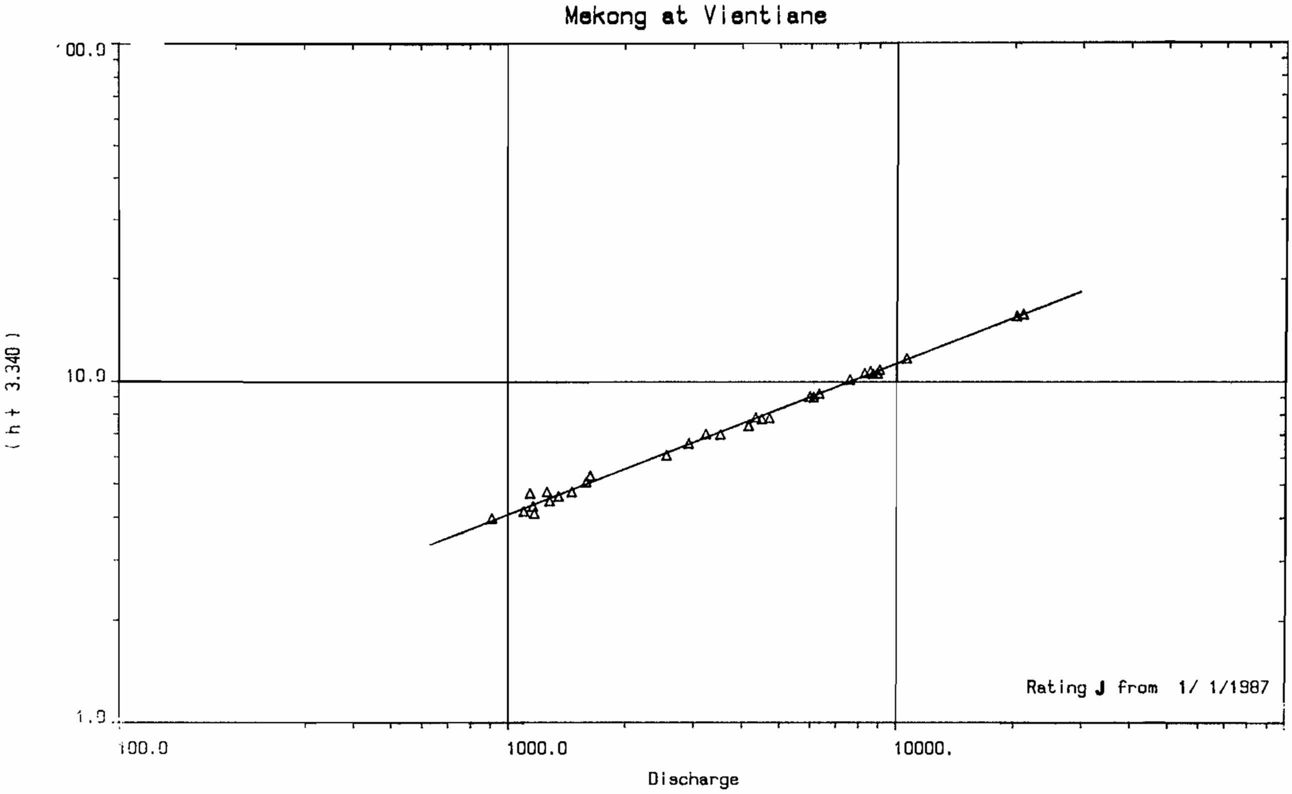


Figure C9.4.4j

River gaugings for station 11901 : Mekong at Vientiane

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
1	24 Aug 1960	B	9.820			14300.000	0.07/B	->
2	1 Dec 1960	B	2.120			2490.000	-0.03/B	<-
3	6 Dec 1960	B	2.480			2840.000	-0.04/B	<-
4	23 Jan 1961	B	0.840			1450.000	0.00/B	-
5	1 Feb 1961	B	0.710			1410.000	-0.07/B	<-
6	7 Feb 1961	B	0.610			1280.000	0.03/B	->
7	9 Feb 1961	B	0.610			1280.000	0.03/B	->
8	13 Feb 1961	B	0.670			1310.000	0.04/B	->
9	16 Feb 1961	B	0.800			1420.000	0.01/B	-
10	20 Feb 1961	B	0.670			1350.000	-0.02/B	-
11	23 Feb 1961	B	0.600			1280.000	0.02/B	-
12	27 Feb 1961	B	0.440			1190.000	0.00/B	-
13	3 Mar 1961	B	0.310			1110.000	0.00/B	-
14	7 Mar 1961	B	0.240			1070.000	0.00/B	-
15	14 Mar 1961	B	0.240			1070.000	0.00/B	-
16	17 Mar 1961	B	0.260			1080.000	0.00/B	-
17	24 Mar 1961	B	0.180			1050.000	-0.02/B	<-
18	28 Mar 1961	B	0.150			1030.000	-0.02/B	-
19	31 Mar 1961	B	0.330			1140.000	-0.03/B	<-
20	4 Apr 1961	B	0.580			1280.000	-0.00/B	-
21	7 Apr 1961	B	0.740			1380.000	0.01/B	-
22	11 Apr 1961	B	0.670			1340.000	-0.00/B	-
23	18 Apr 1961	B	0.670			1340.000	-0.00/B	-
24	20 Apr 1961	B	0.720			1370.000	0.00/B	-
25	3 May 1961	B	0.800			1460.000	-0.05/B	<-
26	5 May 1961	B	0.900			1520.000	-0.04/B	<-
27	8 May 1961	B	1.150			1690.000	-0.02/B	<-
28	10 May 1961	B	1.110			1640.000	0.00/B	-
29	12 May 1961	B	0.990			1560.000	-0.01/B	-
30	16 May 1961	B	1.020			1560.000	0.02/B	->
31	18 May 1961	B	1.000			1540.000	0.03/B	->
32	22 May 1961	B	1.130			1620.000	0.05/B	->
33	24 May 1961	B	1.290			1730.000	0.06/B	->
34	26 May 1961	B	1.370			1780.000	0.08/B	->
35	31 May 1961	B	1.970			2280.000	0.06/B	->
36	2 Jun 1961	B	1.980			2310.000	0.03/B	->
37	5 Jun 1961	B	2.360			2700.000	-0.02/B	-
38	7 Jun 1961	B	2.960			3320.000	-0.04/B	<-
39	9 Jun 1961	B	3.080			3440.000	-0.03/B	<-
40	12 Jun 1961	B	3.330			3720.000	-0.04/B	<-
41	16 Jun 1961	B	4.410			4970.000	-0.00/B	-
42	19 Jun 1961	B	5.850			6930.000	0.04/B	->
43	21 Jun 1961	B	5.200			5990.000	0.03/B	->
44	23 Jun 1961	B	4.940			5540.000	0.10/B	->
45	26 Jun 1961	B	4.070			4470.000	0.06/B	->
46	28 Jun 1961	B	3.780			4130.000	0.05/B	->
47	30 Jun 1961	B	3.280			3580.000	0.04/B	->
48	5 Jul 1961	B	2.990			3350.000	-0.04/B	<-
49	6 Jul 1961	B	3.170			3550.000	-0.05/B	<-
50	10 Jul 1961	B	2.980			3340.000	-0.04/B	<-
51	12 Jul 1961	B	3.300			3690.000	-0.04/B	<-
52	14 Jul 1961	B	4.020			4600.000	-0.10/B	<-
53	17 Jul 1961	B	5.480			6490.000	-0.03/B	<-
54	20 Jul 1961	B	6.860			9040.001	-0.23/B	<<<-
55	21 Jul 1961	B	7.370			9950.001	-0.23/B	<<<-
56	24 Jul 1961	B	7.080			9420.000	-0.23/B	<<<-
57	28 Jul 1961	B	5.040			5850.000	-0.03/B	<-
58	31 Jul 1961	B	4.220			4740.000	-0.01/B	-
59	2 Aug 1961	B	4.120			4660.000	-0.05/B	<-
60	4 Aug 1961	B	5.570			6660.000	-0.06/B	<-

River gaugings for station 11901 : Mekong at Vientiane

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
61	7 Aug 1961	B	7.250			9600.000	-0.16/B	<<-
62	9 Aug 1961	B	7.360			9930.000	-0.23/B	<<<-
63	11 Aug 1961	B	8.420			11900.000	-0.19/B	<<-
64	14 Aug 1961	B	8.860			12800.000	-0.19/B	<<-
65	16 Aug 1961	B	8.690			12100.000	-0.02/B	-
66	21 Aug 1961	B	7.890			10400.000	0.05/B	->
67	23 Aug 1961	B	8.670			11800.000	0.11/B	->
68	25 Aug 1961	B	9.020			12500.001	0.12/B	->
69	28 Aug 1961	B	9.350			13199.999	0.11/B	->
70	30 Aug 1961	B	8.970			12400.001	0.11/B	->
71	1 Sep 1961	B	8.620			11700.000	0.11/B	->
72	5 Sep 1961	B	9.700			14000.001	0.09/B	->
73	7 Sep 1961	B	9.880			14900.001	-0.13/B	<<-
74	8 Sep 1961	B	10.700			17000.000	-0.21/B	<<-
75	9 Sep 1961	B	11.130			18199.999	-0.27/B	<<<-
76	11 Sep 1961	B	10.800			17200.000	-0.19/B	<<-
77	12 Sep 1961	B	10.270			15100.000	0.17/B	->>
78	15 Sep 1961	B	8.840			12000.000	0.18/B	->>
79	20 Sep 1961	B	8.570			11500.000	0.16/B	->>
80	22 Sep 1961	B	8.590			11500.000	0.18/B	->>
81	27 Sep 1961	B	9.800			14100.000	0.15/B	->>
82	6 Oct 1961	B	9.130			12800.000	0.08/B	->
83	11 Oct 1961	B	7.330			9330.000	0.07/B	->
84	18 Oct 1961	B	6.450			7840.000	0.07/B	->
85	20 Oct 1961	B	5.990			7060.000	0.10/B	->
86	31 Oct 1961	B	5.270			5950.000	0.13/B	->>
87	7 Nov 1961	B	4.340			4770.000	0.08/B	->
88	9 Nov 1961	B	4.070			4440.000	0.08/B	->
89	14 Nov 1961	B	3.820			4150.000	0.07/B	->
90	16 Nov 1961	B	3.840			4240.000	0.02/B	-
91	24 Nov 1961	B	3.290			3640.000	-0.01/B	-
92	28 Nov 1961	B	2.910			3270.000	-0.04/B	<-
93	30 Nov 1961	B	2.810			3170.000	-0.05/B	<-
94	6 Dec 1961	B	2.950			3310.000	-0.04/B	<-
95	12 Dec 1961	B	2.410			2770.000	-0.04/B	<-
96	19 Dec 1961	B	2.170			2530.000	-0.02/B	<-
97	22 Dec 1961	B	2.020			2400.000	-0.03/B	<-
98	28 Dec 1961	B	2.010			2390.000	-0.03/B	<-
99	18 Feb 1967	D	1.230	0.789	1825.10	1440.000	0.21/D	->>
100	7 Mar 1967	D	0.980	0.770	1779.22	1370.000	0.07/D	->
101	10 Apr 1967	D	0.670	0.748	1661.76	1243.000	-0.03/D	<-
102	28 Apr 1967	D	1.370	0.848	2068.40	1754.000	-0.10/D	<-
103	2 May 1967	D	1.370	0.867	1967.70	1706.000	-0.03/D	<-
104	25 May 1967	D	1.040	0.794	1801.01	1430.000	0.04/D	->
105	5 Jun 1967	D	1.440	0.887	2051.86	1820.000	-0.12/D	<-
106	13 Jun 1967	D	3.900	1.065	3633.80	3870.000	0.15/D	->>
107	20 Jun 1967	D	2.780	1.000	3066.00	3066.000	-0.21/D	<<-
108	26 Jun 1967	D	2.680	0.967	2874.87	2780.000	-0.01/D	-
109	4 Jul 1967	D	3.260	1.036	3320.46	3440.000	-0.10/D	<-
110	10 Jul 1967	D	3.130	0.981	3251.78	3190.000	0.02/D	-
111	17 Jul 1967	D	3.750	1.046	3661.57	3830.000	0.04/D	->
112	24 Jul 1967	D	5.770	1.340	4835.82	6480.000	0.02/D	-
113	1 Aug 1967	D	7.790	1.520	6243.42	9490.001	0.22/D	->>
114	9 Aug 1967	D	5.140	1.290	4533.33	5848.000	-0.18/D	<<-
115	15 Aug 1967	D	7.240	1.690	5461.54	9230.000	-0.19/D	<<-
116	27 Aug 1967	D	8.880	1.780	7393.26	13160.000	-0.53/D	<<<<-
117	29 Aug 1967	D	7.210	1.460	5787.67	8450.000	0.23/D	->>>
118	5 Sep 1967	D	5.790	1.420	4718.31	6700.000	-0.11/D	<-
119	14 Sep 1967	D	6.880	1.380	5328.99	7354.000	0.56/D	->>>>
120	20 Sep 1967	D	8.420	1.600	6920.00	11072.001	0.02/D	-

River gaugings for station 11901 : Mekong at Vientiane

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
121	27 Sep 1967	D	8.670	1.650	6836.36	11280.001	0.16/D	->>
122	3 Oct 1967	D	8.120	1.660	6262.65	10396.001	0.06/D	->
123	10 Oct 1967	D	6.840	1.500	5426.67	8140.000	0.04/D	->
124	17 Oct 1967	D	5.300	1.290	4496.12	5800.000	0.02/D	-
125	26 Oct 1967	D	4.630	1.200	4075.83	4891.000	0.03/D	->
126	6 Nov 1967	D	3.830	1.080	3685.19	3980.000	-0.02/D	-
127	28 Nov 1967	D	3.700	1.080	3611.11	3900.000	-0.08/D	<-
128	13 Dec 1967	D	2.500	0.892	2892.38	2580.000	0.02/D	->
129	10 Jan 1968	E	1.570	0.790	2392.40	1890.000	-0.03/E	<-
130	26 Jan 1968	E	2.480	0.920	2746.74	2527.000	0.09/E	->
131	7 Feb 1968	E	1.120	0.750	2052.00	1539.000	0.02/E	->
132	22 Feb 1968	E	1.030	0.720	2136.11	1538.000	-0.07/E	<-
133	6 Mar 1968	E	1.050	0.700	1947.14	1363.000	0.23/E	->>>
134	29 Mar 1968	E	0.400	0.650	1696.92	1103.000	0.02/E	-
135	22 Apr 1968	E	0.890			1350.000	0.09/E	->
136	29 Apr 1968	E	0.800			1420.000	-0.11/E	<-
137	13 May 1968	E	2.430			2440.000	0.14/E	->>
138	21 May 1968	E	2.310			2470.000	-0.01/E	-
139	3 Jun 1968	E	1.000			1530.000	-0.08/E	<-
140	7 Jun 1968	E	2.310			2570.000	-0.13/E	<<-
141	18 Jun 1968	E	4.000			4280.000	-0.12/E	<<-
142	17 Jul 1968	E	6.070			6890.000	-0.02/E	-
143	24 Jul 1968	E	6.210			7300.000	-0.14/E	<<-
144	26 Jul 1968	E	5.690			6470.000	-0.11/E	<-
145	30 Jul 1968	E	5.040			5410.000	0.01/E	-
146	1 Aug 1968	E	4.500			5090.000	-0.29/E	<<<-
147	7 Aug 1968	E	6.480			6370.000	0.75/E	->>>>
148	13 Aug 1968	E	6.900			7180.000	0.62/E	->>>>
149	17 Sep 1968	E	8.480			10900.001	0.05/E	->
150	20 Sep 1968	E	8.080			10400.000	-0.08/E	<-
151	25 Sep 1968	E	7.480			8340.001	0.48/E	->>>>
152	27 Sep 1968	E	7.170			8920.000	-0.17/E	<<-
153	17 Oct 1968	E	5.680			6540.000	-0.17/E	<<-
154	18 Oct 1968	E	5.760			6590.000	-0.12/E	<<-
155	29 Oct 1968	E	4.860			5250.000	-0.05/E	<-
156	13 Nov 1968	E	4.490			5000.000	-0.23/E	<<<-
157	25 Nov 1968	E	3.720			3840.000	-0.01/E	-
158	10 Dec 1968	E	2.620			2860.000	-0.14/E	<<-
159	25 Dec 1968	E	1.980			2180.000	0.01/E	-
160	8 Jan 1969	F	1.560			1850.000	-0.16/F	<<-
161	31 Jan 1969	F	1.030			1420.000	0.02/F	-
162	6 Feb 1969	F	0.980			1410.000	-0.02/F	-
163	26 Feb 1969	F	0.600			1190.000	0.02/F	-
164	18 Mar 1969	F	0.340			1050.000	0.05/F	->
165	14 Jul 1969	F	5.280			5320.000	-0.02/F	<-
166	23 Jul 1969	F	6.630			7680.000	-0.28/F	<<<-
167	30 Jul 1969	F	8.030			9950.001	-0.16/F	<<-
168	11 Aug 1969	F	9.050			11700.000	-0.00/F	-
169	21 Aug 1969	F	11.860			17399.999	0.47/F	->>>>
170	27 Aug 1969	?	10.510			23600.000	-2.92/F	<<<<-
171	29 Aug 1969	?	9.550			10600.000	1.03/F	->>>>
172	1 Oct 1969	F	5.700			5360.000	0.37/F	->>>>
173	15 Oct 1969	F	4.250			3960.000	0.09/F	->
174	6 Mar 1970	?	0.430			3212.000	-2.83/G	<<<<-
175	22 Apr 1970	G	0.620			992.000	0.08/G	->
176	19 May 1970	G	1.460			1690.000	-0.12/G	<-
177	26 May 1970	G	4.910			6410.000	-0.90/G	<<<<-
178	1 Jul 1970	?	9.920			22200.000	-3.43/G	<<<<-
179	7 Jul 1970	G	7.500			9000.000	0.08/G	->
180	27 Jul 1970	G	9.800			14900.001	-0.60/G	<<<<-

River gaugings for station 11901 : Mekong at Vientiane

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
181	6 Aug 1970	G	9.790			13000.001	0.27/G	->>>
182	13 Aug 1970	G	11.780			18099.999	0.01/G	-
183	26 Aug 1970	G	9.820			13500.002	0.06/G	->
184	4 Sep 1970	G	9.780			12900.000	0.31/G	->>>
185	17 Sep 1970	G	9.340			12100.000	0.26/G	->>>
186	23 Sep 1970	G	8.880			11900.000	-0.10/G	<-
187	29 Sep 1970	G	7.630			9010.000	0.20/G	->>
188	5 Oct 1970	G	6.720			6390.000	0.93/G	->>>>
189	12 Oct 1970	G	6.220			6790.000	0.16/G	->>
190	15 Jun 1971	H	3.000			2920.000	-0.13/H	<<-
191	18 Jun 1971	H	3.950			3710.000	0.08/H	->
192	22 Jun 1971	H	3.880			3800.000	-0.07/H	<-
193	24 Jun 1971	H	4.550			3980.000	0.45/H	->>>>
194	29 Jun 1971	H	5.580			6110.000	-0.13/H	<<-
195	1 Jul 1971	H	6.330			7370.000	-0.20/H	<<-
196	6 Jul 1971	H	7.400			9220.001	-0.20/H	<<-
197	20 Aug 1971	H	12.290			18400.000	0.53/H	->>>>
198	21 Aug 1971	+	12.420			21099.999	-0.34/H	<<<<-
199	28 Aug 1971	H	12.060			19099.999	0.04/H	->
200	31 Aug 1971	+	12.250			20299.999	-0.22/H	<<-
201	8 Sep 1971	H	11.630			17800.000	0.10/H	->
202	22 Jun 1973	?	4.320	1.052	4007.60	4216.000	0.27/I	->>>
203	26 Jun 1973	?	4.660	0.870	4287.36	3730.000	1.04/I	->>>>
204	29 Jun 1973	?	4.230	0.750	3845.33	2884.000	1.44/I	->>>>
205	3 Jul 1973	?	4.840	0.921	4436.48	4086.000	0.90/I	->>>>
206	6 Jul 1973	?	6.010	1.053	5147.20	5420.000	0.99/I	->>>>
207	10 Jul 1973	?	6.540	0.976	5528.69	5396.000	1.54/I	->>>>
208	30 Aug 1973	?	11.490			14700.001	1.35/I	->>>>
209	2 Oct 1973	?	8.980	1.237	7974.13	9864.001	1.17/I	->>>>
210	5 Oct 1973	?	8.240	1.016	7463.58	7583.000	1.75/I	->>>>
211	8 Oct 1973	?	7.400	1.052	6849.81	7206.000	1.15/I	->>>>
212	16 Oct 1973	?	5.710	0.911	5642.15	5140.000	0.91/I	->>>>
213	19 Oct 1973	?	5.260	0.886	5242.66	4645.000	0.85/I	->>>>
214	3 Feb 1987	J	1.430			1260.000	0.24/J	->>>
215	16 Feb 1987	J	1.430			1460.000	-0.07/J	<-
216	25 Feb 1987	J	1.140			1280.000	-0.08/J	<-
217	12 Mar 1987	J	1.280			1350.000	-0.05/J	<-
218	25 Mar 1987	J	0.840			1100.000	-0.09/J	<-
219	11 Apr 1987	J	0.650			910.000	0.07/J	->
220	22 Apr 1987	J	0.980			1160.000	-0.05/J	<-
221	11 May 1987	J	1.360			1140.000	0.38/J	->>>>
222	25 May 1987	J	0.780			1170.000	-0.27/J	<<<-
223	8 Jun 1987	J	1.750			1590.000	0.07/J	->
224	7 Jul 1987	J	1.970			1630.000	0.23/J	->>>
225	14 Jul 1987	J	3.260			2920.000	0.03/J	->
226	20 Jul 1987	J	3.700			3230.000	0.17/J	->>
227	27 Jul 1987	J	4.450			4500.000	-0.17/J	<<-
228	4 Aug 1987	J	5.900			6320.000	-0.01/J	-
229	4 Aug 1987	J	5.690			6110.000	-0.08/J	<-
230	18 Aug 1987	J	7.280			8270.000	0.20/J	->>
231	25 Aug 1987	J	8.390			10600.000	0.10/J	->
232	2 Sep 1987	J	7.420			8560.001	0.18/J	->>
233	9 Sep 1987	J	7.230			8690.000	-0.08/J	<-
234	16 Sep 1987	J	7.520			9040.001	0.02/J	->
235	23 Sep 1987	J	7.260			8920.000	-0.18/J	<<-
236	14 Oct 1987	J	6.830			7570.000	0.15/J	->>
237	19 Oct 1987	J	5.710			5970.000	0.03/J	->
238	26 Oct 1987	J	4.500			4710.000	-0.28/J	<<<-
239	30 Oct 1987	J	4.100			4160.000	-0.25/J	<<<-
240	10 Nov 1987	J	3.670			3520.000	-0.13/J	<<-

River gaugings for station 11901 : Mekong at Vientiane

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
241	24 Nov 1987	J	4.540			4340.000	0.05/J	->
242	7 Dec 1987	J	2.760			2560.000	-0.10/J	<-

C.9.5 Station 11903 - Chiang Khan

Figure C9.5.1 shows the number of gaugings per year from 1960 to 1987. Figure C9.5.2 shows that the gaugings at Chiang Khan form a reasonably consistent set with only a small ammount of scatter. In terms of rating stability, this is the second best site considered in this study, after Pakse. Figure C9.5.2 also shows the average rating equation for Chiang Khan for use during periods when there are no gaugings.

Figure C9.5.3 shows all rating equations for this site. These ratings form a fairly consistent group as might be expected from the remarks above.

Figures C9.5.4a to C9.5.4j show the indivual fit of each of the eight rating equations. In each case a two part relationship, with a change in the region of 5 to 6.5 metres, gave the best and most realistic fit. There is a good fit for all ratings, particularly at high flows. In some cases, during periods of low flow, the gaugings show instability.

Gauging History - 11903 Chiang Khan

Year	Gauging numbers	Number of gaugings	Rating letter	Shifts (Y=yes)	Fitting method
1967	1 - 102	102	A	Y	2,10 *
1968	103 - 220	118	B	Y	2,4,10 *
1969	221 - 324	104	C	Y	2,4,10 *
1970		0	D		2 *
1971	325 - 407	83	E	Y	2 *
1972	408 - 485	78	F	Y	2,10 *
1973	486 - 558	73	G	Y	2,10 *
1974	559 - 609	51	H	Y	2,10 *
1975	610 - 652	43	I	Y	2,4,10 *
1976#		0	J		2 *
	Total =	652			

= and subsequent years

Dubious gaugings (HYDATA flag ?) - 24,136,644,647
Rare flood gaugings (HYDATA flag +) - 378,380

Observed stage range 1.91 metres to 17.12 metres
Gauged stage range 1.94 metres to 16.20 metres

See Section C.9.1 for description of the table

* Notes on special fitting :

All ratings . A two part rating throughout the period of gaugings with the transition between segments in the range 5 to 6.5 metres.

Ratings A,B,C,F,G,H,I . Two flood gaugings made in August and September 1971 over 16 metres have been used in fitting ratings during these periods.

Ratings B,C and I . The exponent on the upper part of these ratings was restricted to 3. This gave an adequate fit whilst maintaining a sensible value for this parameter

Rating equations - 11903 Mekong at Chiang Khan

Rating Letter	Rating Date	Parameters (a, c, b)	Maximum Stage
A from	1 Jan 1967	$Q = 168.448\ (h + 0.360)^{1.519}$	6.34 m
		$Q = 38.346\ (h + 0.360)^{2.297}$	20.00 m
B from	1 Jan 1968	$Q = 6.854\ (h + 3.990)^{2.620}$	5.52 m
		$Q = 2.912\ (h + 3.990)^{3.000}$	20.00 m
C from	1 Jan 1969	$Q = 8.093\ (h + 3.760)^{2.580}$	6.02 m
		$Q = 3.107\ (h + 3.760)^{3.000}$	20.00 m
D from	1 Jan 1970	$Q = 17.203\ (h + 3.100)^{2.318}$	6.10 m
		$Q = 5.037\ (h + 3.100)^{2.871}$	20.00 m
E from	1 Jan 1971	$Q = 77.371\ (h + 2.010)^{1.720}$	5.74 m
		$Q = 12.787\ (h + 2.010)^{2.599}$	20.00 m
F from	1 Jan 1972	$Q = 47.940\ (h + 2.470)^{1.920}$	6.40 m
		$Q = 6.114\ (h + 2.470)^{2.863}$	20.00 m
G from	1 Jan 1973	$Q = 104.519\ (h + 0.860)^{1.757}$	6.68 m
		$Q = 32.624\ (h + 0.860)^{2.334}$	20.00 m
H from	1 Jan 1974	$Q = 9.613\ (h + 3.990)^{2.458}$	5.26 m
		$Q = 2.883\ (h + 3.990)^{2.999}$	20.00 m
I from	1 Jan 1975	$Q = 10.683\ (h + 3.590)^{2.448}$	5.64 m
		$Q = 3.131\ (h + 3.590)^{3.000}$	20.00 m
J from	1 Jan 1976	$Q = 17.203\ (h + 3.100)^{2.318}$	6.10 m
		$Q = 5.037\ (h + 3.100)^{2.871}$	20.00 m

Ratings D and J are the average rating

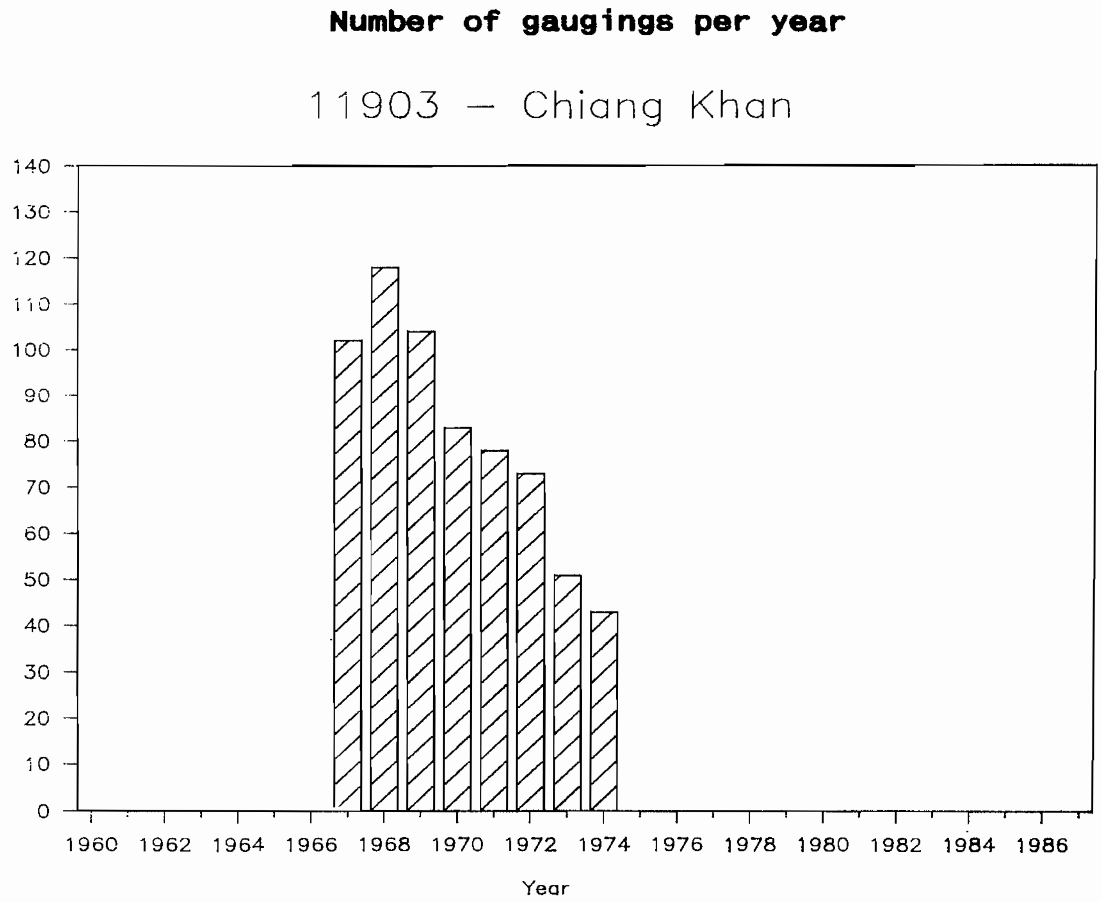

Number of gaugings per year
11903 – Chiang Khan
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1960 1962 1964 1966 1968 1970 1972 1974 1976 1978 1980 1982 1984 1986
Year

Figure C9.5.1

Rating equations

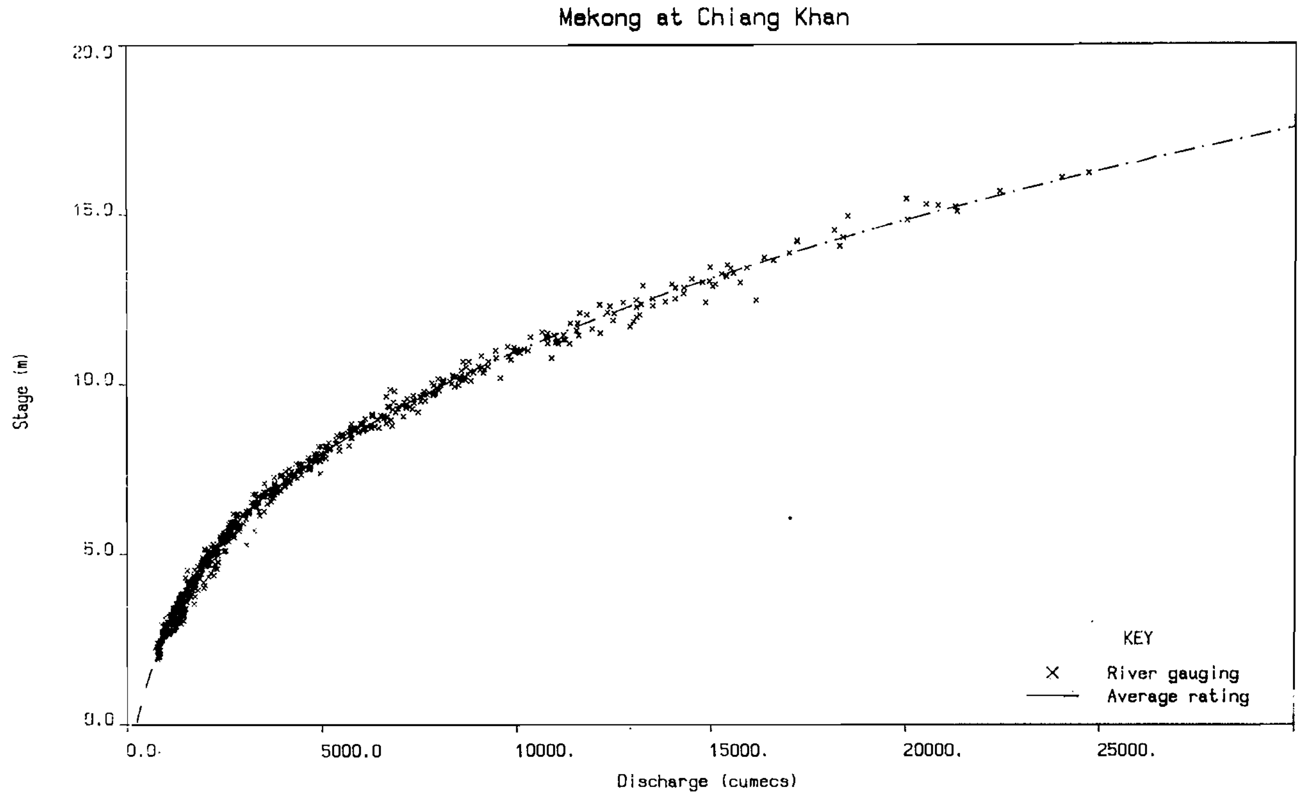


Figure C9.5.2

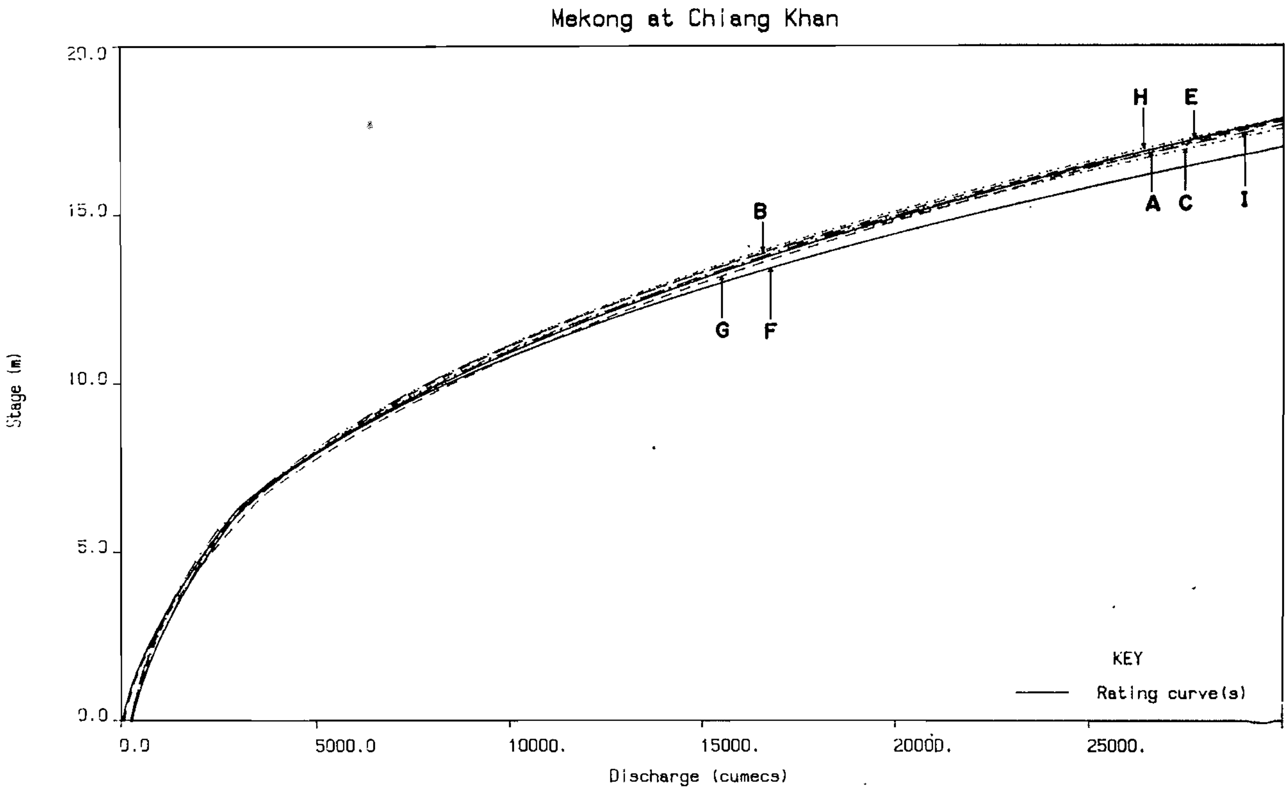


Figure C9.5.3

Rating equations

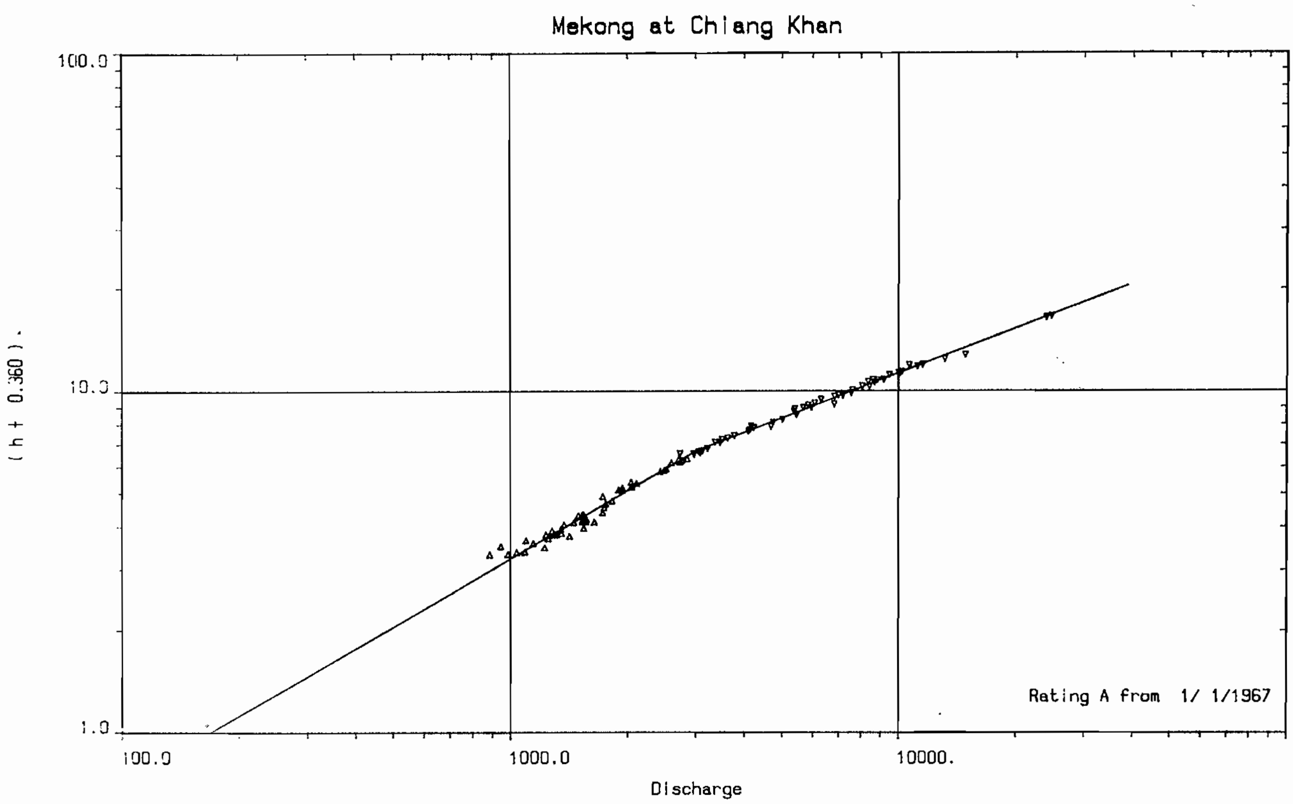


Figure C9.5.4a

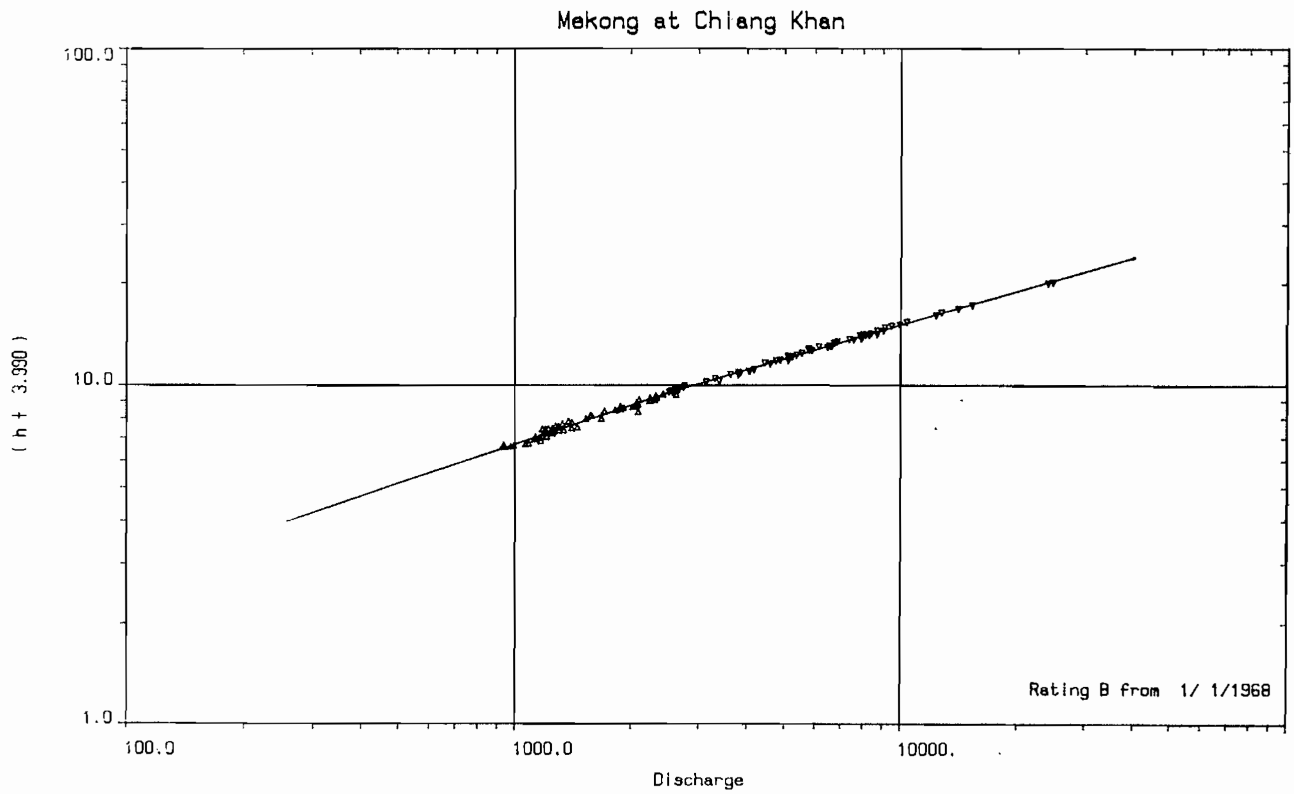


Figure C9.5.4b

Rating equations

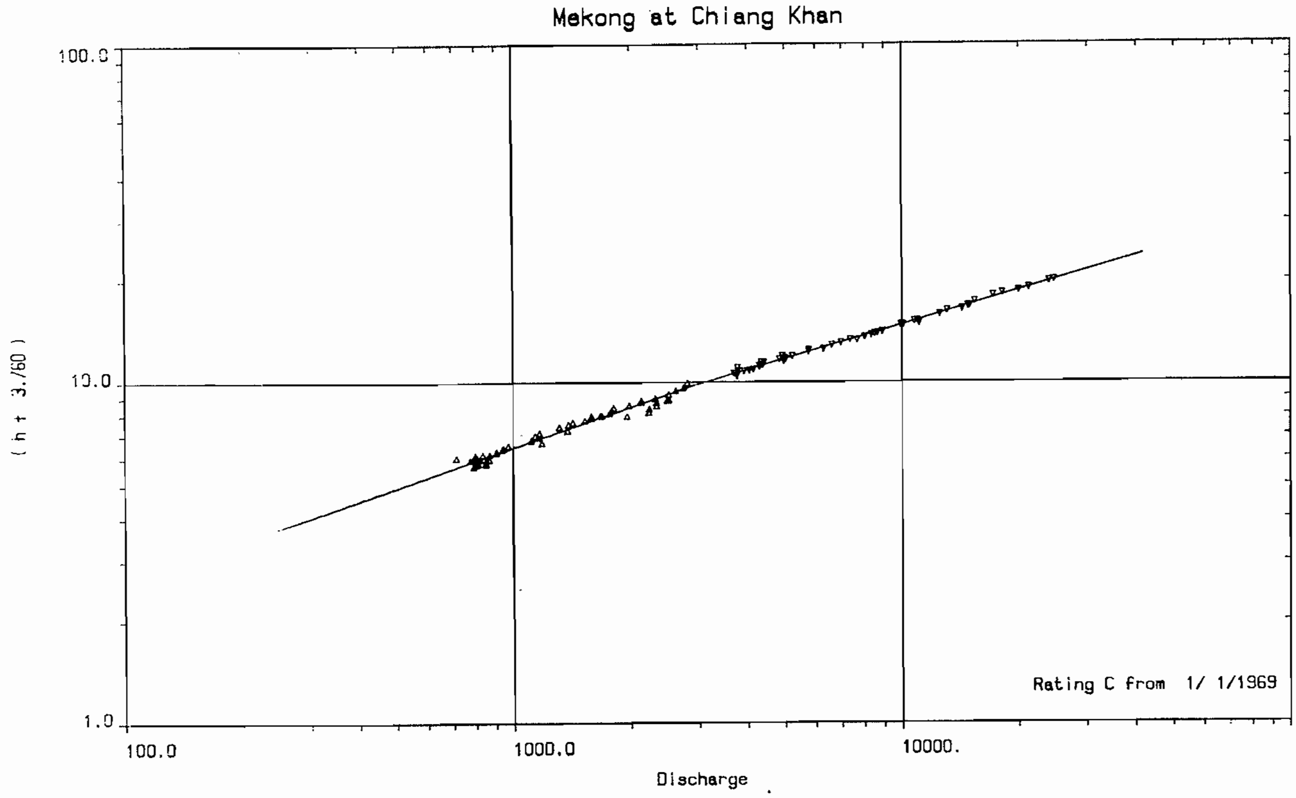


Figure C9.5.4c

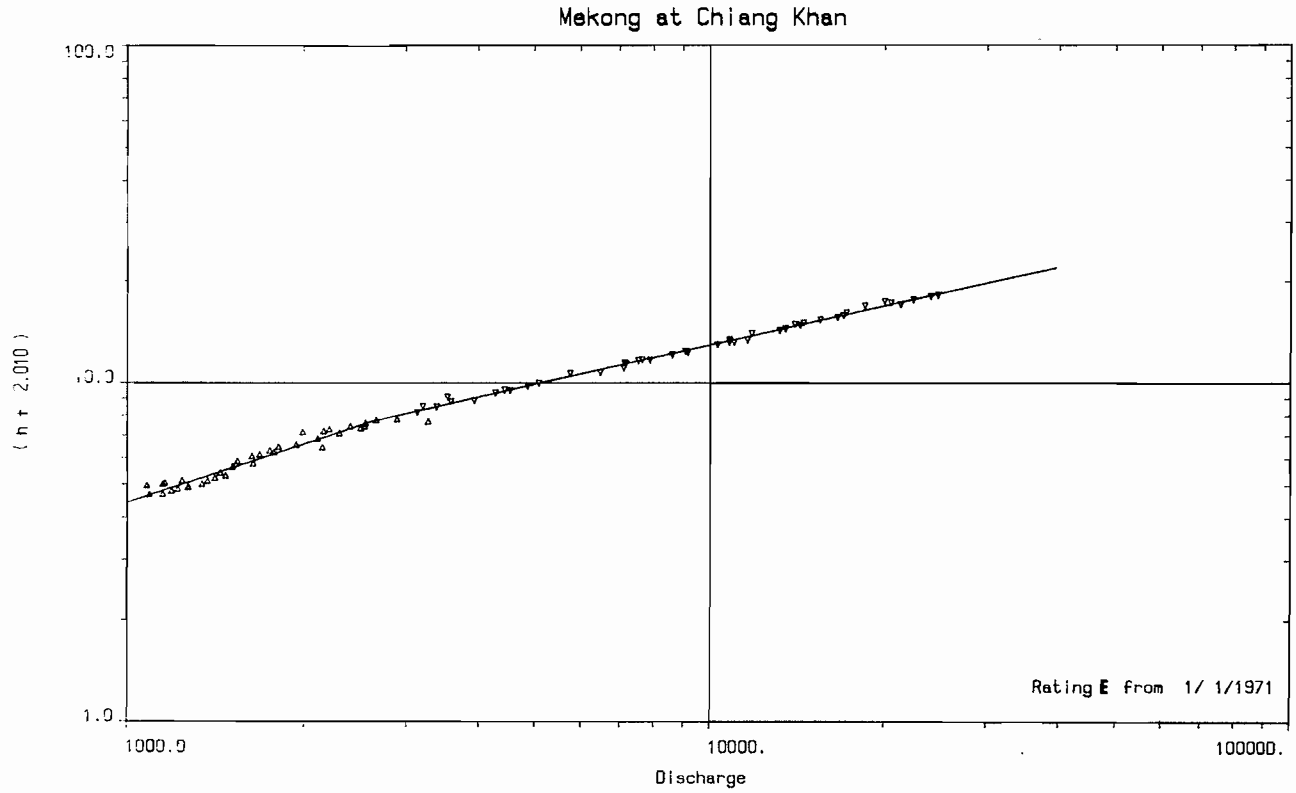


Figure C9.5.4e

Rating equations

Mekong at Chiang Khan

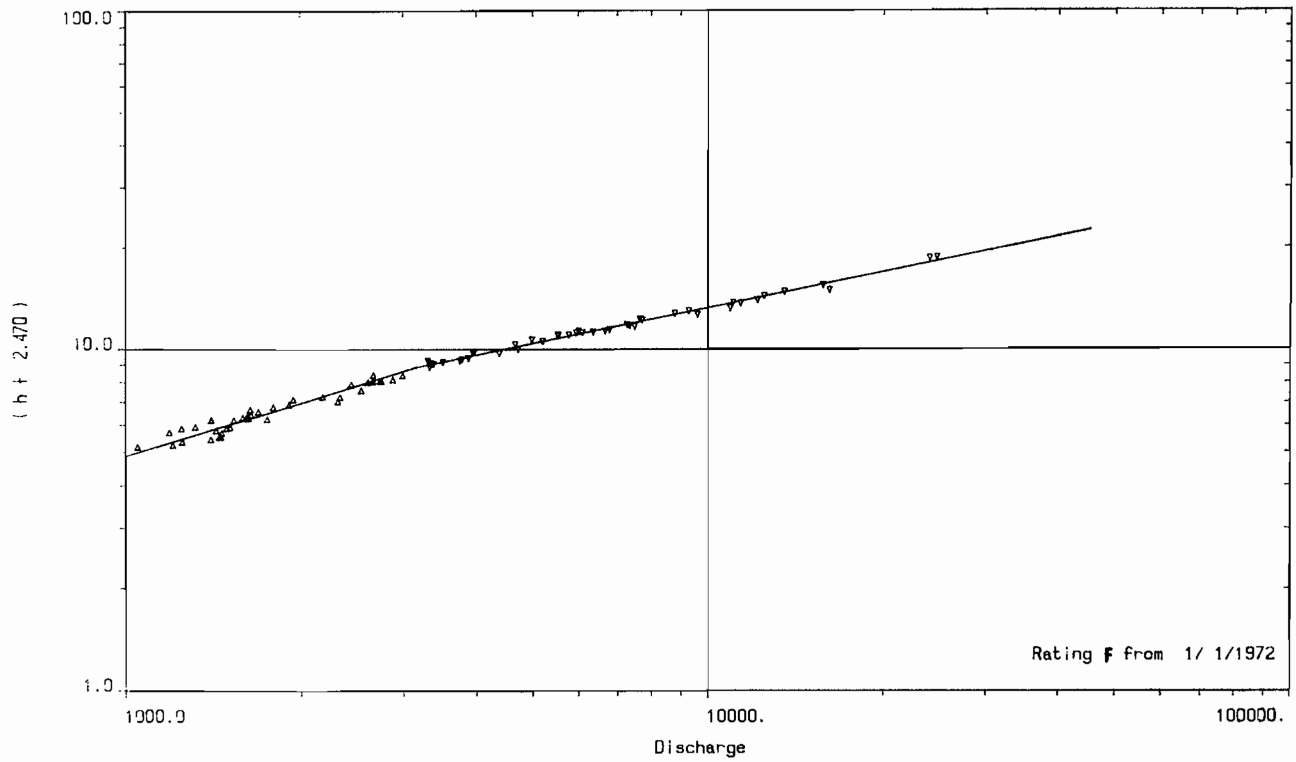


Figure C9.5.4f

Mekong at Chiang Khan

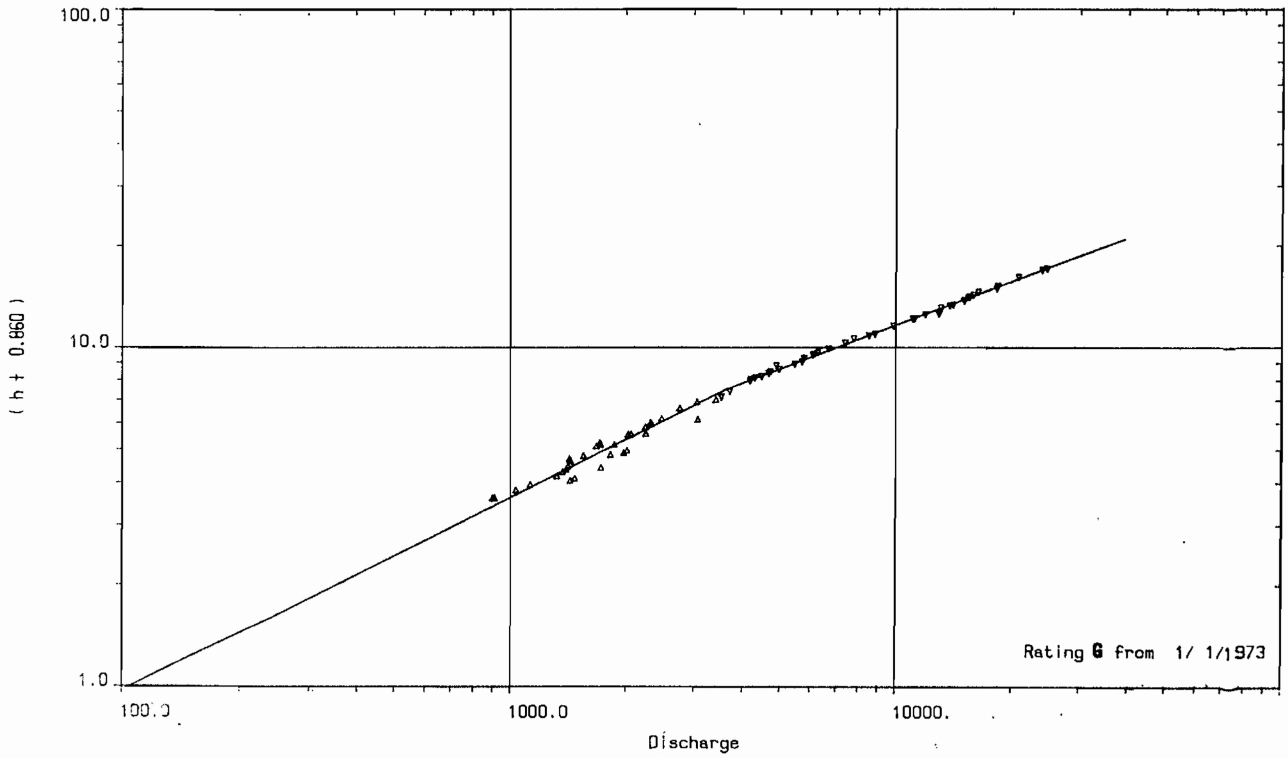


Figure C9.5.4g

Rating Equations

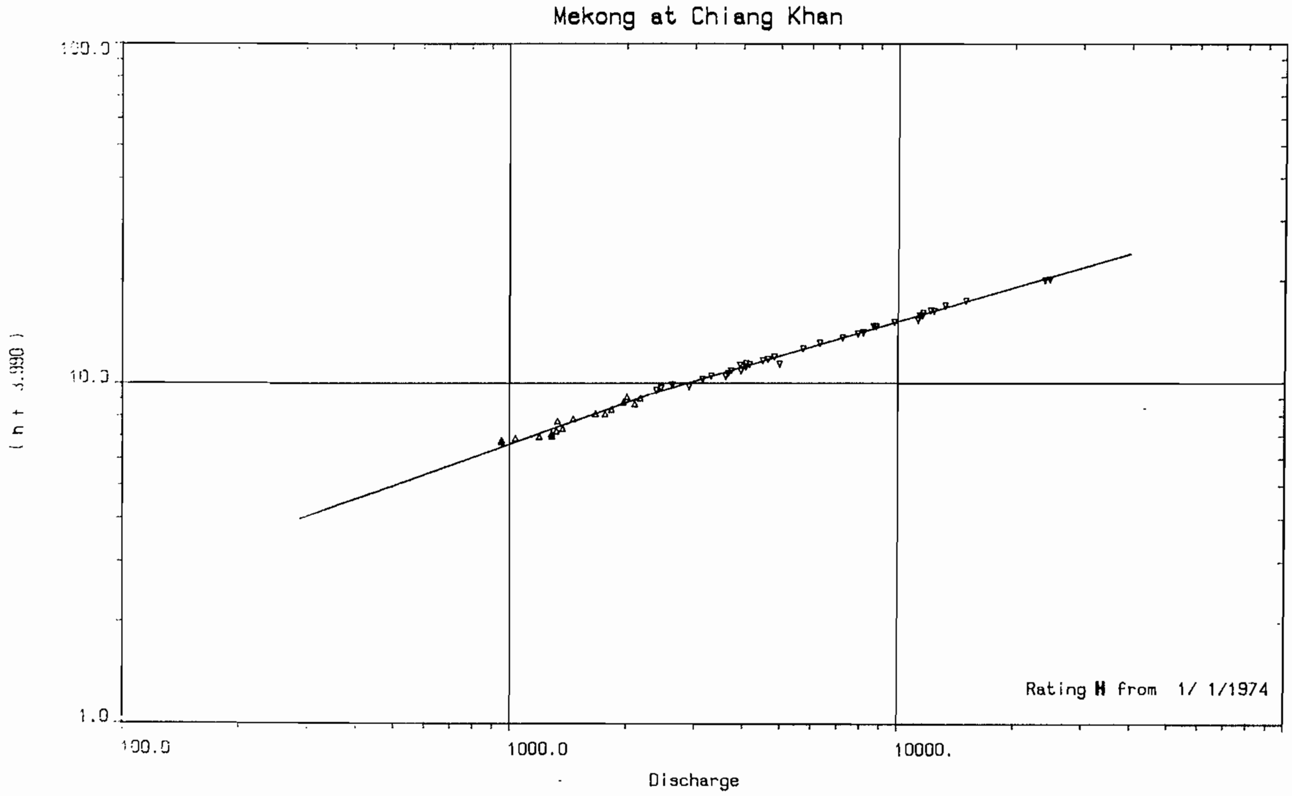


Figure C9.5.4h

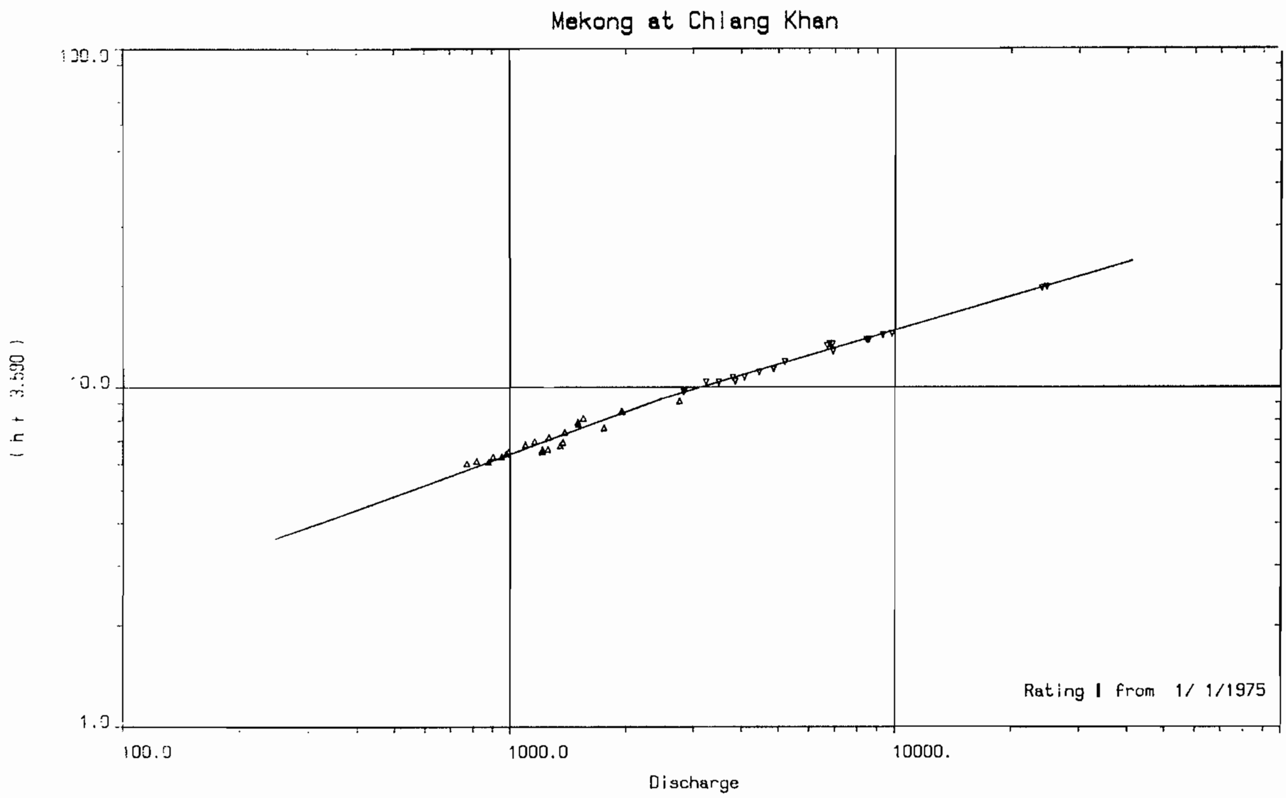


Figure C9.5.4i

River gaugings for station 11903 : Mekong at Chiang Khan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
1	4 Jan 1967	A	5.000	0.923	2289.67	2113.363	0.07/A	->
2	9 Jan 1967	A	4.830	0.923	2105.33	1943.217	0.19/A	->>
3	14 Jan 1967	A	4.870	0.934	2201.57	2056.264	0.04/A	->
4	16 Jan 1967	A	4.770	0.916	2076.00	1901.619	0.20/A	->>
5	21 Jan 1967	A	4.870	0.890	2301.96	2048.747	0.05/A	->
6	23 Jan 1967	A	4.760	0.900	2156.81	1941.125	0.12/A	->
7	26 Jan 1967	A	4.550	0.943	1833.23	1728.735	0.28/A	->>>
8	30 Jan 1967	A	4.310	0.943	1864.80	1758.506	-0.02/A	-
9	4 Feb 1967	A	4.050	0.937	1844.79	1728.572	-0.22/A	<<<-
10	8 Feb 1967	A	3.960	0.891	1678.08	1495.168	0.11/A	->
11	11 Feb 1967	A	3.980	0.914	1692.28	1546.740	0.03/A	->
12	13 Feb 1967	A	3.980	0.918	1667.98	1531.204	0.06/A	->
13	18 Feb 1967	A	3.760	0.925	1575.73	1457.553	-0.02/A	<-
14	20 Feb 1967	A	3.710	0.929	1480.07	1374.989	0.09/A	->
15	25 Feb 1967	A	3.580	0.961	1404.30	1349.533	0.00/A	-
16	27 Feb 1967	A	3.540	0.965	1326.73	1280.291	0.10/A	->
17	4 Mar 1967	A	3.440	1.135	1088.60	1235.559	0.09/A	->
18	6 Mar 1967	A	3.470	1.045	1296.29	1354.620	-0.12/A	<-
19	11 Mar 1967	A	3.330	1.005	1246.35	1252.586	-0.06/A	<-
20	13 Mar 1967	A	3.290	1.043	1051.24	1096.445	0.22/A	->>
21	17 Mar 1967	A	3.430	1.201	1083.88	1301.744	-0.05/A	<-
22	20 Mar 1967	A	3.450	1.168	1118.00	1305.826	-0.04/A	<-
23	24 Mar 1967	A	3.220	1.235	927.12	1144.998	0.05/A	->
24	27 Mar 1967	?	3.140	1.094	686.72	751.271	0.82/A	->>>>
25	30 Mar 1967	A	3.150	0.954	992.06	946.422	0.39/A	->>>>
26	3 Apr 1967	A	3.010	1.200	865.73	1038.876	0.06/A	->
27	7 Apr 1967	A	2.960	1.146	773.41	886.331	0.34/A	->>>>
28	10 Apr 1967	A	3.020	1.306	834.82	1090.269	-0.04/A	<-
29	14 Apr 1967	A	2.970	1.217	810.53	986.416	0.13/A	->>
30	17 Apr 1967	A	3.120	1.284	953.95	1224.873	-0.21/A	<<-
31	21 Apr 1967	A	3.400	1.193	1190.73	1420.543	-0.31/A	<<<-
32	24 Apr 1967	A	3.610	1.138	1357.31	1544.616	-0.33/A	<<<<-
33	27 Apr 1967	A	3.780	1.117	1472.67	1644.974	-0.34/A	<<<<-
34	30 Apr 1967	A	3.780	1.188	1320.07	1568.246	-0.21/A	<<-
35	3 May 1967	A	3.860	1.137	1380.34	1569.444	-0.13/A	<<-
36	8 May 1967	A	3.460	1.319	1001.12	1320.472	-0.06/A	<-
37	13 May 1967	A	3.830	1.181	1306.45	1542.917	-0.11/A	<-
38	24 May 1967	A	3.440	1.160	1134.80	1316.363	-0.07/A	<-
39	26 May 1967	A	3.780	1.043	1472.67	1535.999	-0.15/A	<<-
40	28 May 1967	A	3.820	1.077	1422.61	1532.156	-0.10/A	<-
41	30 May 1967	A	4.190	1.010	1725.92	1743.180	-0.11/A	<-
42	3 Jun 1967	A	3.880	1.020	1513.12	1543.380	-0.06/A	<-
43	7 Jun 1967	A	4.400	0.975	1878.03	1831.081	-0.05/A	<-
44	17 Jun 1967	A	5.970	0.991	2883.25	2857.302	-0.12/A	<<-
45	21 Jun 1967	A	5.840	0.962	2845.56	2737.425	-0.07/A	<-
46	24 Jun 1967	A	5.805	0.972	2675.30	2600.394	0.10/A	->
47	27 Jun 1967	A	5.500	0.944	2636.99	2489.322	-0.03/A	<-
48	30 Jun 1967	A	5.900	1.024	2703.33	2768.207	-0.06/A	<-
49	5 Jul 1967	A	6.250	1.025	3015.72	3091.111	-0.15/A	<<-
50	9 Jul 1967	A	6.200	1.050	2606.23	2736.542	0.29/A	->>>
51	12 Jul 1967	A	6.200	1.039	2858.28	2969.755	-0.06/A	<-
52	15 Jul 1967	A	6.320	1.063	2939.32	3124.493	-0.11/A	<-
53	19 Jul 1967	A	7.455	1.173	3607.19	4231.229	0.06/A	->
54	22 Jul 1967	A	9.330	1.369	5248.28	7184.889	-0.07/A	<-
55	26 Jul 1967	A	8.185	1.234	4419.46	5453.615	-0.11/A	<-
56	29 Jul 1967	A	11.030	1.562	6531.44	10202.114	0.02/A	-
57	1 Aug 1967	A	10.960	1.668	6006.81	10019.361	0.03/A	->
58	4 Aug 1967	A	9.940	1.527	5515.16	8421.654	-0.16/A	<<-
59	8 Aug 1967	A	8.600	1.358	4387.03	5957.583	-0.04/A	<-
60	11 Aug 1967	A	8.800	1.516	4502.14	6825.251	-0.39/A	<<<<-

River gaugings for station 11903 : Mekong at Chiang Khan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
61	15 Aug 1967	A	10.440	1.528	6008.73	9181.337	-0.06/A	<-
62	18 Aug 1967	A	10.231	1.942	4468.59	8677.998	-0.01/A	-
63	21 Aug 1967	A	11.580	1.772	6512.21	11539.641	-0.06/A	<-
64	23 Aug 1967	A	12.395	1.924	7721.48	14856.126	-0.64/A	<<<<-
65	26 Aug 1967	A	11.540	1.590	6702.86	10657.544	0.31/A	->>>
66	28 Aug 1967	A	10.400	1.447	6100.22	8827.024	0.08/A	->
67	31 Aug 1967	A	9.510	1.379	5475.04	7550.075	-0.11/A	<-
68	4 Sep 1967	A	9.095	1.219	5180.56	6315.107	0.22/A	->>>
69	8 Sep 1967	A	9.075	1.210	5212.22	6306.790	0.21/A	->>
70	11 Sep 1967	A	9.380	1.292	5413.80	6994.627	0.09/A	->
71	14 Sep 1967	A	9.980	1.371	5888.43	8073.034	0.07/A	->
72	18 Sep 1967	A	12.035	1.692	7779.27	13162.520	-0.31/A	<<<-
73	22 Sep 1967	A	10.280	1.375	6085.73	8367.878	0.21/A	->>
74	25 Sep 1967	A	11.450	1.558	7191.18	11203.859	-0.04/A	<-
75	30 Sep 1967	A	10.780	1.460	6494.88	9482.522	0.12/A	->>
76	3 Oct 1967	A	10.930	1.508	6687.34	10084.502	-0.03/A	<-
77	6 Oct 1967	A	10.410	1.428	6019.43	8595.747	0.21/A	->>
78	10 Oct 1967	A	9.700	1.459	5215.98	7610.117	0.05/A	->
79	12 Oct 1967	A	9.275	1.384	4942.72	6840.722	0.08/A	->
80	14 Oct 1967	A	8.855	1.273	4771.72	6074.405	0.14/A	->>
81	16 Oct 1967	A	8.520	1.218	4431.67	5397.772	0.26/A	->>>
82	18 Oct 1967	A	8.380	1.250	4293.33	5366.659	0.14/A	->>
83	20 Oct 1967	A	8.740	1.238	4720.99	5844.590	0.18/A	->>
84	23 Oct 1967	A	8.590	1.279	4434.91	5672.251	0.14/A	->>
85	25 Oct 1967	A	7.900	1.164	4310.55	5017.483	-0.09/A	<-
86	27 Oct 1967	A	7.520	1.216	3852.73	4684.922	-0.22/A	<<<-
87	30 Oct 1967	A	7.350	1.107	3745.98	4146.798	0.02/A	->
88	3 Nov 1967	A	7.280	1.110	3694.32	4100.700	-0.01/A	-
89	6 Nov 1967	A	6.930	1.086	3341.05	3628.380	0.04/A	->
90	8 Nov 1967	A	6.850	1.056	3327.75	3514.107	0.06/A	->
91	11 Nov 1967	A	6.720	1.049	3306.35	3468.359	-0.03/A	<-
92	14 Nov 1967	A	6.430	1.024	3147.51	3223.046	-0.10/A	<-
93	17 Nov 1967	A	6.290	1.037	2948.63	3057.726	-0.08/A	<-
94	21 Nov 1967	A	7.750	1.125	4216.04	4743.047	-0.04/A	<-
95	24 Nov 1967	A	7.530	1.089	3828.39	4169.114	0.19/A	->>
96	28 Nov 1967	A	7.045	1.060	3560.75	3774.395	0.03/A	->
97	1 Dec 1967	A	6.730	0.998	3371.86	3365.116	0.07/A	->
98	5 Dec 1967	A	6.170	0.991	3005.64	2978.586	-0.10/A	<-
99	8 Dec 1967	A	5.960	0.942	2881.77	2714.626	0.08/A	->
100	15 Dec 1967	A	5.460	0.964	2525.50	2434.586	0.02/A	-
101	19 Dec 1967	A	5.540	0.980	2573.14	2521.678	-0.04/A	<-
102	27 Dec 1967	A	5.040	0.958	2137.51	2047.735	0.22/A	->>>
103	2 Jan 1968	B	4.700	0.970	1936.73	1878.627	0.17/B	->>
104	8 Jan 1968	B	4.470	0.954	1909.52	1821.678	0.04/B	->
105	12 Jan 1968	B	4.160	0.884	1787.77	1580.392	0.17/B	->>
106	17 Jan 1968	B	4.150	0.918	1711.84	1571.468	0.18/B	->>
107	23 Jan 1968	B	4.780	0.917	2277.83	2088.771	-0.10/B	<-
108	25 Jan 1968	B	5.635	0.911	2792.82	2544.259	0.06/B	->
109	29 Jan 1968	B	4.380	0.830	2055.01	1705.657	0.16/B	->>
110	2 Feb 1968	B	3.980	0.902	1695.75	1529.570	0.09/B	->
111	5 Feb 1968	B	3.850	0.898	1533.16	1376.777	0.27/B	->>>
112	7 Feb 1968	B	3.770	0.918	1532.11	1406.474	0.13/B	->>
113	9 Feb 1968	B	3.700	0.871	1525.22	1328.469	0.22/B	->>>
114	12 Feb 1968	B	3.580	0.918	1387.88	1274.074	0.22/B	->>>
115	14 Feb 1968	B	3.490	0.929	1348.14	1252.425	0.18/B	->>
116	16 Feb 1968	B	3.450	0.931	1312.26	1221.716	0.21/B	->>
117	19 Feb 1968	B	3.440	0.912	1293.52	1179.688	0.30/B	->>>
118	21 Feb 1968	B	3.580	0.938	1381.97	1296.286	0.17/B	->>
119	24 Feb 1968	B	3.440	0.910	1318.40	1199.747	0.25/B	->>>
120	27 Feb 1968	B	3.300	0.929	1296.82	1204.748	0.10/B	->

River gaugings for station 11903 : Mekong at Chiang Khan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
121	1 Mar 1968	B	3.370	0.966	1388.62	1341.409	-0.13/B	<<-
122	4 Mar 1968	B	3.530	0.963	1507.20	1451.436	-0.20/B	<<-
123	6 Mar 1968	B	3.340	0.944	1342.42	1267.242	-0.00/B	-
124	12 Mar 1968	B	3.090	0.992	1187.83	1178.328	-0.05/B	<-
125	15 Mar 1968	B	3.040	0.993	1171.35	1163.146	-0.07/B	<-
126	18 Mar 1968	B	3.040	0.989	1144.69	1132.102	0.01/B	-
127	20 Mar 1968	B	2.940	1.023	1099.58	1124.872	-0.08/B	<-
128	27 Mar 1968	B	2.720	0.981	1087.86	1067.190	-0.16/B	<<-
129	30 Mar 1968	B	2.680	0.852	1100.31	937.461	0.13/B	->>
130	3 Apr 1968	B	2.620	0.948	1030.77	977.173	-0.03/B	<-
131	8 Apr 1968	B	2.600	0.891	1053.48	938.649	0.05/B	->
132	13 Apr 1968	B	2.640	0.998	996.93	994.939	-0.06/B	<-
133	15 Apr 1968	B	2.740	1.005	1081.79	1087.195	-0.19/B	<<-
134	19 Apr 1968	B	2.860	1.088	1074.86	1169.448	-0.26/B	<<<-
135	29 Apr 1968	B	3.060	1.030	1176.19	1211.477	-0.16/B	<<-
136	1 May 1968	?	3.150	1.016	1497.38	1521.342	-0.72/B	<<<<-
137	3 May 1968	B	3.980	0.937	1789.00	1676.289	-0.19/B	<<-
138	6 May 1968	B	4.360	0.936	2232.80	2089.902	-0.53/B	<<<<-
139	9 May 1968	B	5.200	0.856	2724.65	2332.303	-0.06/B	<-
140	13 May 1968	B	5.390	0.894	2933.10	2622.194	-0.28/B	<<<-
141	15 May 1968	B	5.530	0.870	2949.86	2566.375	-0.07/B	<-
142	20 May 1968	B	5.210	0.846	2760.79	2335.629	-0.06/B	<-
143	23 May 1968	B	4.800	0.869	2381.62	2069.631	-0.05/B	<-
144	27 May 1968	B	3.490	1.058	1327.67	1404.671	-0.15/B	<<-
145	29 May 1968	B	3.370	1.089	1196.03	1302.472	-0.05/B	<-
146	31 May 1968	B	3.230	1.076	1166.45	1255.096	-0.09/B	<-
147	5 Jun 1968	B	4.800	0.818	2546.40	2082.952	-0.07/B	<-
148	7 Jun 1968	B	5.070	0.882	2621.15	2311.856	-0.16/B	<<-
149	10 Jun 1968	B	4.650	0.870	2326.25	2023.839	-0.13/B	<<-
150	12 Jun 1968	B	5.030	0.871	2574.47	2242.365	-0.10/B	<-
151	14 Jun 1968	B	6.280	0.926	3657.51	3386.856	-0.25/B	<<<-
152	16 Jun 1968	B	7.020	0.971	4165.22	4044.433	-0.15/B	<<-
153	20 Jun 1968	B	6.860	0.967	3970.94	3839.897	-0.12/B	<-
154	22 Jun 1968	B	6.250	0.918	3407.93	3128.482	-0.00/B	-
155	24 Jun 1968	B	5.860	0.935	2921.67	2731.761	0.06/B	->
156	26 Jun 1968	B	5.680	0.932	2855.85	2661.655	-0.04/B	<-
157	28 Jun 1968	B	6.760	1.010	3753.19	3790.725	-0.17/B	<<-
158	30 Jun 1968	B	7.840	1.038	4924.86	5112.007	-0.23/B	<<<-
159	3 Jul 1968	B	8.470	1.156	4795.72	5543.850	0.07/B	->
160	6 Jul 1968	B	8.130	1.191	4392.01	5230.888	-0.04/B	<-
161	8 Jul 1968	B	7.820	1.134	4191.47	4753.131	0.04/B	->
162	10 Jul 1968	B	8.060	1.145	4478.32	5127.680	-0.03/B	<-
163	16 Jul 1968	B	9.100	1.274	5120.51	6523.532	0.00/B	-
164	19 Jul 1968	B	8.980	1.261	5115.71	6450.915	-0.07/B	<-
165	23 Jul 1968	B	9.360	1.280	5239.48	6706.530	0.14/B	->>
166	26 Jul 1968	B	8.710	1.168	4966.30	5800.644	0.12/B	->
167	29 Jul 1968	B	8.290	1.177	4557.05	5363.646	0.02/B	->
168	31 Jul 1968	B	7.880	1.115	4355.85	4856.770	0.01/B	-
169	2 Aug 1968	B	7.670	1.114	3983.28	4437.376	0.15/B	->>
170	4 Aug 1968	B	8.690	1.218	4832.89	5886.465	0.04/B	->
171	7 Aug 1968	B	9.920	1.398	5699.05	7967.273	-0.08/B	<-
172	9 Aug 1968	B	9.680	1.367	5388.20	7365.672	0.04/B	->
173	13 Aug 1968	B	10.530	1.448	6237.94	9032.531	-0.06/B	<-
174	14 Aug 1968	B	12.110	1.685	7317.44	12329.886	-0.08/B	<-
175	16 Aug 1968	B	13.240	1.935	7890.45	15268.014	-0.14/B	<<-
176	19 Aug 1968	B	12.830	1.779	7913.87	14078.776	-0.09/B	<-
177	21 Aug 1968	B	12.400	1.889	6740.36	12732.538	0.04/B	->
178	26 Aug 1968	B	10.130	1.401	5802.02	8128.625	0.04/B	->
179	28 Aug 1968	B	9.740	1.409	5614.06	7910.216	-0.22/B	<<<-
180	1 Sep 1968	B	11.000	1.448	6541.80	9472.524	0.17/B	->>

River gaugings for station 11903 : Mekong at Chiang Khan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
181	6 Sep 1968	B	10.840	1.431	6363.26	9105.824	0.21/B	->>
182	12 Sep 1968	B	11.090	1.489	6679.63	9945.964	0.02/B	-
183	15 Sep 1968	B	11.390	1.514	6845.74	10364.445	0.11/B	->
184	25 Sep 1968	B	10.240	1.431	5861.78	8388.206	0.00/B	-
185	26 Sep 1968	B	10.170	1.393	5747.04	8005.628	0.15/B	->>
186	28 Sep 1968	B	10.510	1.437	6061.31	8710.106	0.09/B	->
187	1 Oct 1968	B	10.060	1.370	5919.18	8109.271	-0.02/B	-
188	3 Oct 1968	B	10.050	1.360	5767.92	7844.376	0.13/B	->>
189	8 Oct 1968	B	9.490	1.272	5386.95	6852.198	0.18/B	->>
190	10 Oct 1968	B	9.340	1.280	5272.55	6748.869	0.10/B	->
191	13 Oct 1968	B	8.740	1.181	4873.27	5755.337	0.18/B	->>
192	18 Oct 1968	B	9.020	1.275	5183.60	6609.088	-0.13/B	<<-
193	20 Oct 1968	B	10.100	1.386	5983.63	8293.312	-0.09/B	<-
194	22 Oct 1968	B	9.650	1.358	5570.39	7564.596	-0.11/B	<-
195	25 Oct 1968	B	8.860	1.202	4800.31	5769.969	0.29/B	->>>
196	27 Oct 1968	B	8.200	1.161	4413.25	5123.780	0.12/B	->
197	3 Nov 1968	B	10.140	1.440	6038.52	8695.464	-0.27/B	<<<-
198	4 Nov 1968	B	9.780	1.401	5660.81	7930.790	-0.20/B	<<-
199	6 Nov 1968	B	9.010	1.262	4856.25	6128.591	0.18/B	->>
200	9 Nov 1968	B	8.180	1.168	4362.57	5095.478	0.12/B	->
201	11 Nov 1968	B	7.880	1.120	4358.50	4881.516	-0.01/B	-
202	13 Nov 1968	B	7.580	1.106	4148.72	4588.479	-0.07/B	<-
203	17 Nov 1968	B	7.140	1.073	3887.25	4171.020	-0.14/B	<<-
204	20 Nov 1968	B	7.020	1.068	3807.20	4066.091	-0.17/B	<<-
205	22 Nov 1968	B	6.930	1.014	3744.07	3796.485	-0.00/B	-
206	25 Nov 1968	B	6.760	0.995	3639.64	3621.444	-0.00/B	-
207	27 Nov 1968	B	6.480	0.980	3369.55	3302.157	0.04/B	->
208	29 Nov 1968	B	6.240	0.964	3254.93	3137.750	-0.02/B	<-
209	2 Dec 1968	B	5.990	0.925	2979.38	2755.929	0.16/B	->>
210	4 Dec 1968	B	5.830	0.961	2778.36	2670.000	0.10/B	->
211	6 Dec 1968	B	5.730	0.945	2766.15	2614.013	0.07/B	->
212	9 Dec 1968	B	5.570	0.919	2732.87	2511.508	0.04/B	->
213	11 Dec 1968	B	5.420	0.910	2665.33	2425.446	0.02/B	-
214	13 Dec 1968	B	5.330	0.926	2504.28	2318.959	0.09/B	->
215	16 Dec 1968	B	5.190	0.928	2417.46	2243.402	0.06/B	->
216	18 Dec 1968	B	5.070	0.907	2314.83	2099.551	0.17/B	->>
217	21 Dec 1968	B	4.910	0.914	2266.54	2071.621	0.05/B	->
218	24 Dec 1968	B	4.740	0.943	2190.47	2065.612	-0.11/B	<-
219	28 Dec 1968	B	4.600	0.916	2089.48	1913.965	0.01/B	-
220	30 Dec 1968	B	4.510	0.914	2063.62	1886.147	-0.03/B	<-
221	3 Jan 1969	C	4.350	0.921	1923.71	1771.733	0.04/C	->
222	6 Jan 1969	C	4.220	0.920	1840.66	1693.403	0.05/C	->
223	11 Jan 1969	C	4.100	0.904	1756.70	1588.060	0.12/C	->>
224	15 Jan 1969	C	3.980	0.913	1674.42	1528.741	0.11/C	->
225	20 Jan 1969	C	3.880	0.905	1572.82	1423.398	0.22/C	->>>
226	23 Jan 1969	C	3.780	0.919	1509.77	1387.480	0.20/C	->>
227	27 Jan 1969	C	3.660	0.920	1428.53	1314.247	0.23/C	->>>
228	2 Feb 1969	C	3.480	0.948	1455.86	1380.152	-0.09/C	<-
229	6 Feb 1969	C	3.370	0.912	1282.38	1169.529	0.26/C	->>>
230	11 Feb 1969	C	3.250	0.935	1219.05	1139.811	0.21/C	->>
231	15 Feb 1969	C	3.160	0.977	1185.42	1158.158	0.07/C	->
232	18 Feb 1969	C	3.030	0.957	1163.82	1113.777	0.05/C	->
233	26 Feb 1969	C	2.790	0.989	982.87	972.054	0.15/C	->>
234	2 Mar 1969	C	2.690	0.960	983.62	944.273	0.12/C	->>
235	4 Mar 1969	C	2.630	0.983	954.08	937.863	0.08/C	->
236	9 Mar 1969	C	2.540	0.975	929.89	906.644	0.07/C	->
237	12 Mar 1969	C	2.490	0.989	914.09	904.031	0.03/C	->
238	13 Mar 1969	C	2.420	0.959	906.63	869.458	0.05/C	->
239	21 Mar 1969	C	2.400	0.924	903.59	834.916	0.13/C	->>
240	25 Mar 1969	C	2.380	0.952	839.68	799.380	0.21/C	->>

River gaugings for station 11903 : Mekong at Chiang Khan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
241	31 Mar 1969	C	2.270	0.942	757.21	713.292	0.36/C	->>>>
242	4 Apr 1969	C	2.210	0.979	832.71	815.219	-0.01/C	-
243	10 Apr 1969	C	2.180	0.938	825.72	774.524	0.08/C	->
244	13 Apr 1969	C	2.200	1.016	794.82	807.538	0.01/C	-
245	14 Apr 1969	C	2.260	0.983	817.67	803.770	0.08/C	->
246	19 Apr 1969	C	2.260	0.961	823.96	791.826	0.11/C	->
247	22 Apr 1969	C	2.200	0.991	802.36	795.138	0.04/C	->
248	26 Apr 1969	C	2.220	1.014	810.90	822.254	-0.02/C	-
249	29 Apr 1969	C	2.240	1.015	810.78	822.937	0.00/C	-
250	1 May 1969	C	2.200	1.007	847.16	853.087	-0.12/C	<<-
251	7 May 1969	C	2.120	1.013	790.28	800.554	-0.05/C	<-
252	9 May 1969	C	2.100	1.050	810.42	850.945	-0.22/C	<<-
253	11 May 1969	C	2.030	1.091	747.39	815.407	-0.19/C	<<-
254	14 May 1969	C	2.000	1.025	783.41	803.000	-0.18/C	<<-
255	20 May 1969	C	1.940	1.095	722.78	791.440	-0.21/C	<<-
256	24 May 1969	C	2.020	1.101	774.95	853.217	-0.30/C	<<<-
257	26 May 1969	C	2.200	1.038	836.96	868.765	-0.17/C	<<-
258	29 May 1969	C	2.920	0.997	1189.97	1186.402	-0.23/C	<<<-
259	2 Jun 1969	C	4.200	0.817	2403.72	1963.836	-0.44/C	<<<<-
260	4 Jun 1969	C	4.400	0.884	2524.04	2231.252	-0.67/C	<<<<-
261	7 Jun 1969	C	4.980	0.783	2981.77	2334.728	-0.25/C	<<<-
262	9 Jun 1969	C	5.100	0.821	3032.46	2489.648	-0.35/C	<<<<-
263	12 Jun 1969	C	4.780	0.840	2783.18	2337.869	-0.45/C	<<<<-
264	16 Jun 1969	C	4.610	0.811	2758.07	2236.796	-0.47/C	<<<<-
265	19 Jun 1969	C	5.120	0.832	3018.04	2511.007	-0.36/C	<<<<-
266	20 Jun 1969	C	6.680	0.926	4063.70	3762.988	-0.22/C	<<-
267	21 Jun 1969	C	8.150	1.009	5177.99	5224.592	0.02/C	-
268	23 Jun 1969	C	7.990	0.985	5069.63	4993.585	0.04/C	->
269	25 Jun 1969	C	7.920	0.955	5077.85	4849.346	0.08/C	->
270	28 Jun 1969	C	7.140	0.946	4381.06	4144.482	-0.11/C	<-
271	1 Jul 1969	C	7.420	0.945	4536.57	4287.062	0.05/C	->
272	3 Jul 1969	C	7.014	0.919	4264.65	3919.214	-0.03/C	<-
273	9 Jul 1969	C	7.060	0.956	4232.42	4046.197	-0.10/C	<-
274	13 Jul 1969	C	7.780	1.018	4878.88	4966.700	-0.15/C	<<-
275	14 Jul 1969	C	8.530	1.108	5185.85	5745.925	0.02/C	-
276	16 Jul 1969	C	9.090	1.194	5531.86	6605.044	-0.01/C	-
277	21 Jul 1969	C	9.530	1.339	5727.17	7668.676	-0.22/C	<<<-
278	24 Jul 1969	C	10.140	1.393	6118.95	8523.703	-0.10/C	<-
279	27 Jul 1969	C	11.030	1.535	6525.77	10017.056	0.02/C	-
280	29 Jul 1969	C	11.200	1.564	7082.80	11077.501	-0.32/C	<<<-
281	1 Aug 1969	C	10.210	1.494	5791.03	8651.793	-0.10/C	<-
282	4 Aug 1969	C	11.380	1.580	6807.40	10755.701	0.01/C	-
283	5 Aug 1969	C	12.660	1.785	8005.88	14290.501	-0.21/C	<<-
284	7 Aug 1969	C	12.990	1.802	8198.11	14772.988	-0.07/C	<-
285	10 Aug 1969	C	12.080	1.658	7540.47	12502.093	-0.07/C	<-
286	14 Aug 1969	C	13.020	1.736	8615.63	14956.738	-0.11/C	<-
287	15 Aug 1969	C	14.520	1.910	9507.20	18158.750	0.27/C	->>>
288	16 Aug 1969	C	14.820	1.996	10034.16	20028.187	-0.03/C	<-
289	19 Aug 1969	C	15.200	2.008	10588.53	21261.765	-0.03/C	<-
290	24 Aug 1969	C	14.220	1.789	9607.93	17188.589	0.29/C	->>>
291	26 Aug 1969	C	13.510	1.706	9036.50	15416.267	0.21/C	->>
292	28 Aug 1969	C	12.470	1.645	7950.32	13078.272	0.08/C	->
293	30 Aug 1969	C	11.440	1.558	7035.28	10960.973	-0.02/C	<-
294	2 Sep 1969	C	11.000	1.558	6377.35	9935.907	0.03/C	->
295	7 Sep 1969	C	10.350	1.410	6316.46	8906.204	-0.10/C	<-
296	10 Sep 1969	C	9.830	1.423	5640.94	8027.059	-0.13/C	<<-
297	13 Sep 1969	C	9.570	1.358	5420.48	7361.007	-0.00/C	-
298	18 Sep 1969	C	10.960	1.584	6354.75	10065.926	-0.08/C	<-
299	23 Sep 1969	C	10.030	1.449	5758.78	8344.479	-0.11/C	<-
300	25 Sep 1969	C	9.300	1.367	5099.17	6970.562	-0.03/C	<-

River gaugings for station 11903 : Mekong at Chiang Khan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
301	28 Sep 1969	C	8.680	1.272	4534.01	5767.266	0.15/C	->>
302	3 Oct 1969	C	8.740	1.308	4808.52	6289.549	-0.15/C	<<-
303	6 Oct 1969	C	8.180	1.163	4235.72	4926.138	0.28/C	->>>
304	11 Oct 1969	C	7.670	1.137	3887.06	4419.585	0.18/C	->>
305	16 Oct 1969	C	7.280	1.073	3516.64	3773.359	0.37/C	->>>>
306	18 Oct 1969	C	7.480	1.127	3894.76	4389.400	0.02/C	-
307	20 Oct 1969	C	7.690	1.099	3952.08	4343.338	0.27/C	->>>
308	25 Oct 1969	C	7.030	1.081	3494.29	3777.328	0.12/C	->
309	30 Oct 1969	C	6.830	1.044	3568.25	3725.253	-0.03/C	<-
310	3 Nov 1969	C	7.340	1.118	3847.88	4301.932	-0.05/C	<-
311	6 Nov 1969	C	7.920	1.127	4457.22	5023.285	-0.06/C	<-
312	10 Nov 1969	C	6.860	1.045	3534.97	3694.039	0.03/C	->
313	14 Nov 1969	C	6.180	0.935	2997.63	2802.787	0.30/C	->>>
314	18 Nov 1969	C	5.870	0.986	2777.98	2739.092	0.07/C	->
315	23 Nov 1969	C	5.680	0.972	2691.02	2615.668	0.05/C	->
316	27 Nov 1969	C	5.460	0.966	2598.17	2509.828	-0.02/C	<-
317	30 Nov 1969	C	5.210	0.930	2492.63	2318.149	0.01/C	-
318	2 Dec 1969	C	5.080	0.924	2308.81	2133.342	0.16/C	->>
319	7 Dec 1969	C	4.980	0.947	2259.04	2139.308	0.05/C	->
320	10 Dec 1969	C	4.800	0.991	2004.52	1986.479	0.12/C	->>
321	13 Dec 1969	C	4.660	0.917	1978.40	1814.189	0.27/C	->>>
322	16 Dec 1969	C	4.510	0.914	1957.78	1789.408	0.17/C	->>
323	22 Dec 1969	C	4.200	0.901	1763.90	1589.272	0.22/C	->>
324	24 Dec 1969	C	4.240	0.925	1811.84	1675.949	0.10/C	->
325	4 Jan 1971	E	5.380	0.923	2708.56	2500.000	-0.15/E	<<-
326	8 Jan 1971	E	5.120	0.919	2502.72	2300.000	-0.06/E	<-
327	13 Jan 1971	E	4.870	0.884	2386.88	2110.000	0.05/E	->
328	20 Jan 1971	E	4.570	0.898	2160.36	1940.000	0.07/E	->
329	22 Jan 1971	E	4.480	0.877	2063.85	1810.000	0.24/E	->>>
330	26 Jan 1971	E	4.330	0.899	1946.61	1750.000	0.21/E	->>
331	31 Jan 1971	E	4.240	0.928	1918.10	1780.000	0.06/E	->
332	2 Feb 1971	E	4.160	0.891	1885.52	1680.000	0.18/E	->>
333	6 Feb 1971	E	4.090	0.885	1841.81	1630.000	0.22/E	->>
334	11 Feb 1971	E	3.880	0.858	1794.87	1540.000	0.20/E	->>
335	18 Feb 1971	E	3.760	0.907	1686.88	1530.000	0.10/E	->
336	22 Feb 1971	E	3.660	0.923	1635.97	1510.000	0.04/E	->
337	28 Feb 1971	E	3.420	0.941	1530.29	1440.000	-0.04/E	<-
338	10 Mar 1971	E	3.140	0.930	1333.33	1240.000	0.13/E	->>
339	15 Mar 1971	E	3.020	0.900	1277.78	1150.000	0.23/E	->>>
340	18 Mar 1971	E	2.970	0.939	1150.16	1080.000	0.35/E	->>>>
341	23 Mar 1971	E	3.060	0.897	1293.20	1160.000	0.24/E	->>>
342	3 Apr 1971	E	2.840	0.937	1302.03	1220.000	-0.12/E	<<-
343	9 Apr 1971	E	2.670	0.901	1209.77	1090.000	0.02/E	->
344	12 Apr 1971	E	2.680	0.922	1247.29	1150.000	-0.11/E	<-
345	18 Apr 1971	E	2.780	0.928	1282.33	1190.000	-0.11/E	<-
346	24 Apr 1971	E	2.920	0.935	1358.29	1270.000	-0.16/E	<<-
347	8 May 1971	E	2.900	0.994	1277.67	1270.000	-0.18/E	<<-
348	11 May 1971	E	3.020	0.973	1377.18	1340.000	-0.22/E	<<-
349	17 May 1971	E	3.130	0.942	1454.35	1370.000	-0.18/E	<<-
350	21 May 1971	E	3.240	0.937	1504.80	1410.000	-0.16/E	<<-
351	25 May 1971	E	3.320	0.935	1572.19	1470.000	-0.21/E	<<-
352	26 May 1971	E	3.780	0.895	1832.40	1640.000	-0.11/E	<-
353	28 May 1971	E	4.470	0.865	2485.55	2150.000	-0.43/E	<<<<-
354	31 May 1971	E	5.720	0.917	3565.98	3270.000	-0.71/E	<<<<-
355	1 Jun 1971	E	6.550	0.803	3985.06	3200.000	0.19/E	->>
356	11 Jun 1971	E	5.480	0.820	3097.56	2540.000	-0.12/E	<<-
357	16 Jun 1971	E	6.890	0.922	4262.47	3930.000	-0.16/E	<<-
358	23 Jun 1971	E	7.550	0.992	4465.73	4430.000	0.07/E	->
359	25 Jun 1971	E	7.990	1.051	4833.49	5080.000	-0.00/E	-
360	28 Jun 1971	E	8.670	1.118	5143.11	5750.000	0.19/E	->>

River gaugings for station 11903 : Mekong at Chiang Khan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
361	30 Jun 1971	E	9.480	1.300	5484.62	7130.000	0.10/E	->
362	2 Jul 1971	E	9.640	1.344	5602.68	7530.000	0.01/E	-
363	5 Jul 1971	E	10.430	1.567	5788.13	9070.001	-0.06/E	<-
364	7 Jul 1971	E	11.000	1.621	6354.10	10300.000	-0.12/E	<-
365	11 Jul 1971	E	11.230	1.630	6748.47	11000.001	-0.22/E	<<<-
366	16 Jul 1971	E	11.440	1.683	6892.45	11600.001	-0.29/E	<<<-
367	19 Jul 1971	E	12.040	1.700	6941.18	11800.000	0.22/E	->>
368	21 Jul 1971	E	13.090	1.900	7631.58	14500.001	0.13/E	->>
369	22 Jul 1971	E	12.830	1.993	7175.11	14300.000	-0.05/E	<-
370	26 Jul 1971	E	12.500	1.939	6962.35	13500.002	-0.06/E	<-
371	29 Jul 1971	E	13.860	1.949	8722.42	17000.000	-0.05/E	<-
372	5 Aug 1971	E	13.410	1.789	8664.06	15500.000	0.06/E	->
373	9 Aug 1971	E	12.940	1.649	8489.99	14000.001	0.18/E	->>
374	12 Aug 1971	E	14.190	1.841	9342.75	17200.000	0.21/E	->>
375	15 Aug 1971	E	14.940	1.886	9809.12	18500.000	0.51/E	->>>>
376	16 Aug 1971	E	15.280	2.003	10234.65	20499.999	0.18/E	->>
377	18 Aug 1971	E	15.450	1.962	10193.68	20000.000	0.52/E	->>>>
378	25 Aug 1971	+	16.200	2.266	10900.26	24699.999	-0.17/E	<<-
379	26 Aug 1971	E	15.660	2.258	9920.28	22400.000	-0.03/E	<-
380	2 Sep 1971	+	16.060	2.300	10434.78	23999.999	-0.11/E	<-
381	6 Sep 1971	E	15.070	2.378	8957.11	21299.999	-0.28/E	<<<-
382	9 Sep 1971	E	13.640	2.027	8189.44	16599.999	-0.12/E	<<-
383	12 Sep 1971	E	12.340	1.834	7197.38	13199.999	-0.09/E	<-
384	16 Sep 1971	E	11.500	1.682	6420.93	10800.000	0.14/E	->>
385	19 Sep 1971	E	11.350	1.688	6398.10	10800.000	-0.01/E	-
386	23 Sep 1971	E	11.200	1.688	6398.10	10800.000	-0.16/E	<<-
387	26 Sep 1971	E	10.340	1.558	5879.33	9160.000	-0.20/E	<<-
388	30 Sep 1971	E	9.700	1.432	5502.79	7880.000	-0.13/E	<<-
389	3 Oct 1971	E	10.140	1.485	5797.98	8610.001	-0.10/E	<-
390	7 Oct 1971	E	9.720	1.412	5410.77	7640.000	0.03/E	->
391	14 Oct 1971	E	9.400	1.341	5346.76	7170.000	-0.01/E	-
392	19 Oct 1971	E	8.740	1.341	4832.21	6480.000	-0.23/E	<<<-
393	31 Oct 1971	E	7.800	1.178	4125.64	4860.000	-0.02/E	<-
394	2 Nov 1971	E	9.070	1.384	5137.28	7110.000	-0.30/E	<<<-
395	10 Nov 1971	E	7.520	1.156	3918.69	4530.000	-0.04/E	<-
396	14 Nov 1971	E	7.360	1.112	3839.93	4270.000	0.02/E	-
397	17 Nov 1971	E	7.100	0.934	3779.44	3530.000	0.42/E	->>>>
398	21 Nov 1971	E	6.830	1.045	3425.84	3580.000	0.10/E	->
399	24 Nov 1971	E	6.530	0.996	3393.57	3380.000	-0.01/E	-
400	29 Nov 1971	E	6.210	0.974	3213.55	3130.000	-0.08/E	<-
401	6 Dec 1971	E	5.850	1.011	2858.56	2890.000	-0.19/E	<<-
402	8 Dec 1971	E	5.800	0.970	2742.27	2660.000	0.01/E	-
403	12 Dec 1971	E	5.640	0.951	2681.39	2550.000	0.02/E	-
404	15 Dec 1971	E	5.480	0.926	2591.79	2400.000	0.12/E	->>
405	18 Dec 1971	E	5.320	0.937	2358.59	2210.000	0.31/E	->>>
406	22 Dec 1971	E	5.220	0.940	2297.87	2160.000	0.30/E	->>>
407	31 Dec 1971	E	5.180	0.897	2218.51	1990.000	0.58/E	->>>>
408	6 Jan 1972	F	4.820	0.953	2288.56	2181.000	-0.01/F	-
409	12 Jan 1972	F	4.690	0.952	2038.87	1941.000	0.29/F	->>>
410	17 Jan 1972	F	4.440	0.942	2025.48	1908.000	0.10/F	->
411	20 Jan 1972	F	4.330	0.910	1970.33	1793.000	0.21/F	->>
412	23 Jan 1972	F	4.210	0.902	1814.86	1637.000	0.39/F	->>>>
413	26 Jan 1972	F	4.120	0.908	1861.23	1690.000	0.20/F	->>
414	30 Jan 1972	F	3.990	0.950	1727.37	1641.000	0.16/F	->>
415	2 Feb 1972	F	3.900	0.953	1697.80	1618.000	0.12/F	->
416	7 Feb 1972	F	3.860	0.940	1691.49	1590.000	0.14/F	->>
417	9 Feb 1972	F	3.750	0.962	1595.63	1535.000	0.14/F	->>
418	13 Feb 1972	F	3.750	0.926	1515.12	1403.000	0.42/F	->>>>
419	20 Feb 1972	F	3.460	0.928	1421.34	1319.000	0.31/F	->>>
420	23 Feb 1972	F	3.390	0.932	1340.13	1249.000	0.40/F	->>>>

River gaugings for station 11903 : Mekong at Chiang Khan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
421	27 Feb 1972	F	3.250	0.932	1276.82	1190.000	0.39/F	->>>>
422	31 Mar 1972	F	2.710	0.925	1132.97	1048.000	0.19/F	->>
423	5 Apr 1972	F	2.890	1.059	1182.25	1252.000	-0.11/F	<-
424	8 Apr 1972	F	2.990	1.100	1274.55	1402.000	-0.34/F	<<<<-
425	11 Apr 1972	F	3.080	1.137	1274.41	1449.000	-0.35/F	<<<<-
426	17 Apr 1972	F	3.410	1.021	1461.31	1492.000	-0.11/F	<-
427	20 Apr 1972	F	3.220	1.067	1372.07	1464.000	-0.24/F	<<<-
428	24 Apr 1972	F	2.780	1.183	1020.29	1207.000	-0.12/F	<-
429	1 May 1972	F	3.070	1.279	1140.73	1459.000	-0.38/F	<<<<-
430	10 May 1972	F	3.440	1.152	1314.24	1514.000	-0.13/F	<<-
431	22 May 1972	F	3.320	1.165	1229.18	1432.000	-0.08/F	<-
432	30 May 1972	F	3.790	1.048	1669.85	1750.000	-0.25/F	<<<-
433	5 Jun 1972	F	3.820	1.034	1572.53	1626.000	0.02/F	->
434	8 Jun 1972	F	5.130	0.979	2595.51	2541.000	-0.31/F	<<<-
435	10 Jun 1972	F	5.700	0.985	2921.83	2878.000	-0.27/F	<<<-
436	19 Jun 1972	F	4.590	1.021	2266.41	2314.000	-0.47/F	<<<<-
437	22 Jun 1972	F	4.800	1.035	2257.00	2336.000	-0.30/F	<<<-
438	27 Jun 1972	F	5.560	0.986	2645.03	2608.000	0.01/F	-
439	4 Jul 1972	F	5.630	0.993	2679.76	2661.000	-0.00/F	-
440	7 Jul 1972	F	5.920	1.044	2863.98	2990.000	-0.22/F	<<-
441	12 Jul 1972	F	5.590	1.059	2508.03	2656.000	-0.03/F	<-
442	15 Jul 1972	F	5.600	1.064	2586.47	2752.000	-0.17/F	<<-
443	19 Jul 1972	F	5.440	0.984	2481.71	2442.000	0.16/F	->>
444	21 Jul 1972	F	7.260	1.065	4111.74	4379.000	-0.21/F	<<-
445	24 Jul 1972	F	8.870	1.167	5148.24	6008.000	0.24/F	->>>
446	25 Jul 1972	F	9.200	1.276	5869.91	7490.000	-0.32/F	<<<-
447	28 Jul 1972	F	8.560	1.148	5026.13	5770.000	0.09/F	->
448	31 Jul 1972	F	10.190	1.529	6273.38	9592.000	-0.41/F	<<<<-
449	1 Aug 1972	F	11.200	1.635	6946.79	11358.001	-0.19/F	<<-
450	3 Aug 1972	F	11.500	1.718	7071.01	12148.001	-0.22/F	<<<-
451	6 Aug 1972	F	11.870	1.792	6960.94	12474.000	0.02/F	-
452	15 Aug 1972	F	10.770	1.622	6721.33	10902.000	-0.42/F	<<<<-
453	21 Aug 1972	F	10.530	1.680	5517.86	9270.001	0.09/F	->
454	25 Aug 1972	F	12.450	2.000	8074.50	16149.000	-0.75/F	<<<<-
455	26 Aug 1972	F	12.980	1.939	8119.13	15743.000	-0.09/F	<-
456	31 Aug 1972	F	12.300	1.796	7511.69	13491.001	0.05/F	->
457	5 Sep 1972	F	11.260	1.569	7033.78	11036.001	0.01/F	-
458	11 Sep 1972	F	10.300	1.434	6115.06	8769.000	0.11/F	->
459	13 Sep 1972	F	9.720	1.375	5613.09	7718.000	0.08/F	->
460	15 Sep 1972	F	9.360	1.359	5349.52	7270.000	-0.03/F	<-
461	20 Sep 1972	F	8.560	1.195	4619.25	5520.000	0.26/F	->>>
462	25 Sep 1972	F	8.100	1.200	4337.50	5205.000	0.02/F	-
463	28 Sep 1972	F	8.720	1.241	4791.30	5946.000	0.13/F	->>
464	2 Oct 1972	F	9.800	1.336	5722.31	7645.000	0.20/F	->>
465	7 Oct 1972	F	9.290	1.390	5283.45	7344.000	-0.14/F	<<-
466	13 Oct 1972	F	8.200	1.149	4342.91	4990.000	0.27/F	->>>
467	15 Oct 1972	F	8.780	1.230	5170.73	6360.000	-0.07/F	<-
468	20 Oct 1972	F	8.870	1.283	5201.87	6674.000	-0.17/F	<<-
469	25 Oct 1972	F	8.520	1.170	4731.62	5536.000	0.21/F	->>
470	30 Oct 1972	F	7.860	1.149	4060.92	4666.000	0.17/F	->>
471	2 Nov 1972	F	7.360	1.051	3773.55	3966.000	0.23/F	->>>
472	6 Nov 1972	F	6.780	0.991	3335.01	3305.000	0.24/F	->>>
473	10 Nov 1972	F	6.650	1.018	3277.01	3336.000	0.08/F	->
474	15 Nov 1972	F	8.740	1.278	4768.39	6094.000	0.06/F	->
475	23 Nov 1972	F	6.580	1.064	3176.69	3380.000	-0.03/F	<-
476	27 Nov 1972	F	7.560	1.161	4067.18	4722.000	-0.17/F	<<-
477	30 Nov 1972	F	6.960	1.078	3597.40	3878.000	-0.09/F	<-
478	6 Dec 1972	F	8.970	1.308	5192.66	6792.000	-0.14/F	<<-
479	11 Dec 1972	F	7.300	1.088	3625.00	3944.000	0.19/F	->>
480	13 Dec 1972	F	6.880	1.039	3637.15	3779.000	-0.09/F	<-

River gaugings for station 11903 : Mekong at Chiang Khan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
481	15 Dec 1972	F	6.710	1.041	3368.88	3507.000	-0.01/F	-
482	19 Dec 1972	F	6.800	1.109	3381.42	3750.000	-0.14/F	<<-
483	22 Dec 1972	F	6.410	1.071	3108.31	3329.000	-0.15/F	<<-
484	26 Dec 1972	F	5.950	1.013	2629.81	2664.000	0.31/F	->>>
485	29 Dec 1972	F	5.630	1.044	2623.56	2739.000	-0.12/F	<<-
486	2 Jan 1973	G	5.330	1.035	2389.57	2473.200	0.14/G	->>
487	5 Jan 1973	G	5.180	1.029	2249.37	2314.600	0.21/G	->>
488	9 Jan 1973	G	4.980	1.020	2203.63	2247.700	0.11/G	->
489	15 Jan 1973	G	4.690	0.977	2075.03	2027.300	0.14/G	->>
490	22 Jan 1973	G	4.380	0.966	1772.46	1712.200	0.33/G	->>>>
491	24 Jan 1973	G	4.310	0.982	1751.02	1719.500	0.25/G	->>>
492	26 Jan 1973	G	4.270	0.987	1698.89	1676.800	0.28/G	->>>
493	2 Feb 1973	G	3.940	1.043	1486.86	1550.800	0.16/G	->>
494	6 Feb 1973	G	3.840	1.015	1405.52	1426.600	0.27/G	->>>
495	9 Feb 1973	G	3.770	1.037	1385.25	1436.500	0.19/G	->>
496	15 Feb 1973	G	3.610	1.031	1370.42	1412.900	0.07/G	->
497	20 Feb 1973	G	3.450	1.008	1358.23	1369.100	-0.01/G	-
498	23 Feb 1973	G	3.320	1.101	1201.54	1322.900	-0.06/G	<-
499	2 Mar 1973	G	3.100	1.086	1037.48	1126.700	0.09/G	->
500	6 Mar 1973	G	2.950	1.061	974.46	1033.900	0.12/G	->>
501	13 Mar 1973	G	4.040	1.045	1888.13	1973.100	-0.42/G	<<<<-
502	11 Apr 1973	G	2.750	0.914	983.81	899.200	0.21/G	->>
503	15 Apr 1973	G	2.750	0.919	990.86	910.600	0.18/G	->>
504	24 Apr 1973	G	3.520	0.929	1507.64	1400.600	-0.00/G	-
505	27 Apr 1973	G	4.120	0.930	2161.18	2009.900	-0.40/G	<<<<-
506	1 May 1973	G	3.570	0.984	1751.73	1723.700	-0.50/G	<<<<-
507	4 May 1973	G	3.200	1.068	1341.11	1432.300	-0.38/G	<<<<-
508	8 May 1973	G	3.260	1.016	1448.62	1471.800	-0.39/G	<<<<-
509	11 May 1973	G	3.980	0.889	2050.73	1823.100	-0.25/G	<<<-
510	15 May 1973	G	4.700	0.819	2518.44	2062.600	0.10/G	->
511	22 May 1973	G	4.320	0.887	2104.06	1866.300	0.02/G	->
512	25 May 1973	G	4.720	0.878	2564.35	2251.500	-0.16/G	<<-
513	29 May 1973	G	5.100	0.854	2728.45	2330.100	0.11/G	->
514	1 Jun 1973	G	5.300	1.062	2886.44	3065.400	-0.68/G	<<<<-
515	8 Jun 1973	G	6.160	0.967	3527.09	3410.700	-0.25/G	<<<-
516	12 Jun 1973	G	6.560	0.996	3715.36	3700.500	-0.17/G	<<-
517	15 Jun 1973	G	7.290	1.016	4241.83	4309.700	0.05/G	->
518	19 Jun 1973	G	7.530	1.076	4337.45	4667.100	0.00/G	-
519	22 Jun 1973	G	7.760	1.146	4337.61	4970.900	0.00/G	-
520	29 Jun 1973	G	7.200	1.003	4195.61	4208.200	0.04/G	->
521	3 Jul 1973	G	8.440	1.321	4363.74	5764.500	0.12/G	->>
522	6 Jul 1973	G	9.460	1.454	5080.81	7387.500	0.11/G	->
523	13 Jul 1973	G	10.110	1.635	5403.36	8834.500	-0.05/G	<-
524	15 Jul 1973	G	10.730	1.677	5879.84	9860.500	0.04/G	->
525	20 Jul 1973	G	11.690	1.831	7054.23	12916.299	-0.42/G	<<<<-
526	24 Jul 1973	G	9.770	1.516	5127.70	7773.600	0.20/G	->>
527	27 Jul 1973	G	9.060	1.428	4682.42	6686.500	0.14/G	->>
528	31 Jul 1973	G	11.320	1.704	6580.75	11213.600	-0.03/G	<-
529	7 Aug 1973	G	11.630	1.644	7260.95	11937.000	-0.05/G	<-
530	10 Aug 1973	G	12.420	1.732	7975.69	13813.900	-0.07/G	<-
531	14 Aug 1973	G	12.940	1.840	8208.37	15103.401	-0.07/G	<-
532	17 Aug 1973	G	11.840	1.760	7388.47	13003.700	-0.31/G	<<<-
533	24 Aug 1973	G	12.870	1.845	8152.19	15040.799	-0.11/G	<-
534	29 Aug 1973	G	15.250	2.095	9934.18	20812.100	0.20/G	->>
535	30 Aug 1973	G	14.060	2.089	8752.61	18284.198	-0.13/G	<<-
536	31 Aug 1973	G	13.260	1.845	8440.33	15572.401	0.07/G	->
537	4 Sep 1973	G	13.720	1.936	8450.46	16360.101	0.23/G	->>>
538	7 Sep 1973	G	14.310	2.057	8933.11	18375.399	0.09/G	->
539	14 Sep 1973	G	13.170	1.802	8540.68	15390.300	0.05/G	->
540	18 Sep 1973	G	13.430	1.826	8714.24	15912.202	0.11/G	->

River gaugings for station 11903 : Mekong at Chiang Khan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
541	24 Sep 1973	G	12.500	1.695	8306.61	14079.700	-0.10/G	<-
542	26 Sep 1973	G	12.260	1.714	7633.84	13084.401	0.08/G	->
543	28 Sep 1973	G	11.960	1.196	10940.13	13084.401	-0.22/G	<<<-
544	2 Oct 1973	G	11.300	1.585	6988.96	11077.500	0.02/G	-
545	8 Oct 1973	G	9.990	1.453	5868.69	8527.201	-0.01/G	-
546	15 Oct 1973	G	8.700	1.273	4820.97	6137.100	0.13/G	->>
547	19 Oct 1973	G	8.210	1.219	4681.87	5707.200	-0.07/G	<-
548	26 Oct 1973	G	7.980	1.138	4293.32	4885.800	0.29/G	->>>
549	30 Oct 1973	G	8.070	1.196	4564.05	5458.600	-0.04/G	<-
550	2 Nov 1973	G	8.440	1.177	4916.48	5786.700	0.11/G	->
551	5 Nov 1973	G	7.630	1.115	4236.59	4723.800	0.06/G	->
552	10 Nov 1973	G	7.120	1.083	3860.30	4180.700	-0.02/G	-
553	14 Nov 1973	G	8.800	1.237	5074.53	6277.200	0.14/G	->>
554	21 Nov 1973	G	7.360	1.070	4184.95	4477.900	-0.02/G	-
555	27 Nov 1973	G	8.660	1.220	4986.31	6083.300	0.13/G	->>
556	11 Dec 1973	G	6.280	1.076	3273.98	3522.800	-0.26/G	<<<-
557	14 Dec 1973	G	6.060	0.963	3171.13	3053.800	0.09/G	->
558	19 Dec 1973	G	5.780	0.988	2789.17	2755.700	0.20/G	->>
559	8 Jan 1974	H	4.700	0.929	2262.32	2101.700	-0.26/H	<<<-
560	17 Jan 1974	H	4.380	0.911	2012.62	1833.500	-0.10/H	<-
561	24 Jan 1974	H	4.140	0.897	1858.97	1667.500	-0.02/H	-
562	19 Feb 1974	H	3.360	0.989	1386.86	1371.600	-0.17/H	<<-
563	27 Feb 1974	H	3.120	0.960	1338.33	1284.800	-0.22/H	<<-
564	8 Mar 1974	H	2.900	0.908	1140.86	1035.900	0.18/H	->>
565	15 Mar 1974	H	2.800	0.907	1051.71	953.900	0.30/H	->>>
566	21 Mar 1974	H	2.740	0.892	1066.37	951.200	0.25/H	->>>
567	5 Apr 1974	H	3.000	0.981	1313.05	1288.100	-0.34/H	<<<<-
568	18 Apr 1974	H	3.250	0.973	1358.48	1321.800	-0.17/H	<<-
569	26 Apr 1974	H	2.980	0.943	1267.13	1194.900	-0.14/H	<<-
570	3 May 1974	H	5.050	0.744	2920.43	2172.800	-0.03/H	<-
571	10 May 1974	H	3.750	0.690	1928.55	1330.700	0.31/H	->>>
572	15 May 1974	H	3.860	0.731	1997.95	1460.500	0.13/H	->>
573	22 May 1974	H	4.140	0.765	2307.58	1765.300	-0.21/H	<<-
574	3 Jun 1974	H	5.790	0.824	3520.87	2901.200	-0.25/H	<<<-
575	11 Jun 1974	H	6.280	0.941	3342.51	3145.300	-0.03/H	<-
576	14 Jun 1974	H	6.500	0.884	4073.64	3601.100	-0.29/H	<<<-
577	17 Jun 1974	H	7.400	0.999	4975.08	4970.100	-0.61/H	<<<<-
578	20 Jun 1974	H	7.460	0.933	4368.49	4075.800	0.22/H	->>
579	26 Jun 1974	H	6.880	0.957	4127.80	3950.300	-0.25/H	<<<-
580	2 Jul 1974	H	7.330	1.011	3885.36	3928.100	0.22/H	->>>
581	9 Jul 1974	H	7.980	1.133	4254.81	4820.700	0.09/H	->
582	16 Jul 1974	H	6.900	1.029	3622.74	3727.800	-0.01/H	-
583	23 Jul 1974	H	9.140	1.193	5278.37	6297.100	0.14/H	->>
584	29 Jul 1974	H	9.980	1.406	5610.17	7887.900	-0.03/H	<-
585	4 Aug 1974	H	11.120	1.506	6496.75	9784.100	0.07/H	->
586	6 Aug 1974	H	10.680	1.405	6250.75	8782.300	0.16/H	->>
587	12 Aug 1974	H	12.340	1.619	7493.70	12132.301	0.17/H	->>
588	16 Aug 1974	H	11.800	1.670	6814.61	11380.401	-0.03/H	<-
589	19 Aug 1974	H	11.320	1.691	6656.18	11255.600	-0.45/H	<<<<-
590	26 Aug 1974	H	10.090	1.441	5650.38	8142.200	-0.07/H	<-
591	29 Aug 1974	H	12.100	1.571	7398.66	11623.300	0.16/H	->>
592	2 Sep 1974	H	13.440	1.804	8302.16	14977.100	0.09/H	->
593	5 Sep 1974	H	12.890	1.628	8134.71	13243.301	0.24/H	->>>
594	12 Sep 1974	H	12.290	1.670	7418.74	12389.300	0.01/H	-
595	19 Sep 1974	H	11.800	1.690	6843.61	11565.700	-0.11/H	<-
596	23 Sep 1974	H	10.680	1.541	5606.36	8639.401	0.24/H	->>>
597	9 Oct 1974	H	9.590	1.136	6346.30	7209.900	-0.01/H	-
598	16 Oct 1974	H	8.640	1.276	4474.06	5708.900	0.06/H	->
599	22 Oct 1974	H	7.770	1.160	4004.66	4645.400	0.03/H	->
600	30 Oct 1974	H	7.180	1.073	3795.34	4072.400	-0.06/H	<-

River gaugings for station 11903 : Mekong at Chiang Khan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
601	6 Nov 1974	H	7.680	1.099	4095.54	4501.000	0.06/H	->
602	13 Nov 1974	H	6.710	1.025	3574.05	3663.400	-0.14/H	<<-
603	20 Nov 1974	H	7.370	1.060	3924.81	4160.300	0.05/H	->
604	27 Nov 1974	H	6.520	0.983	3368.16	3310.900	0.03/H	->
605	4 Dec 1974	H	5.900	0.905	2898.78	2623.400	0.19/H	->>
606	7 Dec 1974	H	5.690	0.887	2769.90	2456.900	0.19/H	->>
607	11 Dec 1974	H	5.550	0.899	2656.73	2388.400	0.14/H	->>
608	18 Dec 1974	H	5.140	0.871	2305.28	2007.900	0.34/H	->>>>
609	25 Dec 1974	H	4.820	0.918	2142.27	1966.600	0.10/H	->
610	1 Jan 1975	I	4.540	0.839	1849.05	1551.350	0.49/I	->>>>
611	8 Jan 1975	I	4.330	0.846	1773.18	1500.110	0.38/I	->>>>
612	15 Jan 1975	I	4.900	0.893	2191.18	1956.720	0.09/I	->
613	22 Jan 1975	I	4.920	0.887	2195.08	1947.040	0.13/I	->>
614	29 Jan 1975	I	4.220	0.845	1781.02	1504.960	0.26/I	->>>
615	6 Feb 1975	I	3.800	0.894	1552.39	1387.840	0.09/I	->
616	13 Feb 1975	I	3.560	0.894	1412.46	1262.740	0.12/I	->>
617	19 Feb 1975	I	3.380	0.815	1424.71	1161.140	0.18/I	->>
618	26 Feb 1975	I	3.220	0.853	1287.47	1098.210	0.17/I	->>
619	12 Mar 1975	I	2.920	0.875	1134.63	992.800	0.14/I	->>
620	15 Mar 1975	I	2.820	0.854	1144.27	977.210	0.08/I	->
621	19 Mar 1975	I	2.710	0.869	1095.48	951.970	0.04/I	->
622	26 Mar 1975	I	2.520	0.775	1055.96	818.370	0.23/I	->>>
623	2 Apr 1975	I	2.420	0.849	909.39	772.070	0.26/I	->>>
624	10 Apr 1975	I	2.690	0.881	1025.26	903.250	0.15/I	->>
625	17 Apr 1975	I	2.480	0.940	934.95	878.850	0.01/I	-
626	24 Apr 1975	I	3.010	0.923	1361.28	1256.460	-0.41/I	<<<<-
627	30 Apr 1975	I	2.900	0.938	1293.69	1213.480	-0.42/I	<<<<-
628	8 May 1975	I	3.000	0.925	1314.00	1215.450	-0.33/I	<<<<-
629	15 May 1975	I	3.320	0.896	1533.39	1373.920	-0.36/I	<<<<-
630	22 May 1975	I	3.170	0.893	1514.49	1352.440	-0.46/I	<<<<-
631	30 May 1975	I	4.020	0.841	2087.10	1755.250	-0.43/I	<<<<-
632	4 Jun 1975	I	6.780	0.920	3512.60	3231.590	0.26/I	->>>
633	11 Jun 1975	I	5.520	0.831	3316.71	2756.190	-0.47/I	<<<<-
634	19 Jun 1975	I	7.490	0.956	4648.79	4444.240	-0.16/I	<<-
635	22 Jun 1975	I	9.200	1.162	5945.86	6909.090	-0.23/I	<<<-
636	25 Jun 1975	I	8.300	1.046	4952.56	5180.380	0.06/I	->
637	27 Jun 1975	I	7.740	1.044	4644.77	4849.140	-0.24/I	<<<-
638	30 Jun 1975	I	6.820	0.880	4373.51	3848.690	-0.30/I	<<<-
639	4 Jul 1975	I	6.210	0.863	3290.89	2840.040	0.12/I	->
640	8 Jul 1975	I	6.120	0.857	3292.99	2822.090	0.05/I	->
641	11 Jul 1975	I	7.100	0.931	4075.81	3794.580	0.03/I	->
642	15 Jul 1975	I	6.760	0.941	3708.63	3489.820	-0.02/I	-
643	17 Jul 1975	I	7.120	0.992	4100.32	4067.520	-0.20/I	<<-
644	22 Jul 1975	?	12.030	1.427	7138.32	10186.390	0.80/I	->>>>
645	25 Jul 1975	I	10.680	1.465	6336.31	9282.701	-0.10/I	<-
646	30 Jul 1975	I	9.860	1.169	5788.85	6767.160	0.52/I	->>>>
647	5 Aug 1975	?	10.180	1.299	5131.54	6665.870	0.91/I	->>>>
648	8 Aug 1975	I	10.810	1.469	6676.23	9807.381	-0.23/I	<<<-
649	13 Aug 1975	I	10.240	1.353	6315.96	8545.491	-0.14/I	<<-
650	15 Aug 1975	I	10.220	1.376	6126.68	8430.310	-0.10/I	<-
651	20 Aug 1975	I	9.820	1.166	5901.25	6880.860	0.41/I	->>>>
652	22 Aug 1975	I	9.660	1.164	5726.69	6665.870	0.39/I	->>>>

C.9.6 Station 11904 - Pa Mong Dam site

Figure C9.6.1 shows the number of gaugings per year from 1960 to 1987. Figure C9.6.2 illustrates the considerable scatter of gaugings at this site and gives the average rating curve fitted to all valid gaugings.

The two high flood gaugings made at a stage over 11 metres stage in August 1970 were incorporated in the fitting of all ratings.

Individual annual rating curves are shown on Figure C9.6.3.

Figures C9.6.4a to C9.6.4f show the fit in individual years. In some cases there was a high degree of instability within each year; for example, the low flow gaugings of rating D. The 1972 gaugings used to derive rating C were perhaps the worst group where it was necessary to mark 12 gaugings as dubious and exclude them from the fitting procedure.

Gauging History - 11904 Pa Mong Dam site

Year	Gauging numbers	Number of gaugings	Rating letter	Shifts (Y=yes)	Fitting method
1970	1 - 38	38	A	Y	4 *
1971	39 - 71	33	B	Y	1,10 *
1972	72 - 143	72	C	Y	3,10 *
1973	144 - 257	114	D	Y	4,10 *
1974	258 - 308	51	E	Y	1,10 *
1975	309 - 367	59	F	Y	2,4,10 *
1976#		0	G		1
	Total =	367			

= and subsequent years

Dubious gaugings (HYDATA flag ?) - 15,26,30,72-78,90, 91,93,121,122

Rare flood gaugings (HYDATA flag +) - 8,9

Observed stage range 0.62 metres to 12.91 metres
Gauged stage range 0.90 metres to 11.70 metres

See Section C9.1.1 for description of the table

* Notes on special fitting :

Ratings B,C,D,E,F . Two flood gaugings made in August 1970 over 11 metres have been used in fitting ratings during these periods.

Ratings A,D and F . There is a tendency for the least squares fitting to select a rather high exponent for rating equations at this site. The exponent was restricted to a value of 3 for these gaugings. There was little resulting loss in goodness of fit, but the rating equations derived have sensible parameters.

Rating C . A particularly inconsistent set of gaugings, poorly defined at high flows, required a weighted fit to produce a sensible rating.

Rating equations - 11904 Mekong at Pa Mong Dam site

Rating Letter	Date	Parameters (a, c, b)	Maximum Stage
A from	1 Jan 1970	$Q = 2.937\,(h + 6.450)^{3.000}$	15.00 m
B from	1 Jan 1971	$Q = 11.128\,(h + 4.750)^{2.632}$	15.00 m
C from	1 Jan 1972	$Q = 2.684\,(h + 7.190)^{2.982}$	15.00 m
D from	1 Jan 1973	$Q = 3.634\,(h + 5.970)^{3.000}$	15.00 m
E from	1 Jan 1974	$Q = 46.989\,(h + 2.760)^{2.257}$	15.00 m
F from	1 Jan 1975	$Q = 14.807\,(h + 2.960)^{3.000}$ $Q = 72.205\,(h + 2.960)^{2.033}$	2.19 m 16.00 m
G from	1 Jan 1976	$Q = 43.469\,(h + 3.310)^{2.214}$	15.00 m
Rating G is the average rating			

Number of gaugings per year

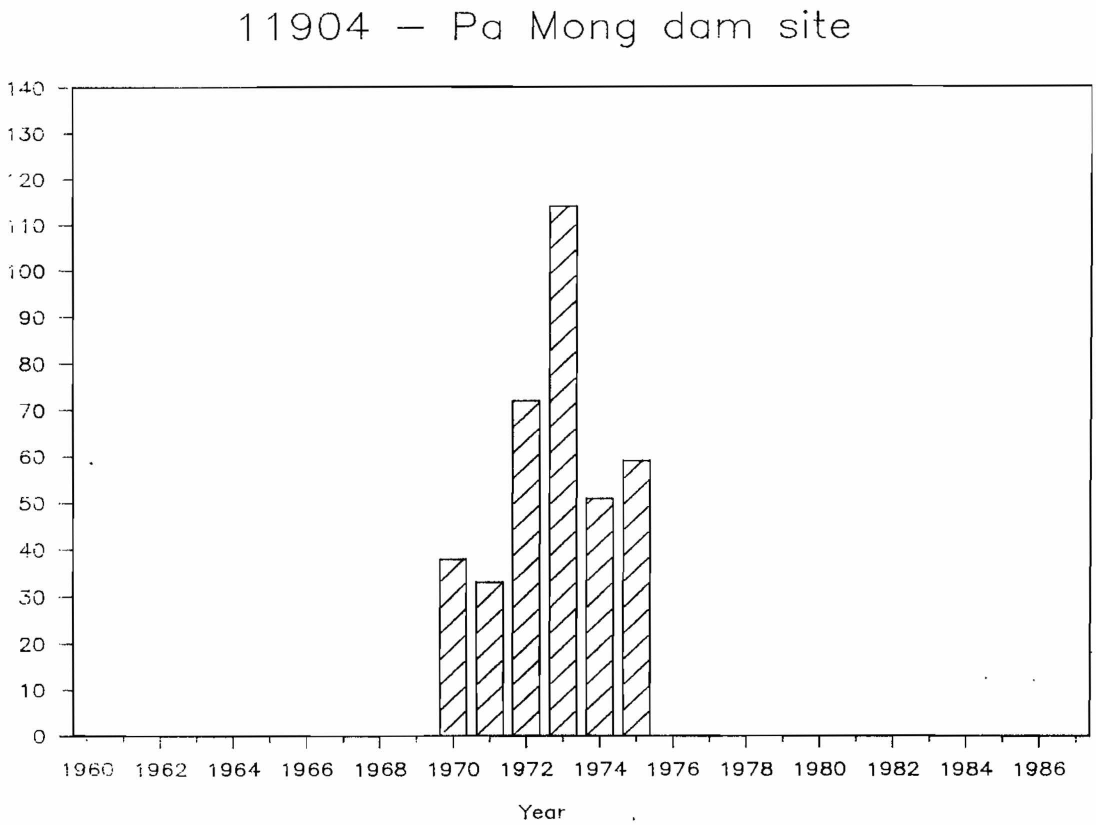


Figure C9.6.1

Rating equations

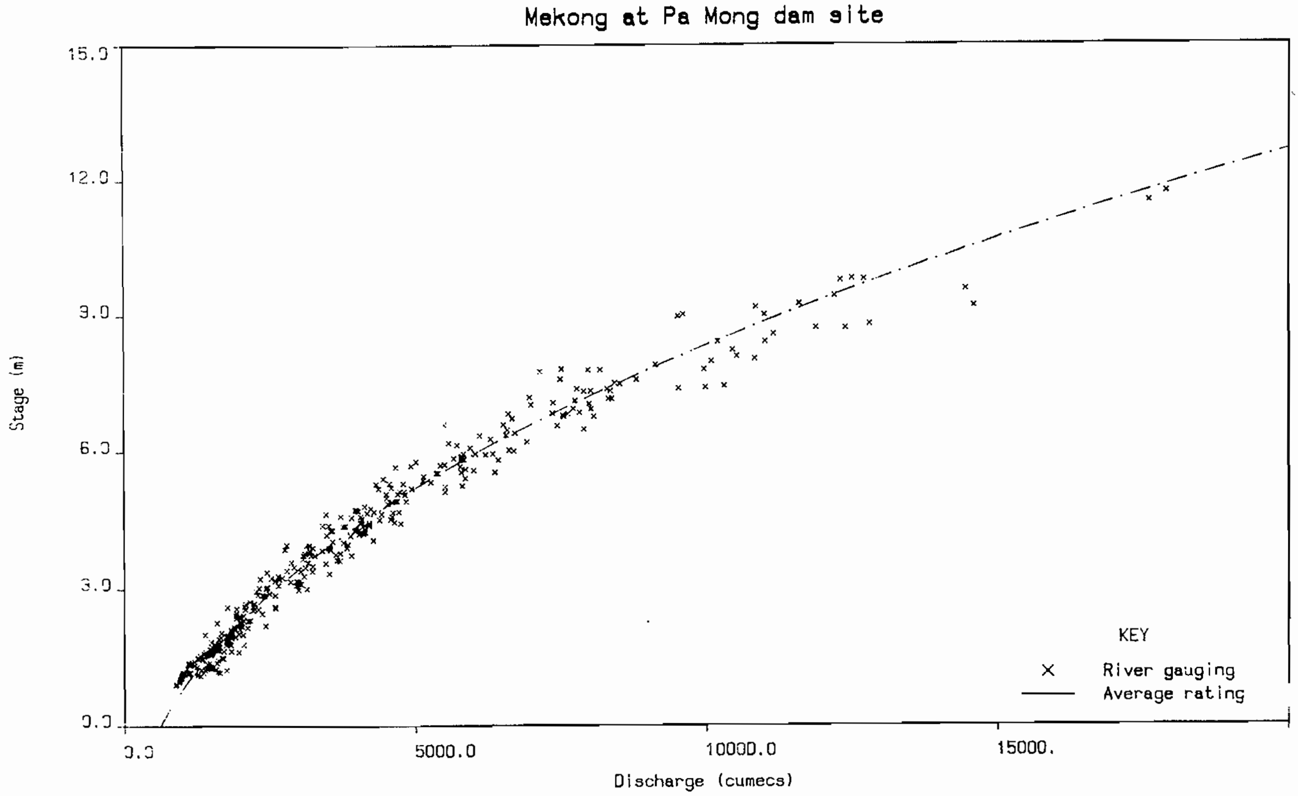


Figure C9.6.2

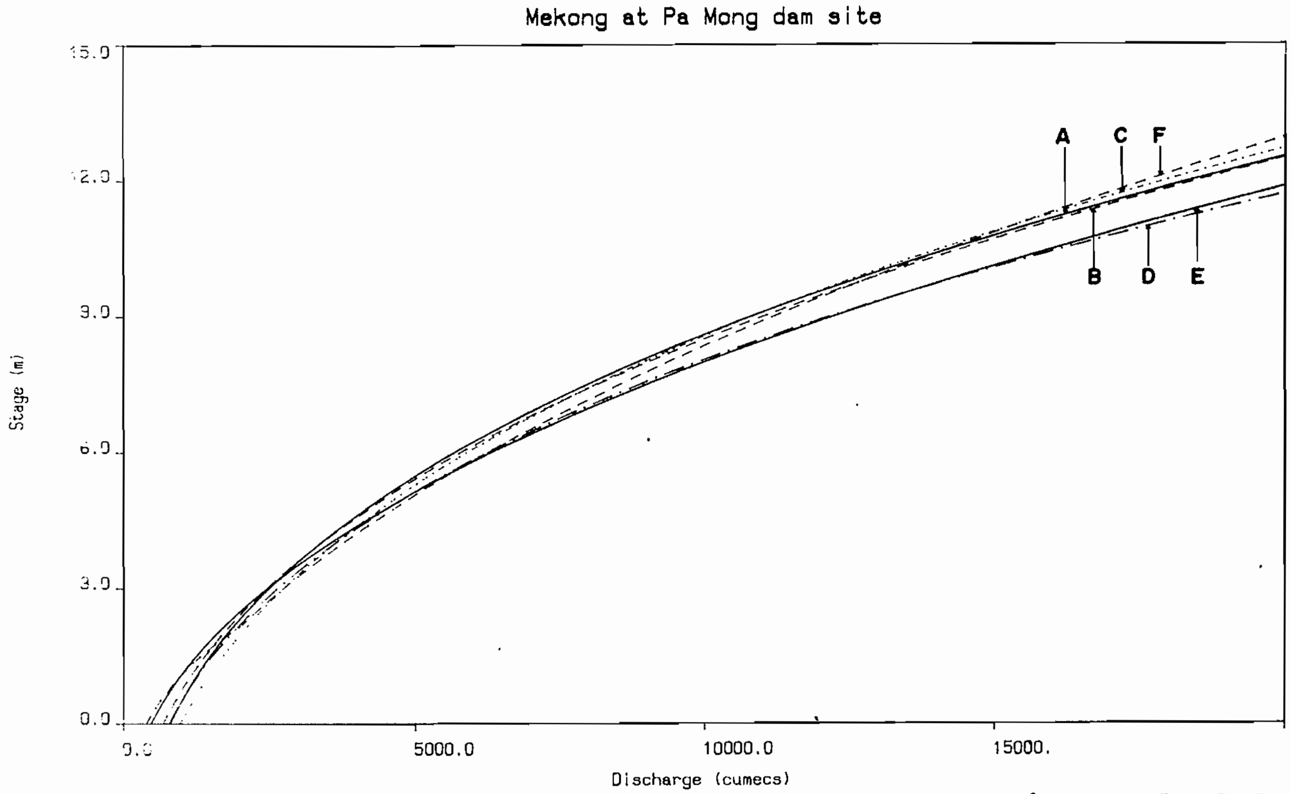


Figure C9.6.3

Rating equations

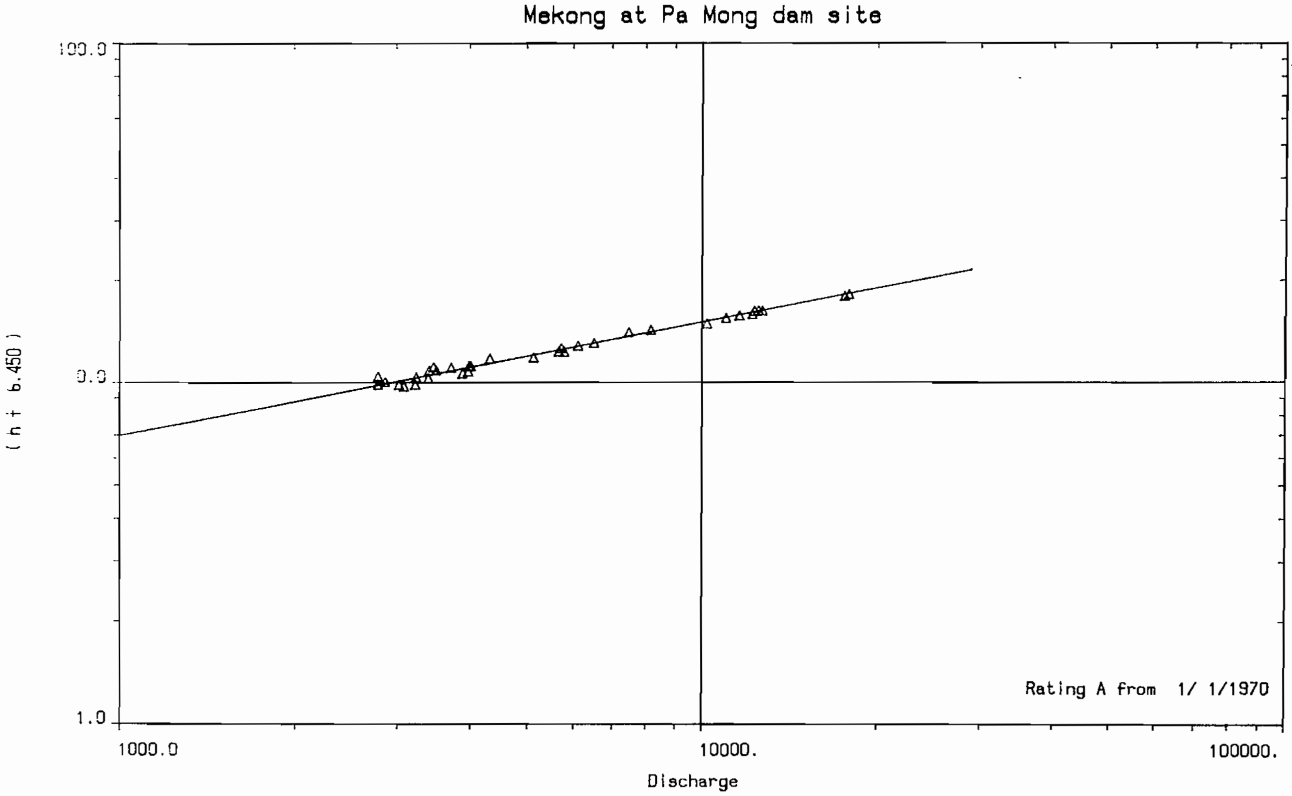


Figure C9.6.4a

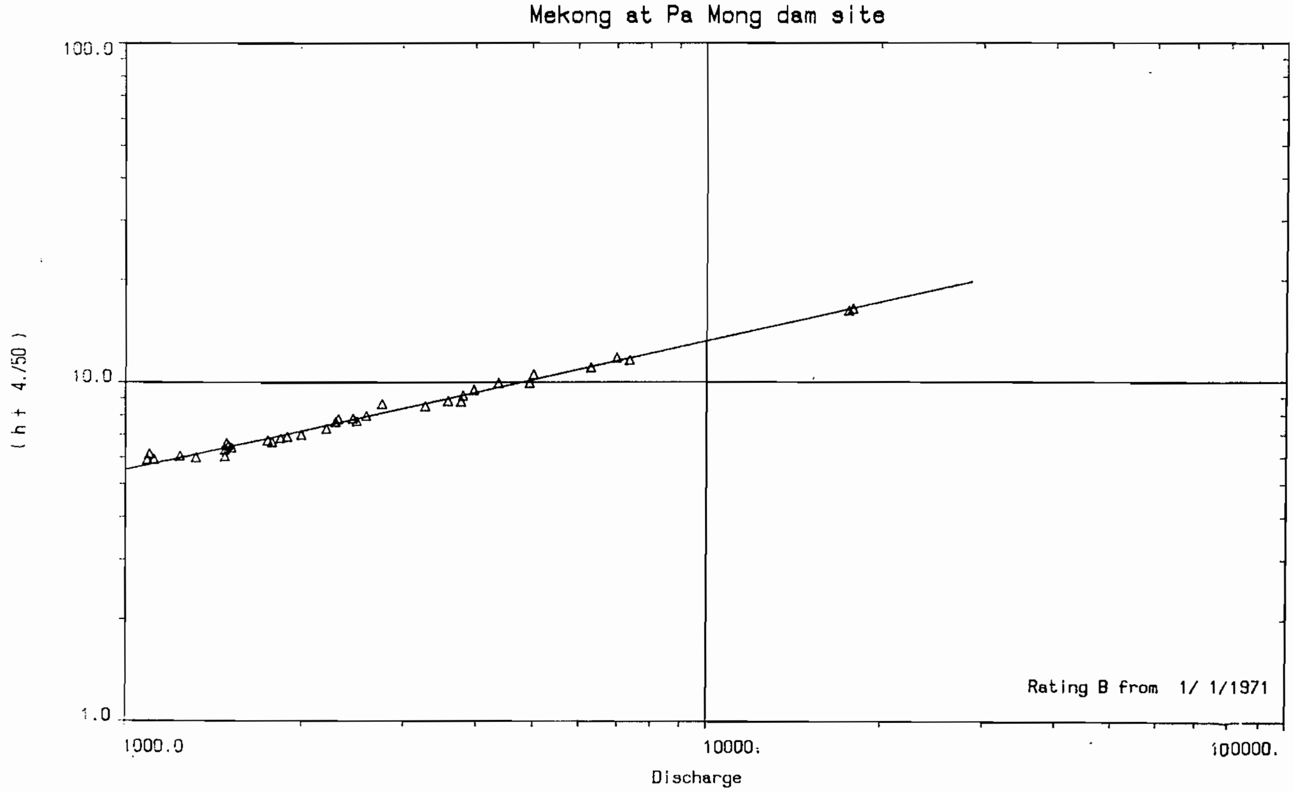


Figure C9.6.4b

Rating equations

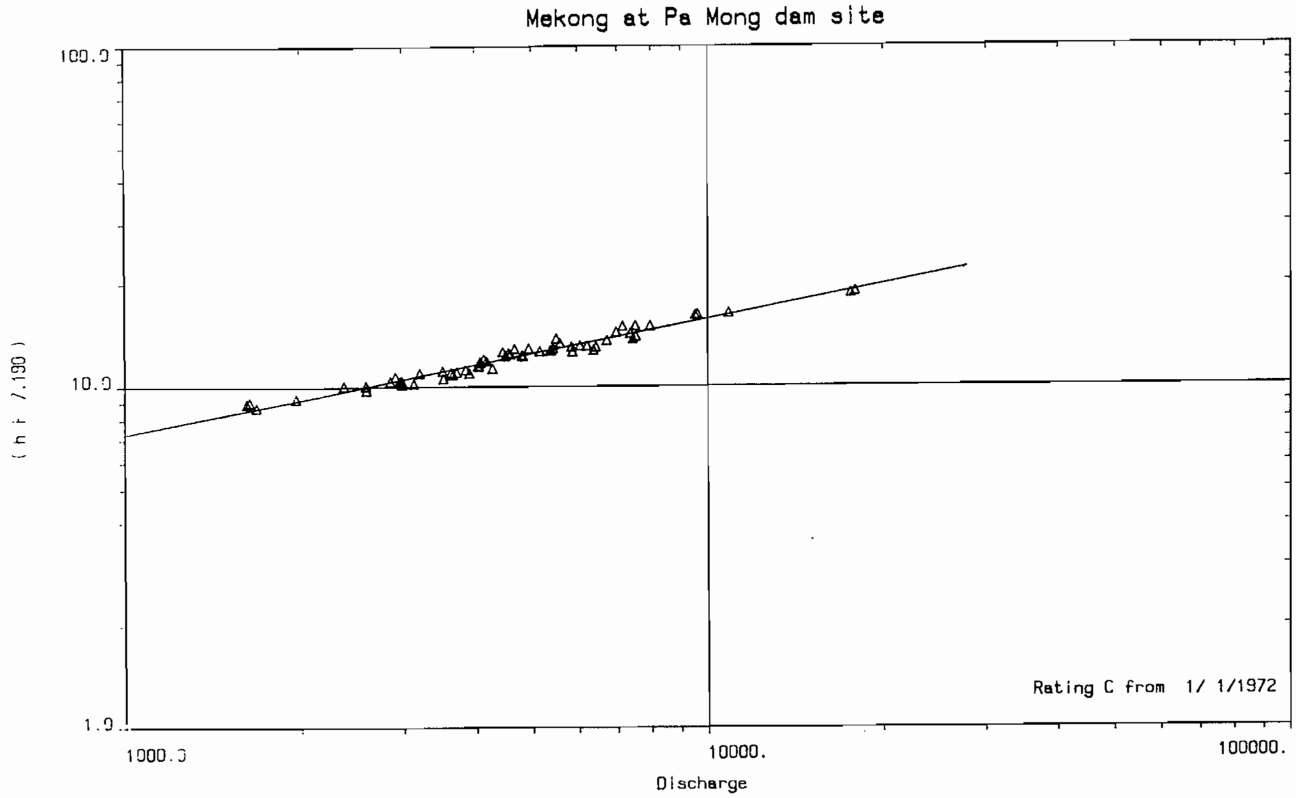


Figure C9.6.4c

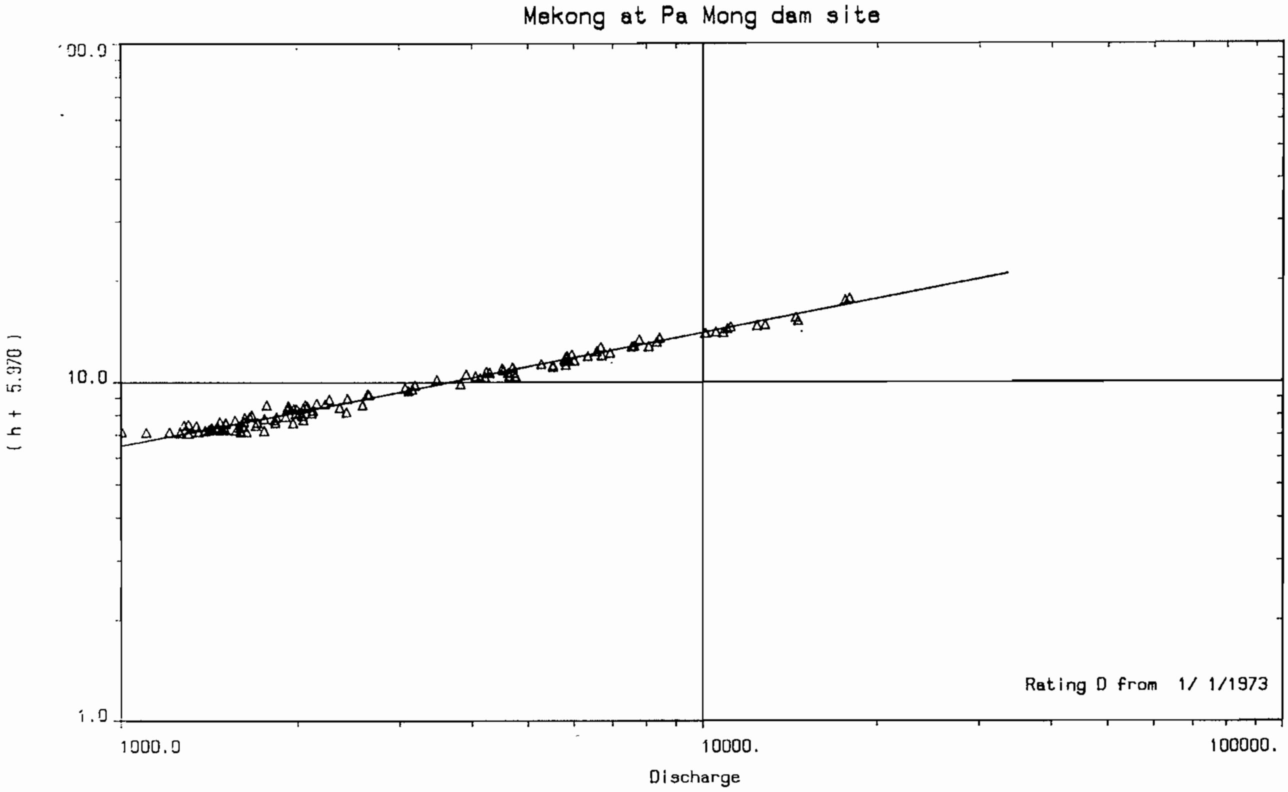


Figure C9.6.4d

Rating equations

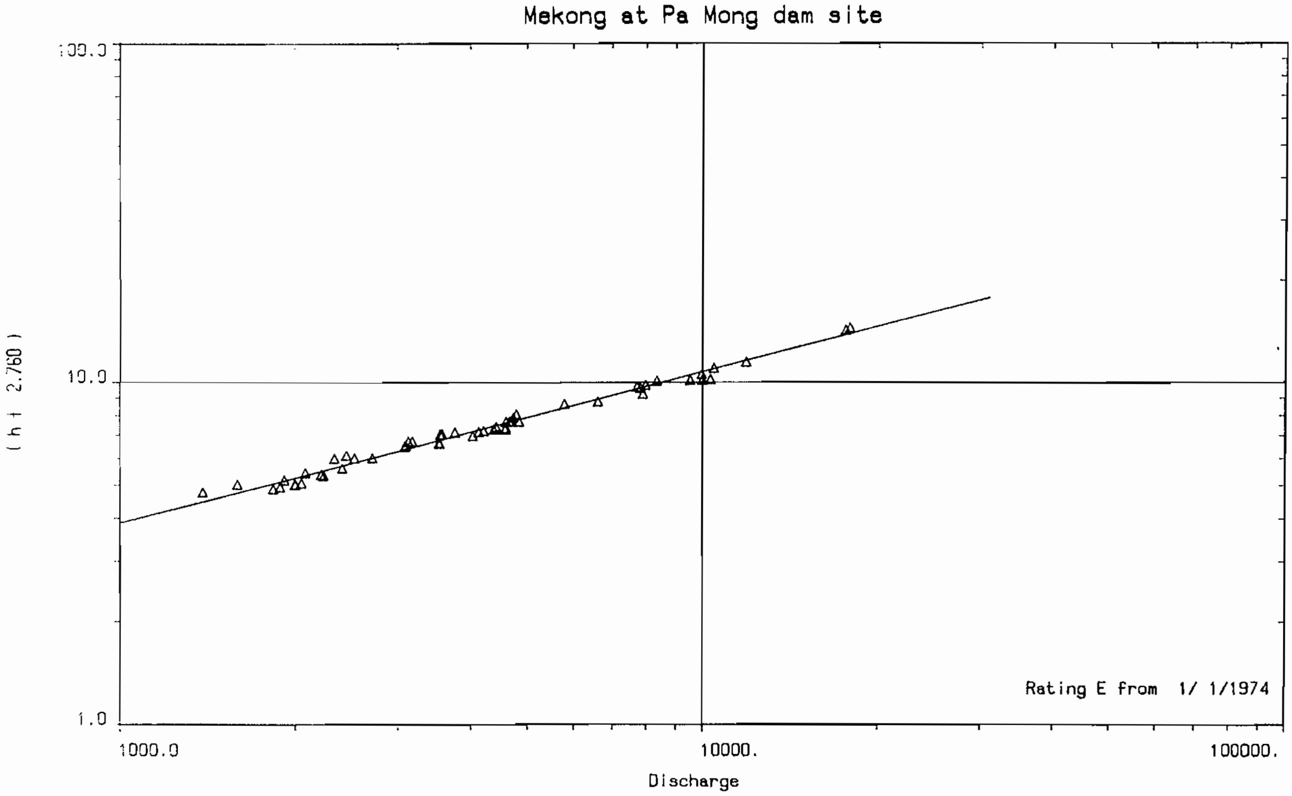


Figure C9.6.4e

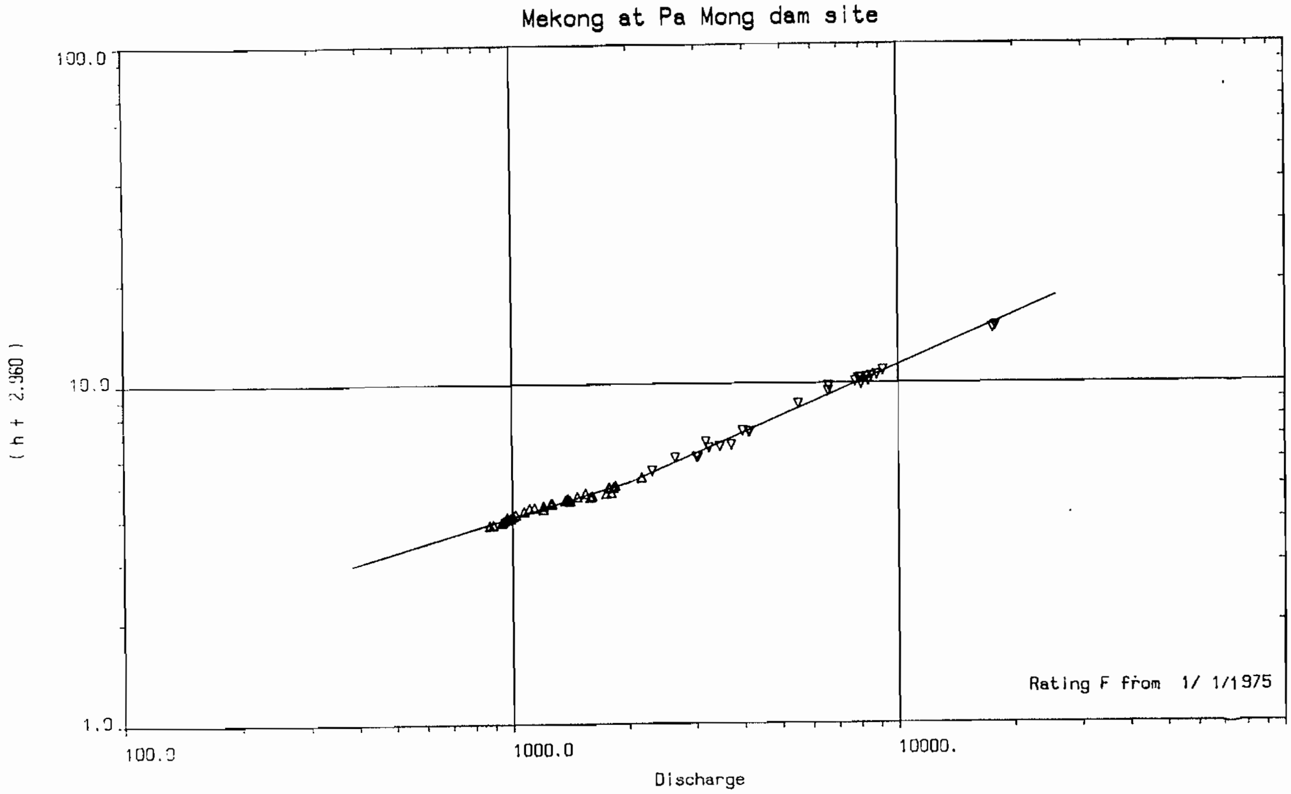


Figure C9.6.4f

River gaugings for station 11904 : Mekong at Pa Mong Dam site

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
1	2 Jun 1970	A	4.650			3470.000	0.53/A	->>>>
2	4 Jun 1970	A	4.740			3990.000	0.11/A	->
3	9 Jun 1970	A	3.410			3230.000	-0.46/A	<<<<-
4	11 Jun 1970	A	3.410			3030.000	-0.24/A	<<<-
5	25 Jun 1970	A	5.850			5800.000	-0.25/A	<<<-
6	4 Aug 1970	A	9.780			12700.000	-0.06/A	<-
7	6 Aug 1970	A	9.760			12300.001	0.09/A	->
8	11 Aug 1970	+	11.500			17599.999	-0.21/A	<<-
9	12 Aug 1970	+	11.700			17900.000	-0.12/A	<-
10	1 Sep 1970	A	9.420			12200.001	-0.21/A	<<-
11	3 Sep 1970	A	9.800			12500.001	0.04/A	->
12	8 Sep 1970	A	9.250			11600.001	-0.11/A	<-
13	10 Sep 1970	A	9.010			11000.001	-0.07/A	<-
14	17 Sep 1970	A	9.250			11600.001	-0.11/A	<-
15	22 Sep 1970	?	8.500			11400.000	-0.77/A	<<<<-
16	24 Sep 1970	A	8.420			10200.001	-0.27/A	<<<-
17	29 Sep 1970	A	7.600			7490.000	0.39/A	->>>>
18	1 Oct 1970	A	7.800			8170.000	0.19/A	->>
19	6 Oct 1970	A	6.600			6520.000	0.00/A	-
20	8 Oct 1970	A	6.360			6120.000	0.04/A	->
21	13 Oct 1970	A	6.150			5730.000	0.10/A	->
22	15 Oct 1970	A	5.860			5670.000	-0.14/A	<<-
23	20 Oct 1970	A	5.380			5140.000	-0.22/A	<<<-
24	22 Oct 1970	A	5.300			4330.000	0.37/A	->>>>
25	28 Oct 1970	A	4.720			4020.000	0.07/A	->
26	29 Oct 1970	?	4.900			3710.000	0.54/A	->>>>
27	3 Nov 1970	A	4.400			3510.000	0.24/A	->>>
28	5 Nov 1970	A	4.310			3980.000	-0.31/A	<<<-
29	10 Nov 1970	A	4.600			3720.000	0.23/A	->>>
30	11 Nov 1970	?	4.270			2960.000	0.69/A	->>>>
31	17 Nov 1970	A	3.920			3240.000	0.04/A	->
32	19 Nov 1970	A	4.180			3890.000	-0.35/A	<<<<-
33	24 Nov 1970	A	3.980			2790.000	0.60/A	->>>>
34	1 Dec 1970	A	3.420			2790.000	0.04/A	->
35	8 Dec 1970	A	3.600			2870.000	0.13/A	->>
36	15 Dec 1970	A	4.400			3410.000	0.34/A	->>>>
37	25 Dec 1970	A	3.860			3400.000	-0.19/A	<<-
38	29 Dec 1970	A	3.300			3090.000	-0.42/A	<<<<-
39	5 Jan 1971	B	2.890	0.644	3555.90	2290.000	0.07/B	->
40	13 Jan 1971	B	2.550	0.640	3453.12	2210.000	-0.16/B	<<-
41	19 Jan 1971	B	2.250	0.595	3361.34	2000.000	-0.19/B	<<-
42	28 Jan 1971	B	2.150	0.569	3321.62	1890.000	-0.13/B	<<-
43	1 Feb 1971	B	2.090	0.567	3245.15	1840.000	-0.12/B	<<-
44	7 Feb 1971	B	1.980	0.546	3205.13	1750.000	-0.10/B	<-
45	16 Feb 1971	B	1.860	0.500	2980.00	1490.000	0.18/B	->>
46	22 Feb 1971	B	1.750	0.472	3177.97	1500.000	0.06/B	->
47	10 Mar 1971	B	1.300	0.511	2896.28	1480.000	-0.36/B	<<<<-
48	18 Mar 1971	B	1.250	0.450	2933.33	1320.000	-0.14/B	<<-
49	23 Mar 1971	B	1.400	0.367	2997.28	1100.000	0.42/B	->>>>
50	30 Mar 1971	B	1.310	0.421	2945.37	1240.000	0.07/B	->
51	8 Apr 1971	B	1.160	0.378	2883.60	1090.000	0.20/B	->>
52	14 Apr 1971	B	1.180	0.382	2931.94	1120.000	0.16/B	->>
53	11 May 1971	B	1.660	0.488	3114.75	1520.000	-0.06/B	<-
54	19 May 1971	B	1.580	0.475	3115.79	1480.000	-0.08/B	<-
55	26 May 1971	B	1.910	0.544	3272.06	1780.000	-0.21/B	<<-
56	2 Jun 1971	B	4.030	0.946	3985.20	3770.000	-0.36/B	<<<<-
57	9 Jun 1971	B	3.750	0.946	3456.66	3270.000	-0.16/B	<<-
58	16 Jun 1971	B	4.060	0.894	4004.47	3580.000	-0.15/B	<<-
59	25 Jun 1971	B	5.200	1.115	4430.49	4940.000	-0.18/B	<<-
60	2 Jul 1971	B	6.850	1.396	5272.21	7360.000	-0.19/B	<<-

River gaugings for station 11904 : Mekong at Pa Mong Dam site

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
61	8 Oct 1971	B	7.050	1.338	5224.21	6990.000	0.24/B	->>>
62	22 Oct 1971	B	5.790	1.227	4091.28	5020.000	0.35/B	->>>>
63	28 Oct 1971	B	5.200	0.971	4500.51	4370.000	0.28/B	->>>
64	5 Nov 1971	B	6.280	1.195	5273.64	6302.000	-0.08/B	<-
65	12 Nov 1971	B	4.740	0.927	4279.40	3967.000	0.17/B	->>
66	19 Nov 1971	B	4.390	0.908	4185.02	3800.000	-0.03/B	<-
67	26 Nov 1971	B	3.880	0.779	3540.44	2758.000	0.51/B	->>>>
68	13 Dec 1971	B	3.200	0.771	3357.98	2589.000	0.02/B	->
69	17 Dec 1971	B	3.060	0.689	3561.68	2454.000	0.04/B	->
70	24 Dec 1971	B	2.920	0.663	3758.67	2492.000	-0.14/B	<<-
71	29 Dec 1971	B	3.040	0.600	3858.33	2315.000	0.19/B	->>
72	14 Jan 1972	?	2.470	0.564	3097.52	1747.000	0.88/C	->>>>
73	21 Jan 1972	?	2.280	0.529	3062.38	1620.000	0.91/C	->>>>
74	28 Jan 1972	?	2.200	0.490	2983.67	1462.000	1.12/C	->>>>
75	4 Feb 1972	?	2.020	0.546	3021.98	1650.000	0.60/C	->>>>
76	11 Feb 1972	?	2.050	0.533	3033.77	1617.000	0.69/C	->>>>
77	21 Apr 1972	?	1.890	0.993	3092.65	3071.000	-1.53/C	<<<<-
78	28 Apr 1972	?	1.620	0.918	2871.46	2636.000	-1.27/C	<<<<-
79	12 May 1972	C	1.750	0.541	2987.06	1616.000	0.39/C	->>>>
80	19 May 1972	C	1.510	0.579	2901.55	1680.000	0.04/C	->
81	26 May 1972	C	1.830	0.541	3022.18	1635.000	0.43/C	->>>>
82	2 Jun 1972	C	2.040	0.545	3607.34	1966.000	0.10/C	->
83	9 Jun 1972	C	2.880	0.644	3687.89	2375.000	0.34/C	->>>>
84	16 Jun 1972	C	3.000	0.775	3860.65	2992.000	-0.32/C	<<<<-
85	22 Jun 1972	C	2.600	0.739	3512.86	2596.000	-0.23/C	<<<-
86	29 Jun 1972	C	3.190	0.750	3949.33	2962.000	-0.10/C	<-
87	6 Jul 1972	C	3.360	0.872	4037.84	3521.000	-0.55/C	<<<<-
88	13 Jul 1972	C	3.180	0.749	3811.75	2855.000	0.02/C	->
89	20 Jul 1972	C	3.100	0.769	3838.75	2952.000	-0.18/C	<<-
90	29 Jul 1972	?	5.760	0.975	4554.87	4441.000	0.95/C	->>>>
91	22 Aug 1972	?	7.750	1.168	5617.29	6561.000	1.26/C	->>>>
92	24 Aug 1972	C	7.820	1.410	5331.21	7517.000	0.69/C	->>>>
93	26 Aug 1972	?	9.840	1.468	5979.56	8778.001	1.95/C	->>>>
94	29 Aug 1972	C	9.180	1.711	6345.41	10857.001	0.17/C	->>
95	31 Aug 1972	C	8.980	1.512	6291.01	9512.000	0.68/C	->>>>
96	2 Sep 1972	C	9.020	1.660	5785.54	9604.001	0.67/C	->>>>
97	7 Sep 1972	C	7.800	1.413	5638.36	7967.000	0.39/C	->>>>
98	9 Sep 1972	C	7.770	1.321	5411.05	7148.000	0.88/C	->>>>
99	12 Sep 1972	C	7.200	1.407	4953.80	6970.000	0.43/C	->>>>
100	14 Sep 1972	C	6.600	1.282	4294.07	5505.000	0.89/C	->>>>
101	16 Sep 1972	C	6.200	1.210	4614.88	5584.000	0.43/C	->>>>
102	19 Sep 1972	C	5.700	1.119	4409.29	4934.000	0.46/C	->>>>
103	21 Sep 1972	C	5.420	1.050	4240.00	4452.000	0.60/C	->>>>
104	23 Sep 1972	C	5.140	1.112	4324.64	4809.000	0.00/C	-
105	26 Sep 1972	C	5.070	1.118	4315.74	4825.000	-0.08/C	<-
106	28 Sep 1972	C	5.680	1.015	4597.04	4666.000	0.67/C	->>>>
107	3 Oct 1972	C	6.810	1.532	4915.80	7531.000	-0.33/C	<<<<-
108	5 Oct 1972	C	7.080	1.454	5069.46	7371.000	0.04/C	->
109	7 Oct 1972	C	6.580	1.601	4651.47	7447.000	-0.50/C	<<<<-
110	10 Oct 1972	C	5.560	1.462	4358.41	6372.000	-0.80/C	<<<<-
111	11 Oct 1972	C	5.220	1.090	4209.17	4588.000	0.28/C	->>>
112	14 Oct 1972	C	5.310	1.071	4253.03	4555.000	0.40/C	->>>>
113	17 Oct 1972	C	5.830	1.448	4443.37	6434.000	-0.57/C	<<<<-
114	19 Oct 1972	C	5.940	1.360	4569.12	6214.000	-0.30/C	<<<-
115	21 Oct 1972	C	5.840	1.334	4380.81	5844.000	-0.13/C	<<-
116	24 Oct 1972	C	5.710	1.218	4467.16	5441.000	0.05/C	->
117	26 Oct 1972	C	5.430	1.359	4317.88	5868.000	-0.56/C	<<<<-
118	28 Oct 1972	C	5.080	1.085	4151.15	4504.000	0.21/C	->>
119	31 Oct 1972	C	4.820	1.066	3874.30	4130.000	0.30/C	->>>
120	2 Nov 1972	C	4.540	1.072	3806.90	4081.000	0.06/C	->

River gaugings for station 11904 : Mekong at Pa Mong Dam site

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
121	4 Nov 1972	?	4.210	1.580	3389.24	5355.000	-1.38/C	<<<<-
122	7 Nov 1972	?	3.860	1.608	3269.90	5258.000	-1.65/C	<<<<-
123	9 Nov 1972	C	3.770	1.118	3247.76	3631.000	-0.26/C	<<<-
124	11 Nov 1972	C	3.800	1.148	3231.71	3710.000	-0.31/C	<<<-
125	14 Nov 1972	C	6.420	1.468	4575.61	6717.000	-0.18/C	<<-
126	16 Nov 1972	C	5.540	1.261	4260.90	5373.000	-0.06/C	<-
127	18 Nov 1972	C	4.670	1.087	3842.69	4177.000	0.10/C	->
128	21 Nov 1972	C	3.990	1.118	3439.18	3845.000	-0.26/C	<<<-
129	23 Nov 1972	C	3.750	1.175	3320.85	3902.000	-0.55/C	<<<<-
130	25 Nov 1972	C	3.650	1.120	3264.29	3656.000	-0.40/C	<<<<-
131	28 Nov 1972	C	4.590	1.076	3777.88	4065.000	0.13/C	->>
132	30 Nov 1972	C	4.240	1.093	3713.63	4059.000	-0.22/C	<<-
133	2 Dec 1972	C	4.080	1.235	3464.78	4279.000	-0.58/C	<<<<-
134	5 Dec 1972	C	5.540	1.264	4271.36	5399.000	-0.08/C	<-
135	7 Dec 1972	C	5.960	1.381	4375.09	6042.000	-0.16/C	<<-
136	9 Dec 1972	C	5.470	1.214	4246.29	5155.000	0.04/C	->
137	12 Dec 1972	C	4.310	1.147	3517.00	4034.000	-0.12/C	<<-
138	14 Dec 1972	C	3.920	1.028	3415.37	3511.000	0.02/C	-
139	16 Dec 1972	C	3.750	0.965	3325.39	3209.000	0.18/C	->>
140	23 Dec 1972	C	3.500	0.900	3236.67	2913.000	0.27/C	->>>
141	26 Dec 1972	C	3.180	0.954	3133.12	2989.000	-0.14/C	<<-
142	28 Dec 1972	C	3.020	1.006	3116.30	3135.000	-0.47/C	<<<<-
143	30 Dec 1972	C	2.880	0.852	3041.08	2591.000	0.05/C	->
144	2 Jan 1973	D	2.700	0.749	2979.57	2231.700	0.17/D	->>
145	4 Jan 1973	D	2.630	0.861	3007.08	2589.100	-0.33/D	<<<<-
146	6 Jan 1973	D	2.570	0.705	2947.66	2078.100	0.24/D	->>>
147	9 Jan 1973	D	2.440	0.704	2904.55	2044.800	0.15/D	->>
148	11 Jan 1973	D	2.380	0.668	2881.44	1924.800	0.26/D	->>>
149	13 Jan 1973	D	2.320	0.746	2849.87	2126.000	-0.07/D	<-
150	16 Jan 1973	D	2.210	0.716	2816.62	2016.700	-0.04/D	<-
151	18 Jan 1973	D	2.170	0.762	2777.82	2116.700	-0.21/D	<<-
152	20 Jan 1973	D	2.140	0.728	2729.81	1987.300	-0.07/D	<-
153	23 Jan 1973	D	2.020	0.772	2639.77	2037.900	-0.26/D	<<<-
154	25 Jan 1973	D	1.970	0.680	2808.38	1909.700	-0.13/D	<<-
155	27 Jan 1973	D	1.950	0.656	2807.77	1841.900	-0.05/D	<-
156	30 Jan 1973	D	1.860	0.651	2698.16	1756.500	-0.02/D	-
157	1 Feb 1973	D	1.800	0.783	2615.45	2047.900	-0.49/D	<<<<-
158	3 Feb 1973	D	1.780	0.642	2436.45	1564.200	0.20/D	->>
159	6 Feb 1973	D	1.690	0.632	2566.30	1621.900	0.02/D	-
160	8 Feb 1973	D	1.660	0.670	2550.90	1709.100	-0.15/D	<<-
161	10 Feb 1973	D	1.640	0.774	2540.83	1966.600	-0.54/D	<<<<-
162	13 Feb 1973	D	1.600	0.585	2580.68	1509.700	0.11/D	->
163	17 Feb 1973	D	1.500	0.659	2577.85	1698.800	-0.29/D	<<<-
164	20 Feb 1973	D	1.460	0.636	2539.62	1615.200	-0.20/D	<<-
165	22 Feb 1973	D	1.400	0.591	2474.79	1462.600	-0.01/D	-
166	24 Feb 1973	D	1.380	0.578	2468.34	1426.700	0.03/D	->
167	27 Feb 1973	D	1.290	0.572	2500.52	1430.300	-0.07/D	<-
168	1 Mar 1973	D	1.280	0.604	2452.48	1481.300	-0.16/D	<<-
169	3 Mar 1973	D	1.260	0.634	2478.39	1571.300	-0.33/D	<<<<-
170	6 Mar 1973	D	1.200	0.664	2412.95	1602.200	-0.44/D	<<<<-
171	8 Mar 1973	D	1.180	0.678	2415.93	1638.000	-0.52/D	<<<<-
172	10 Mar 1973	D	1.240	0.706	2487.25	1756.000	-0.64/D	<<<<-
173	13 Mar 1973	D	1.660	0.744	2468.01	1836.200	-0.34/D	<<<<-
174	15 Mar 1973	D	2.220	0.836	2905.02	2428.600	-0.55/D	<<<<-
175	17 Mar 1973	D	2.480	0.837	2824.49	2364.100	-0.22/D	<<-
176	20 Mar 1973	D	1.800	0.686	2667.20	1829.700	-0.19/D	<<-
177	22 Mar 1973	D	1.400	0.647	2463.99	1594.200	-0.23/D	<<<-
178	24 Mar 1973	D	1.280	0.623	2418.14	1506.500	-0.21/D	<<-
179	28 Mar 1973	D	1.320	0.606	2458.25	1489.700	-0.14/D	<<-
180	29 Mar 1973	D	1.340	0.590	2458.81	1450.700	-0.05/D	<-

River gaugings for station 11904 : Mekong at Pa Mong Dam site

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
181	3 Apr 1973	D	1.280	0.578	2441.00	1410.900	-0.05/D	<-
182	5 Apr 1973	D	1.240	0.576	2414.24	1390.600	-0.05/D	<-
183	7 Apr 1973	D	1.180	0.563	2407.99	1355.700	-0.05/D	<-
184	10 Apr 1973	D	1.110	0.549	2372.13	1302.300	-0.02/D	<-
185	12 Apr 1973	D	1.140	0.530	2378.87	1260.800	0.08/D	->
186	14 Apr 1973	D	1.160	0.507	2385.60	1209.500	0.20/D	->>
187	17 Apr 1973	D	1.160	0.418	2401.20	1003.700	0.62/D	->>>>
188	19 Apr 1973	D	1.150	0.473	2335.10	1104.500	0.40/D	->>>>
189	24 Apr 1973	D	1.560	0.532	2448.31	1302.500	0.43/D	->>>>
190	28 Apr 1973	D	2.060	0.620	2694.84	1670.800	0.31/D	->>>
191	1 May 1973	D	1.920	0.635	2559.37	1625.200	0.24/D	->>>
192	3 May 1973	D	1.640	0.592	2547.13	1507.900	0.15/D	->>
193	5 May 1973	D	1.500	0.521	2456.43	1279.800	0.41/D	->>>>
194	8 May 1973	D	1.480	0.547	2456.86	1343.900	0.27/D	->>>
195	10 May 1973	D	1.700	0.575	2562.61	1473.500	0.27/D	->>>
196	12 May 1973	D	1.960	0.637	2603.77	1658.600	0.23/D	->>>
197	15 May 1973	D	2.490	0.690	2790.14	1925.200	0.37/D	->>>>
198	17 May 1973	D	2.620	0.631	2809.67	1772.900	0.72/D	->>>>
199	19 May 1973	D	2.640	0.745	2766.71	2061.200	0.33/D	->>>>
200	22 May 1973	D	2.400	0.729	2732.51	1992.000	0.19/D	->>
201	24 May 1973	D	2.410	0.713	2763.67	1970.500	0.23/D	->>>
202	26 May 1973	D	2.590	0.714	2703.08	1930.000	0.46/D	->>>>
203	29 May 1973	D	2.740	0.748	2884.09	2157.300	0.31/D	->>>
204	2 Jun 1973	D	2.970	0.794	2857.43	2268.800	0.39/D	->>>>
205	5 Jun 1973	D	3.300	0.869	3038.55	2640.500	0.28/D	->>>
206	7 Jun 1973	D	3.490	0.986	3154.36	3110.200	-0.03/D	<-
207	9 Jun 1973	D	3.670	0.992	3089.62	3064.900	0.19/D	->>
208	12 Jun 1973	D	3.840	1.001	3187.81	3191.000	0.23/D	->>>
209	14 Jun 1973	D	4.200	1.086	3202.49	3477.900	0.32/D	->>>
210	16 Jun 1973	D	4.580	1.155	3381.65	3905.800	0.31/D	->>>
211	19 Jun 1973	D	4.880	1.262	3591.52	4532.500	0.09/D	->
212	21 Jun 1973	D	4.700	1.182	3629.95	4290.600	0.10/D	->
213	23 Jun 1973	D	5.000	1.205	3740.08	4506.800	0.23/D	->>>
214	26 Jun 1973	D	5.090	1.192	3945.55	4703.100	0.16/D	->>
215	28 Jun 1973	D	4.780	1.168	3626.54	4235.800	0.23/D	->>>
216	30 Jun 1973	D	4.460	1.127	3599.11	4056.200	0.06/D	->
217	3 Jul 1973	D	5.340	1.275	4135.76	5273.100	-0.01/D	-
218	5 Jul 1973	D	5.960	1.319	4424.26	5835.600	0.22/D	->>
219	7 Jul 1973	D	6.780	1.532	5266.71	8068.600	-0.30/D	<<<-
220	10 Jul 1973	D	6.840	1.600	4762.87	7620.600	0.01/D	-
221	12 Jul 1973	D	6.780	1.550	4870.26	7548.900	-0.01/D	-
222	14 Jul 1973	D	7.520	1.589	5300.06	8421.800	0.26/D	->>>
223	17 Jul 1973	D	7.990	1.743	5792.08	10095.600	-0.10/D	<-
224	19 Jul 1973	D	8.100	1.694	6212.16	10523.401	-0.18/D	<<-
225	21 Jul 1973	D	8.800	1.848	6929.49	12805.701	-0.45/D	<<<<-
226	24 Jul 1973	D	7.170	1.519	5477.88	8320.901	-0.04/D	<-
227	26 Jul 1973	D	6.220	1.335	5186.74	6924.300	-0.21/D	<<-
228	28 Jul 1973	D	6.020	1.311	5110.45	6699.800	-0.27/D	<<<-
229	31 Jul 1973	D	8.040	1.704	6358.69	10835.202	-0.38/D	<<<<-
230	2 Aug 1973	D	8.710	1.750	7080.57	12391.000	-0.37/D	<<<<-
231	4 Aug 1973	D	8.580	1.569	7112.30	11159.200	0.01/D	-
232	7 Aug 1973	D	8.420	1.693	6505.08	11013.100	-0.08/D	<-
233	9 Aug 1973	D	9.200	1.946	7496.15	14587.500	-0.72/D	<<<<-
234	11 Aug 1973	D	9.560	1.961	7369.51	14451.600	-0.31/D	<<<-
235	8 Oct 1973	D	7.390	1.495	5201.07	7775.600	0.47/D	->>>>
236	11 Oct 1973	D	6.740	1.380	4833.48	6670.200	0.47/D	->>>>
237	13 Oct 1973	D	6.370	1.367	4804.32	6567.500	0.16/D	->>
238	16 Oct 1973	D	5.900	1.254	4633.25	5810.100	0.18/D	->>
239	18 Oct 1973	D	5.630	1.286	4568.58	5875.200	-0.14/D	<<-
240	23 Oct 1973	D	5.130	1.247	4426.30	5519.600	-0.40/D	<<<<-

River gaugings for station 11904 : Mekong at Pa Mong Dam site

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
241	25 Oct 1973	D	5.260	1.295	4487.57	5811.400	-0.46/D	<<<<-
242	27 Oct 1973	D	5.240	1.258	4388.31	5520.500	-0.29/D	<<<-
243	1 Nov 1973	D	5.960	1.337	4740.61	6338.200	-0.11/D	<-
244	11 Nov 1973	D	4.400	1.046	4027.15	4212.400	-0.13/D	<<-
245	15 Nov 1973	D	6.090	1.250	4762.96	5953.700	0.27/D	->>>
246	17 Nov 1973	D	5.600	1.318	4559.64	6009.600	-0.26/D	<<<-
247	20 Nov 1973	D	4.690	1.087	4249.49	4619.200	-0.17/D	<<-
248	22 Nov 1973	D	4.440	1.149	4135.42	4751.600	-0.53/D	<<<<-
249	24 Nov 1973	D	4.470	1.134	4094.18	4642.800	-0.41/D	<<<<-
250	27 Nov 1973	D	5.690	1.257	4599.84	5782.000	-0.01/D	-
251	29 Nov 1973	D	5.560	1.250	4639.92	5799.900	-0.16/D	<<-
252	1 Dec 1973	D	4.700	1.089	4339.95	4726.200	-0.25/D	<<<-
253	4 Dec 1973	D	4.330	1.038	3981.98	4133.300	-0.14/D	<<-
254	8 Dec 1973	D	3.920	0.971	3936.04	3821.900	-0.28/D	<<<-
255	13 Dec 1973	D	3.590	0.990	3187.47	3155.600	0.02/D	-
256	20 Dec 1973	D	3.240	0.835	3182.28	2657.200	0.20/D	->>
257	25 Dec 1973	D	3.030	0.802	3039.78	2437.900	0.25/D	->>>
258	3 Jan 1974	E	2.630	0.767	2888.66	2215.600	-0.12/E	<<-
259	10 Jan 1974	E	2.440	0.680	2818.24	1916.400	0.03/E	->
260	17 Jan 1974	E	2.280	0.725	2195.59	1591.800	0.28/E	->>>
261	31 Jan 1974	E	2.020	0.612	2267.16	1387.500	0.30/E	->>>
262	18 May 1974	E	2.200	0.693	2719.62	1884.700	-0.17/E	<<-
263	21 May 1974	E	2.280	0.717	2793.03	2002.600	-0.23/E	<<<-
264	25 May 1974	E	2.130	0.679	2698.53	1832.300	-0.18/E	<<-
265	28 May 1974	E	2.280	0.719	2779.28	1998.300	-0.23/E	<<<-
266	1 Jun 1974	E	2.690	0.698	2983.38	2082.400	0.09/E	->
267	4 Jun 1974	E	3.270	0.809	3354.02	2713.400	-0.00/E	-
268	8 Jun 1974	E	3.260	0.766	3299.22	2527.200	0.18/E	->>
269	11 Jun 1974	E	3.250	0.730	3198.90	2335.200	0.37/E	->>>>
270	15 Jun 1974	E	3.910	0.995	3549.95	3532.200	-0.11/E	<-
271	18 Jun 1974	E	4.930	1.123	4316.83	4847.800	-0.11/E	<-
272	22 Jun 1974	E	4.590	1.160	3965.86	4600.400	-0.27/E	<<<-
273	25 Jun 1974	E	4.460	1.116	3775.27	4213.200	-0.11/E	<-
274	29 Jun 1974	E	3.870	1.083	3269.34	3540.700	-0.16/E	<<-
275	2 Jul 1974	E	4.410	1.080	3827.50	4133.700	-0.10/E	<-
276	6 Jul 1974	E	4.940	1.099	4273.70	4696.800	0.01/E	-
277	9 Jul 1974	E	5.140	1.106	4283.18	4737.200	0.18/E	->>
278	13 Jul 1974	E	4.930	1.078	4328.57	4666.200	0.02/E	->
279	16 Jul 1974	E	4.220	1.092	3695.24	4035.200	-0.21/E	<<-
280	20 Jul 1974	E	4.650	1.074	4120.02	4424.900	-0.08/E	<-
281	23 Jul 1974	E	6.040	1.369	4831.56	6614.400	-0.15/E	<<-
282	27 Jul 1974	E	6.870	1.516	5157.98	7819.500	-0.01/E	-
283	30 Jul 1974	E	7.060	1.561	5114.16	7983.200	0.09/E	->
284	3 Aug 1974	E	8.240	1.844	5671.85	10458.900	0.04/E	->
285	6 Aug 1974	E	7.810	1.807	5515.77	9967.001	-0.16/E	<<-
286	10 Aug 1974	E	8.720	1.944	6113.27	11884.202	-0.12/E	<<-
287	25 Sep 1974	E	7.450	1.819	5670.75	10315.100	-0.69/E	<<<<-
288	28 Sep 1974	E	7.410	1.769	5646.64	9988.901	-0.57/E	<<<<-
289	1 Oct 1974	E	7.390	1.693	5624.28	9521.901	-0.37/E	<<<<-
290	5 Oct 1974	E	7.340	1.703	4902.58	8349.100	0.18/E	->>
291	8 Oct 1974	E	6.950	1.651	4671.71	7713.000	0.13/E	->>
292	12 Oct 1974	E	6.500	1.638	4821.61	7897.800	-0.42/E	<<<<-
293	15 Oct 1974	E	5.900	1.273	4552.63	5795.500	0.22/E	->>
294	19 Oct 1974	E	5.310	1.201	3993.92	4796.700	0.31/E	->>>
295	22 Oct 1974	E	4.920	1.121	4105.98	4602.800	0.06/E	->
296	26 Oct 1974	E	4.530	1.095	4005.66	4386.200	-0.17/E	<<-
297	29 Oct 1974	E	4.300	0.908	3907.27	3547.800	0.27/E	->>>
298	2 Nov 1974	E	4.300	0.914	3915.21	3578.500	0.24/E	->>>
299	5 Nov 1974	E	4.390	0.938	4010.77	3762.100	0.18/E	->>
300	9 Nov 1974	E	4.540	1.136	4031.87	4580.200	-0.31/E	<<<-

River gaugings for station 11904 : Mekong at Pa Mong Dam site

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
301	12 Nov 1974	E	3.970	0.887	3524.92	3126.600	0.31/E	->>>
302	16 Nov 1974	E	3.750	0.892	3453.92	3080.900	0.13/E	->>
303	19 Nov 1974	E	3.970	0.902	3523.06	3177.800	0.26/E	->>>
304	26 Nov 1974	E	3.800	0.877	3529.99	3095.800	0.17/E	->>
305	30 Nov 1974	E	3.380	0.761	3218.00	2448.900	0.38/E	->>>>
306	10 Dec 1974	E	2.870	0.849	2835.92	2407.700	-0.09/E	<-
307	17 Dec 1974	E	2.590	0.842	2658.55	2238.500	-0.19/E	<<-
308	24 Dec 1974	E	2.330	0.805	2547.70	2050.900	-0.24/E	<<<-
309	4 Jan 1975	F	2.060	0.766	2413.83	1848.990	0.02/F	->
310	7 Jan 1975	F	1.990	0.777	2350.71	1826.500	-0.03/F	<-
311	13 Jan 1975	F	1.980	0.767	2327.93	1785.520	-0.00/F	-
312	18 Jan 1975	F	3.100	0.898	2946.07	2645.570	0.18/F	->>
313	22 Jan 1975	F	2.580	0.841	2741.18	2305.330	0.05/F	->
314	25 Jan 1975	F	2.340	0.832	2601.20	2164.200	-0.03/F	<-
315	28 Jan 1975	F	2.010	0.743	2392.60	1777.700	0.04/F	->
316	1 Feb 1975	F	1.810	0.686	2254.93	1546.880	0.06/F	->
317	4 Feb 1975	F	1.710	0.656	2245.55	1473.080	0.04/F	->
318	8 Feb 1975	F	1.640	0.642	2169.10	1392.560	0.05/F	->
319	15 Feb 1975	F	1.500	0.602	2107.62	1268.790	0.05/F	->
320	18 Feb 1975	F	1.430	0.583	2062.90	1202.670	0.06/F	->
321	22 Feb 1975	F	1.380	0.562	2027.51	1139.460	0.09/F	->
322	25 Feb 1975	F	1.370	0.553	2000.61	1106.340	0.12/F	->
323	1 Mar 1975	F	1.280	0.553	1940.47	1073.080	0.07/F	->
324	11 Mar 1975	F	1.190	0.535	1906.06	1019.740	0.05/F	->
325	15 Mar 1975	F	1.150	0.529	1898.11	1004.100	0.03/F	->
326	18 Mar 1975	F	1.060	0.527	1849.03	974.440	-0.02/F	-
327	22 Mar 1975	F	1.020	0.520	1827.87	950.490	-0.02/F	<-
328	25 Mar 1975	F	0.980	0.518	1819.96	942.740	-0.05/F	<-
329	29 Mar 1975	F	0.920	0.492	1813.33	892.160	-0.04/F	<-
330	1 Apr 1975	F	0.900	0.486	1797.90	873.780	-0.03/F	<-
331	8 Apr 1975	F	1.060	0.524	1849.89	969.340	-0.01/F	-
332	12 Apr 1975	F	1.170	0.534	1867.75	997.380	0.06/F	->
333	15 Apr 1975	F	0.970	0.515	1819.81	937.200	-0.06/F	<-
334	19 Apr 1975	F	1.120	0.522	1854.90	968.260	0.05/F	->
335	22 Apr 1975	F	1.340	0.604	1992.42	1203.420	-0.03/F	<-
336	26 Apr 1975	F	1.500	0.594	2113.84	1255.620	0.07/F	->
337	29 Apr 1975	F	1.600	0.616	2229.25	1373.220	0.03/F	->
338	3 May 1975	F	1.130	0.534	1861.99	994.300	0.03/F	->
339	6 May 1975	F	1.080	0.532	1863.06	991.150	-0.02/F	<-
340	10 May 1975	F	1.580	0.646	2184.64	1411.280	-0.03/F	<-
341	13 May 1975	F	1.690	0.682	2335.06	1592.510	-0.11/F	<-
342	17 May 1975	F	1.820	0.720	2505.65	1804.070	-0.18/F	<<-
343	20 May 1975	F	1.720	0.685	2352.25	1611.290	-0.09/F	<-
344	24 May 1975	F	1.800	0.720	2428.83	1748.760	-0.15/F	<<-
345	27 May 1975	F	1.690	0.685	2329.68	1595.830	-0.11/F	<-
346	31 May 1975	F	2.020	0.707	2588.29	1829.920	-0.00/F	-
347	9 Jun 1975	F	3.790	0.985	3230.24	3181.790	0.31/F	->>>
348	12 Jun 1975	F	3.130	0.975	3114.14	3036.290	-0.20/F	<<-
349	16 Jun 1975	F	3.140	0.959	3130.82	3002.460	-0.16/F	<<-
350	23 Jun 1975	F	6.490	1.473	4473.46	6589.410	0.24/F	->>>
351	26 Jun 1975	F	5.730	1.363	4044.81	5513.070	0.25/F	->>>
352	30 Jun 1975	F	4.300	1.102	3594.98	3961.670	0.09/F	->
353	3 Jul 1975	F	3.580	1.041	3324.26	3460.560	-0.17/F	<<-
354	7 Jul 1975	F	3.520	0.995	3256.15	3239.870	-0.01/F	-
355	10 Jul 1975	F	3.640	1.104	3353.78	3702.570	-0.34/F	<<<<-
356	14 Jul 1975	F	4.240	1.158	3549.43	4110.240	-0.10/F	<-
357	17 Jul 1975	F	4.260	1.167	3549.72	4142.520	-0.11/F	<-
358	28 Jul 1975	F	7.170	1.677	4994.25	8375.361	-0.23/F	<<<-
359	31 Jul 1975	F	6.940	1.662	4824.02	8017.520	-0.24/F	<<<-
360	4 Aug 1975	F	7.390	1.676	4948.46	8293.620	0.04/F	->

River gaugings for station 11904 : Mekong at Pa Mong Dam site

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
361	7 Aug 1975	F	7.590	1.741	5054.34	8799.600	-0.07/F	<-
362	11 Aug 1975	F	7.340	1.639	4890.32	8015.230	0.16/F	->>
363	14 Aug 1975	F	7.330	1.633	4833.04	7892.350	0.23/F	->>>
364	18 Aug 1975	F	7.490	1.659	5132.95	8515.560	0.00/F	-
365	21 Aug 1975	F	6.840	1.409	4689.47	6607.470	0.58/F	->>>>
366	25 Aug 1975	F	7.130	1.616	4792.97	7745.440	0.12/F	->
367	28 Aug 1975	F	7.910	1.936	4714.81	9127.870	0.06/F	->

C.9.7 Station 12001 - Nong Khai

Figure C9.7.1 shows the number of gaugings per year from 1960 to 1987. Figure C9.7.2 shows the scatter of the many gaugings which have been made at Nong Khai together with the average rating curve. It can be seen that the rating is constantly changing from year to year (Figure C9.7.3). In spite of this constant change, individual ratings fit reasonably well as illustrated by Figures C9.7.4a to C9.7.4j. Furthermore the list of gaugings show that there is also shifting within the year. Nong Khai, which has been well gauged for many years, illustrates the need for a continuous gauging programme and rating curve revision beacuse of the variability of the rating curves from year to year. In these respects Nong Khai is typical of many Mekong sites. Therefore the recent gaugings, represented by ratings I and J are important in improving the accuracy of flow data calculated during 1986 and 1987.

Gaugings made between October 1982 and December 1985 were not available until after this study was complete and are therefore not considered here.

Gauging History - 012001 Nong Khai

Year	Gauging numbers	Number of gaugings	Rating letter	Shifts (Y=yes)	Fitting method
1969	1 - 98	98	A	Y	1
1970	99 - 174	76	B	Y	1
1971	175 - 226	52	C	Y	1
1972	227 - 308	82	D	Y	5 *
1973	309 - 430	122	E	Y	1
1974	431 - 546	116	F	Y	1
1975	547 - 609	63	G	Y	1
1976+		0	H		1
1986	610 - 638	29	I	Y	1
1987	639 - 674	36	J		1
	Total =	674			

+ = and subsequent years

Dubious gaugings (HYDATA flag ?) - 21,26,39,47,262,532, 534-536,538,539,631

Rare flood gaugings (HYDATA flag +) - None

Observed stage range 0.48 metres to 13.07 metres
Gauged stage range 0.50 metres to 13.07 metres

See Section C.9.1 for description of the table

* Notes on special fitting :

Rating D . Although free fit gives reasonable parameters, the upper part of the rating deviated considerably from all others ratings. The parameter "b" was fixed at the average value of "b" from earlier ratings of 2.25. Good fit on log-log plot and reasonable parameters.

Rating equations - 12001 Mekong at Nong Khai

Rating Letter	Rating Date	Parameters: $Q = a(h + c)^b$	Maximum Stage
A from	1 Jan 1969	$Q = 60.854 (h + 2.860)^{2.127}$	15.00 m
B from	1 Jan 1970	$Q = 62.509 (h + 3.210)^{2.063}$	15.00 m
C from	1 Jan 1971	$Q = 12.468 (h + 5.200)^{2.559}$	15.00 m
D from	1 Jan 1972	$Q = 28.744 (h + 4.340)^{2.250}$	15.00 m
E from	1 Jan 1973	$Q = 185.449 (h + 1.540)^{1.726}$	15.00 m
F from	1 Jan 1974	$Q = 20.254 (h + 4.070)^{2.452}$	15.00 m
G from	1 Jan 1975	$Q = 77.139 (h + 2.660)^{1.998}$	15.00 m
H from	1 Jan 1976	$Q = 28.323 (h + 3.840)^{2.331}$	15.00 m
I from	1 Jan 1986	$Q = 82.892 (h + 2.590)^{1.969}$	15.00 m
J from	1 Jan 1987	$Q = 86.723 (h + 2.350)^{1.953}$	15.00 m
Rating H is the average rating			

Number of gaugings per year

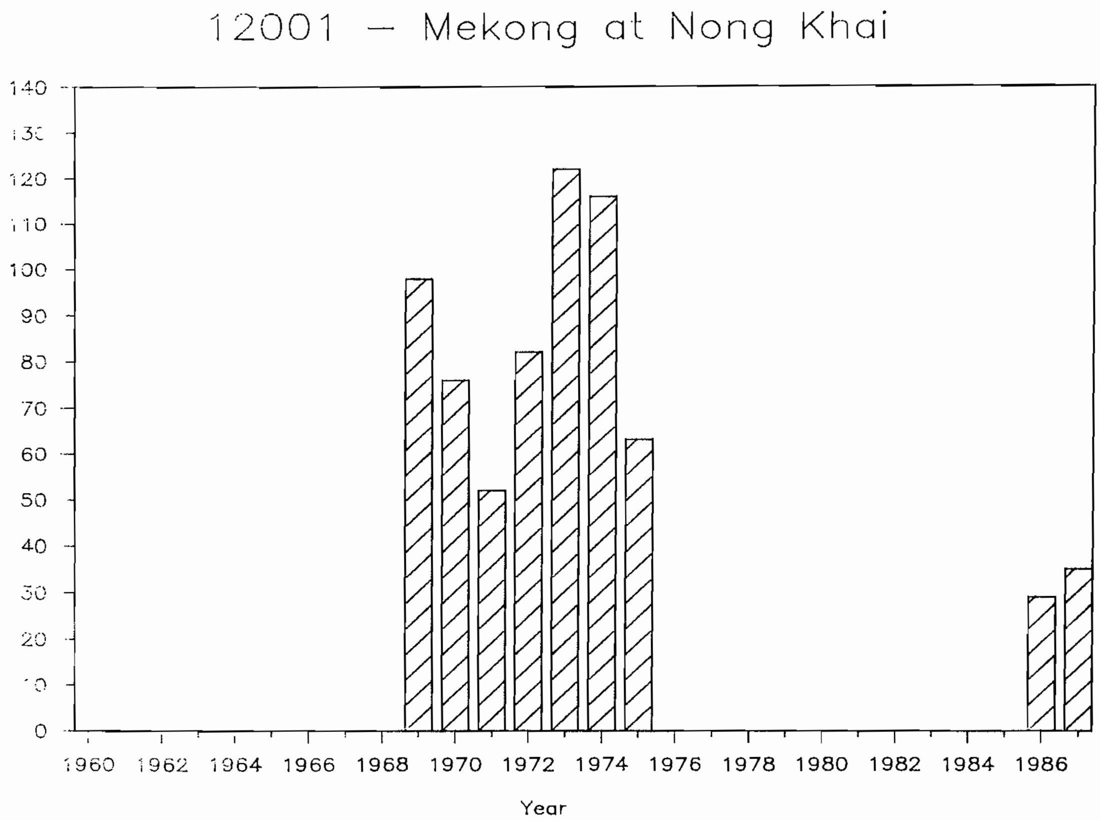


Figure C9.7.1

Rating equations

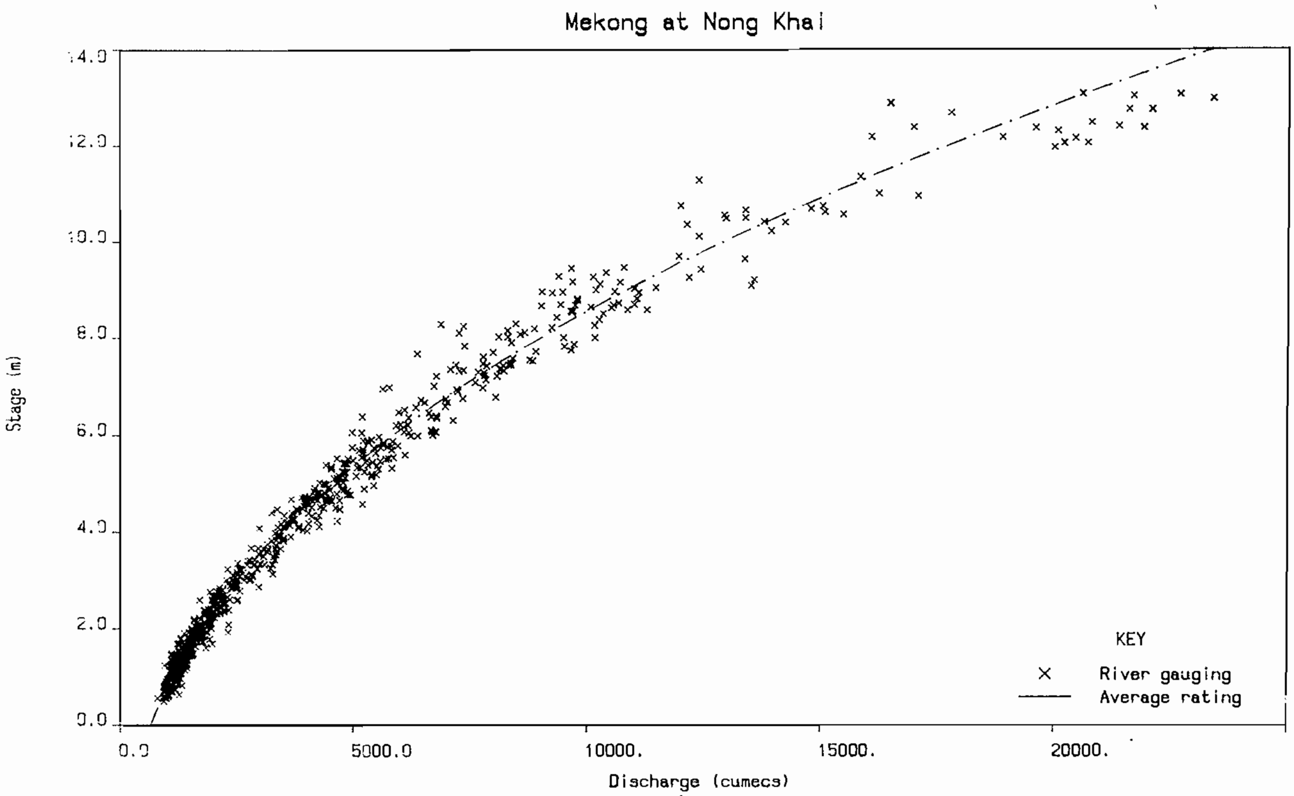


Figure C9.7.2

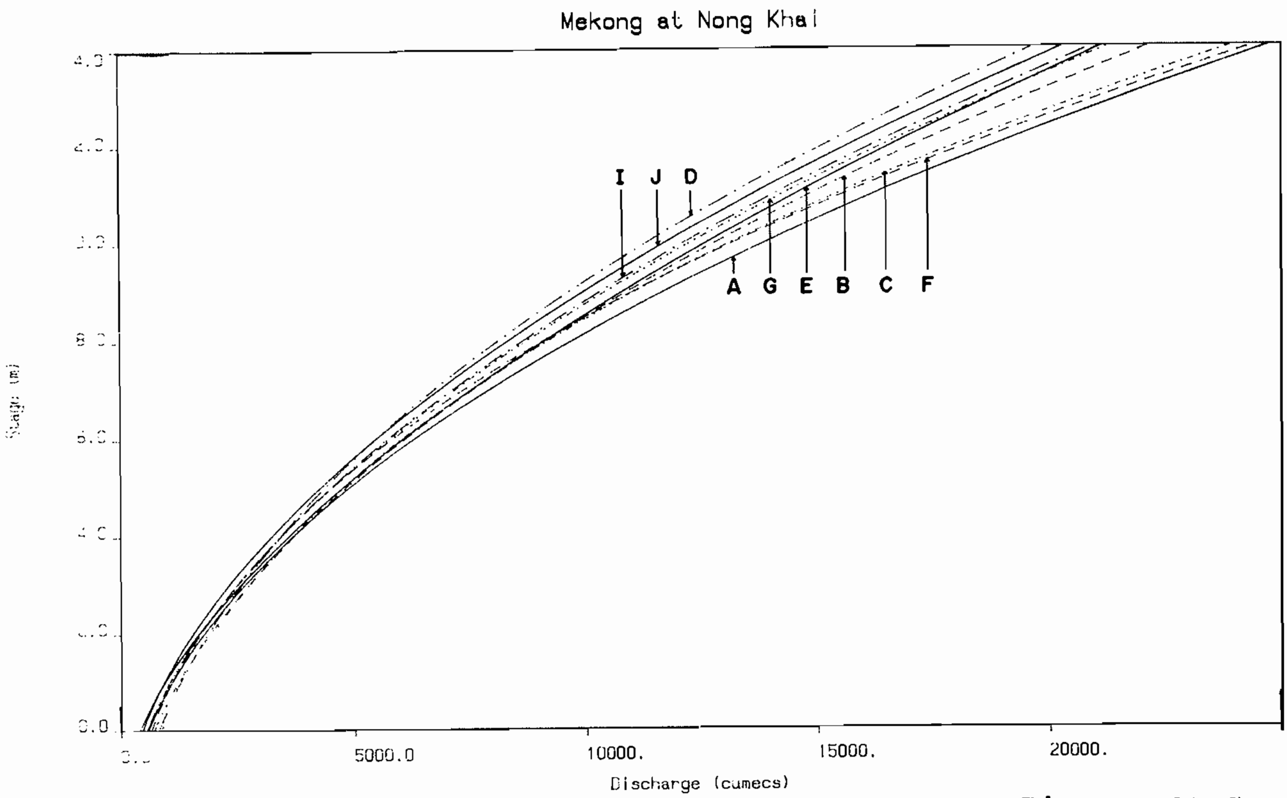


Figure C9.7.3

Rating equations

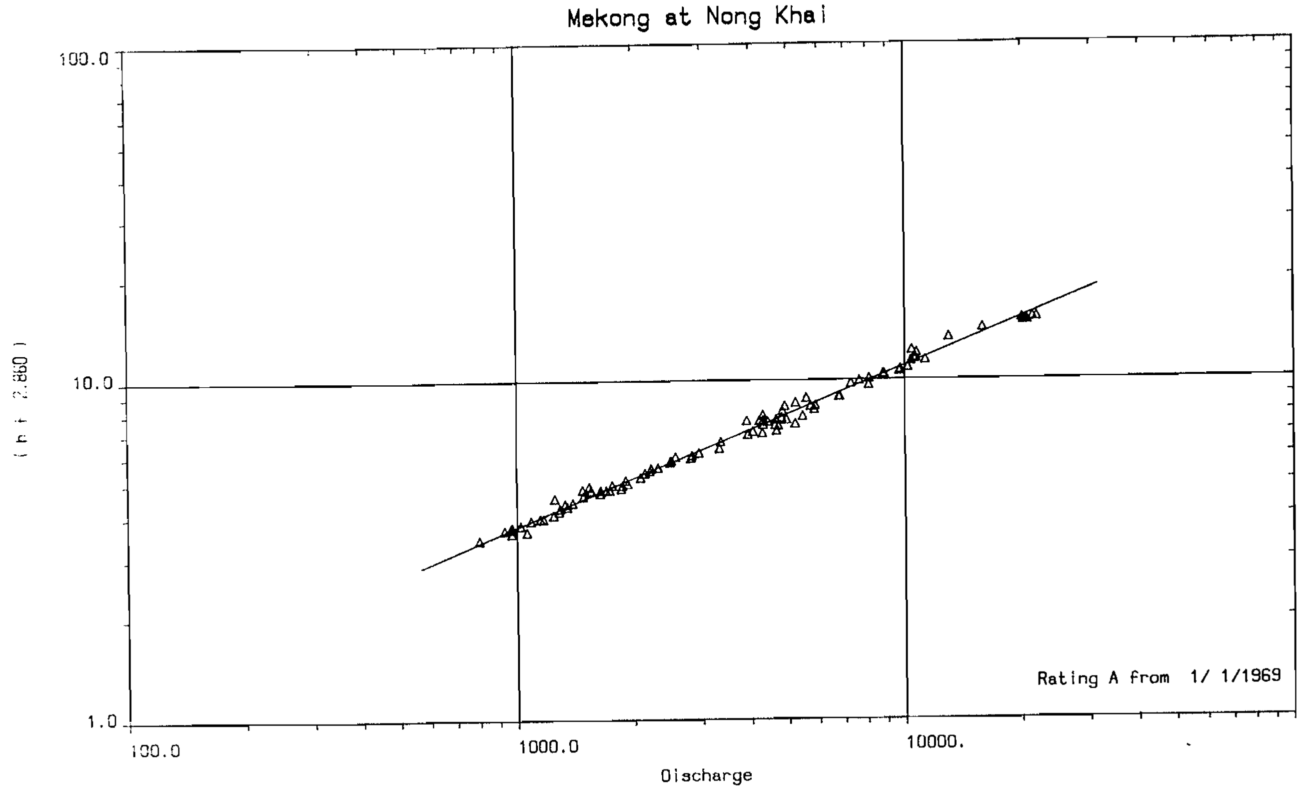


Figure C9.7.4a

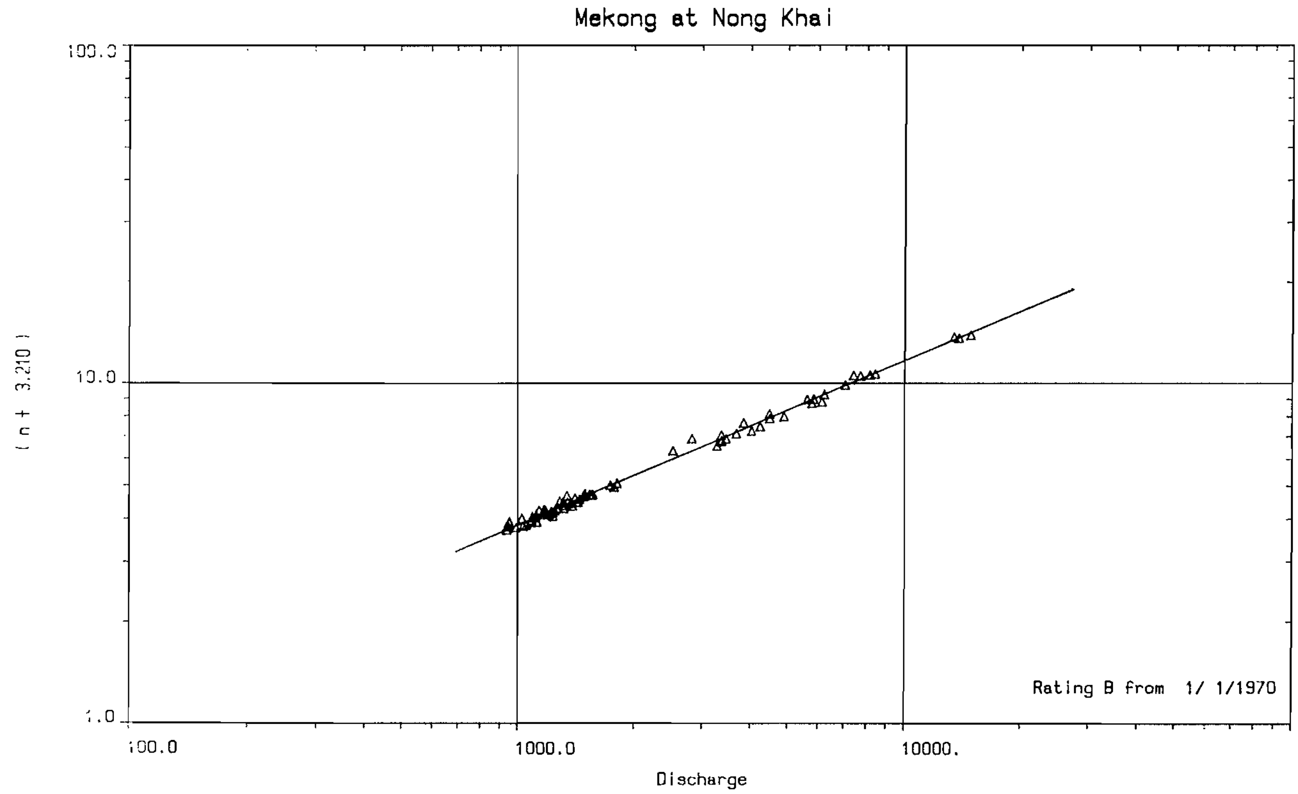


Figure C9.7.4b

Rating equations

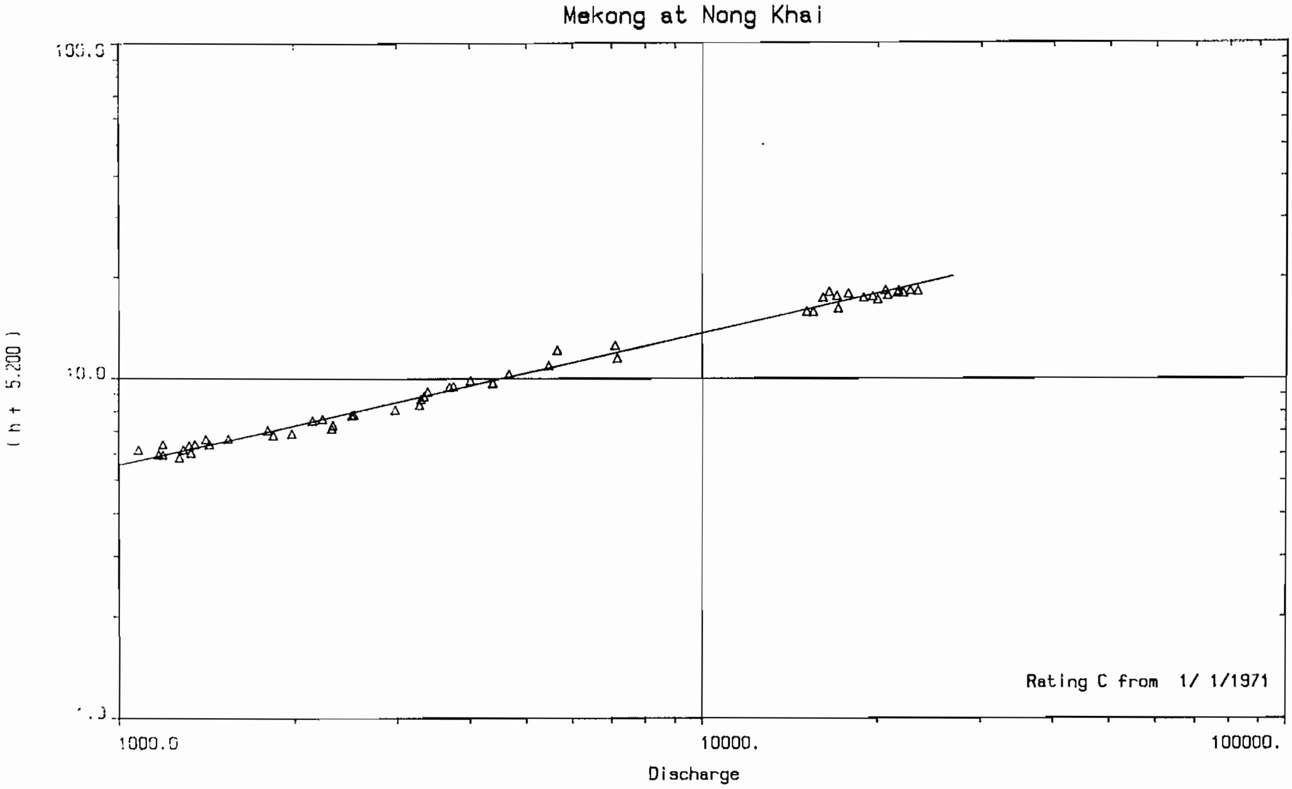


Figure C9.7.4c

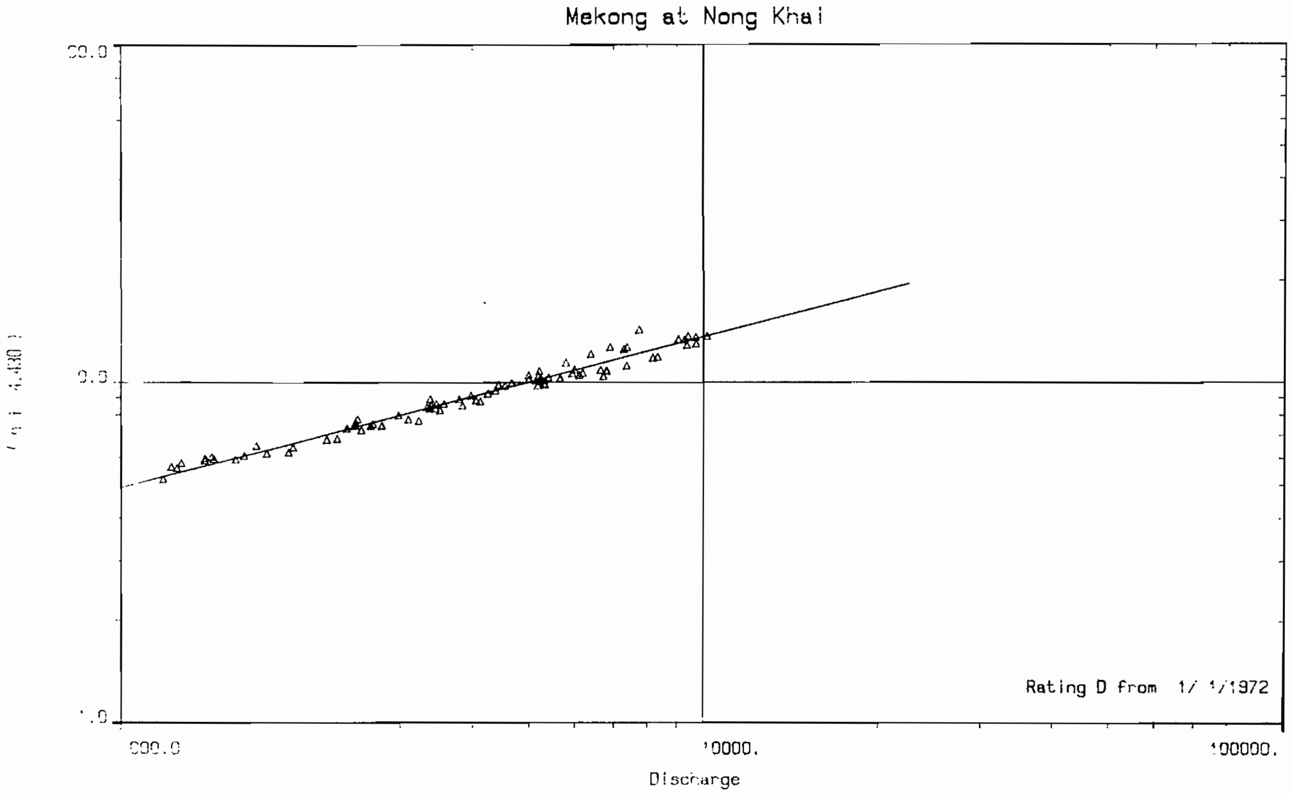


Figure C9.7.4d

Rating equations

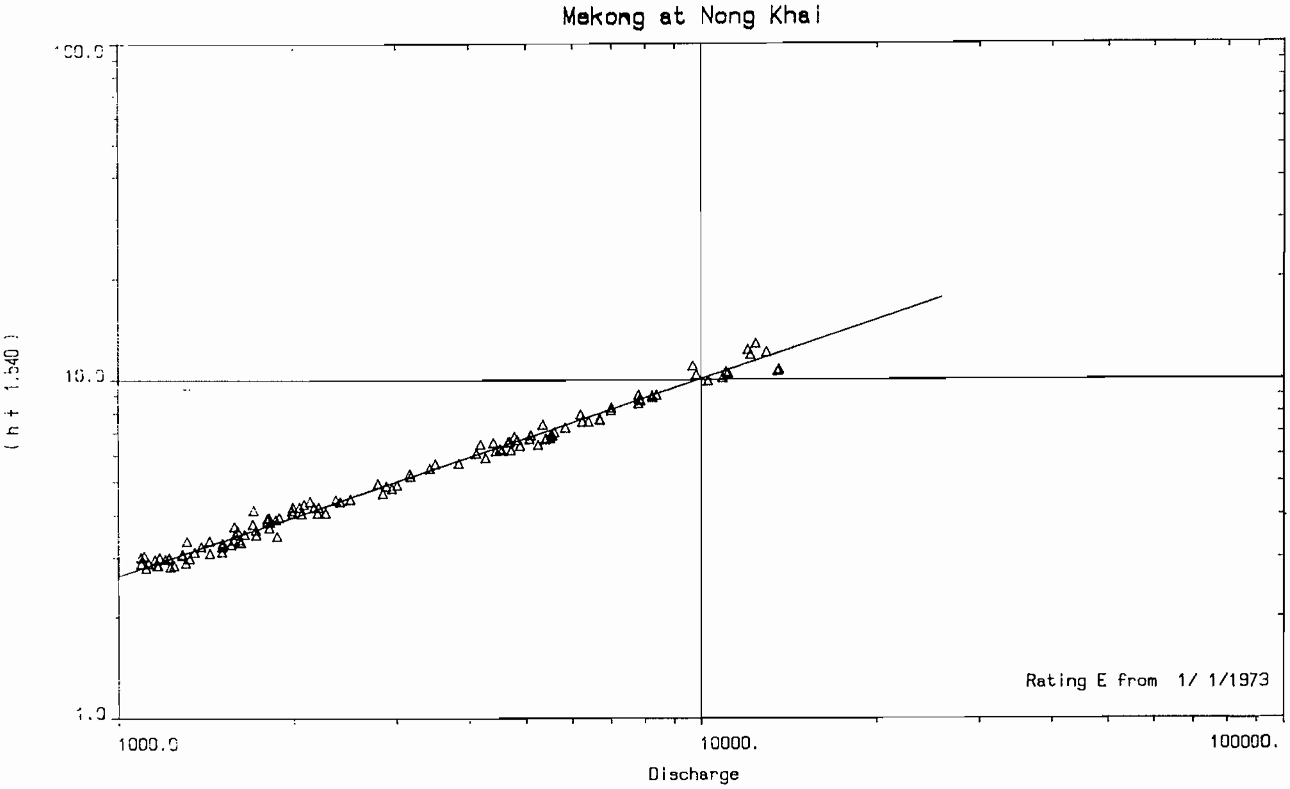


Figure C9.7.4e

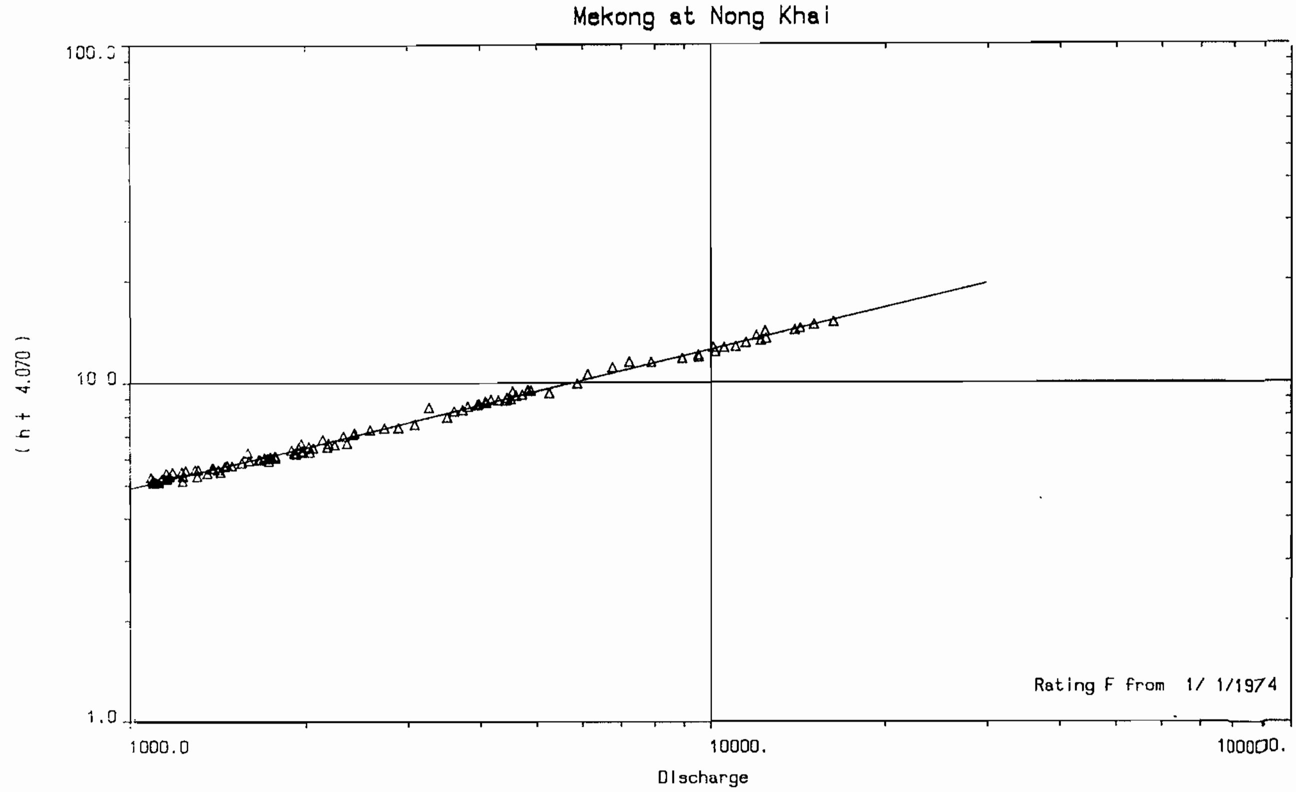


Figure C9.7.4f

Rating equations

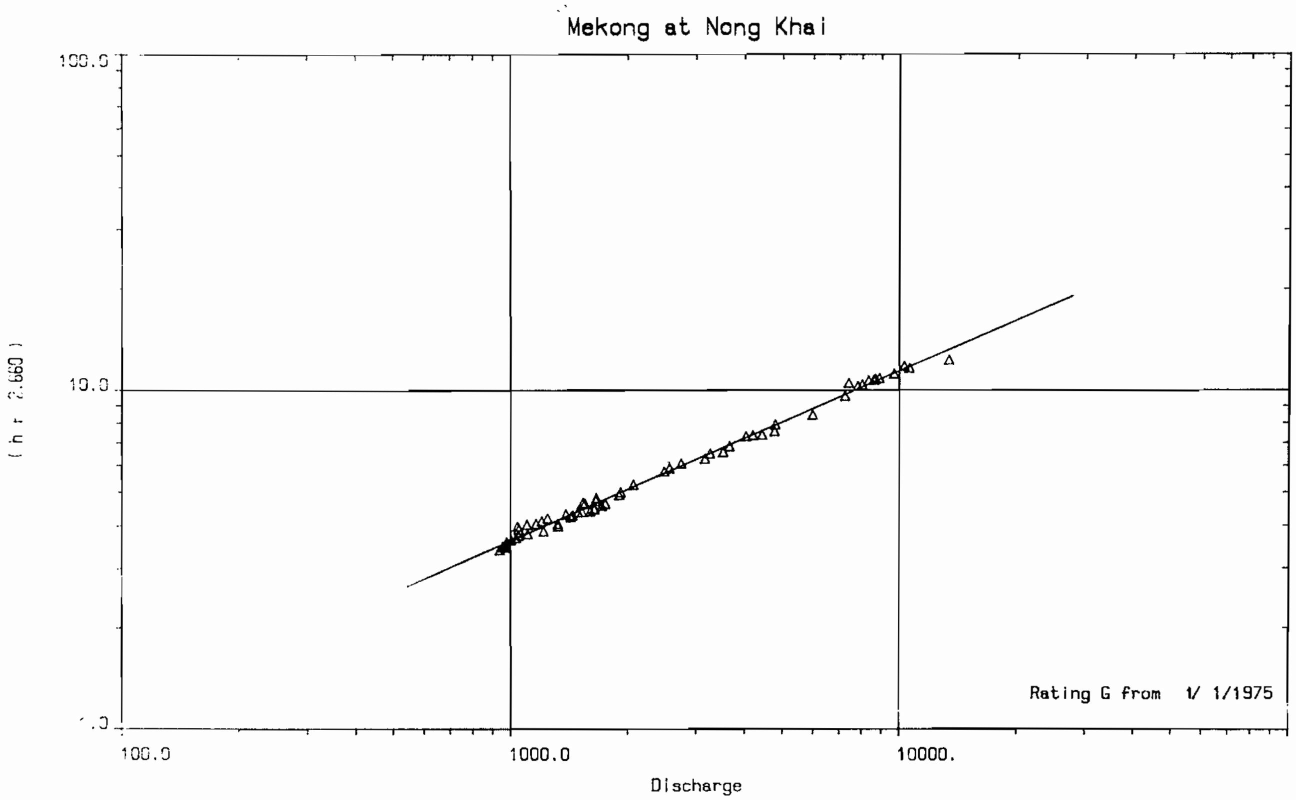


Figure C9.7.4g

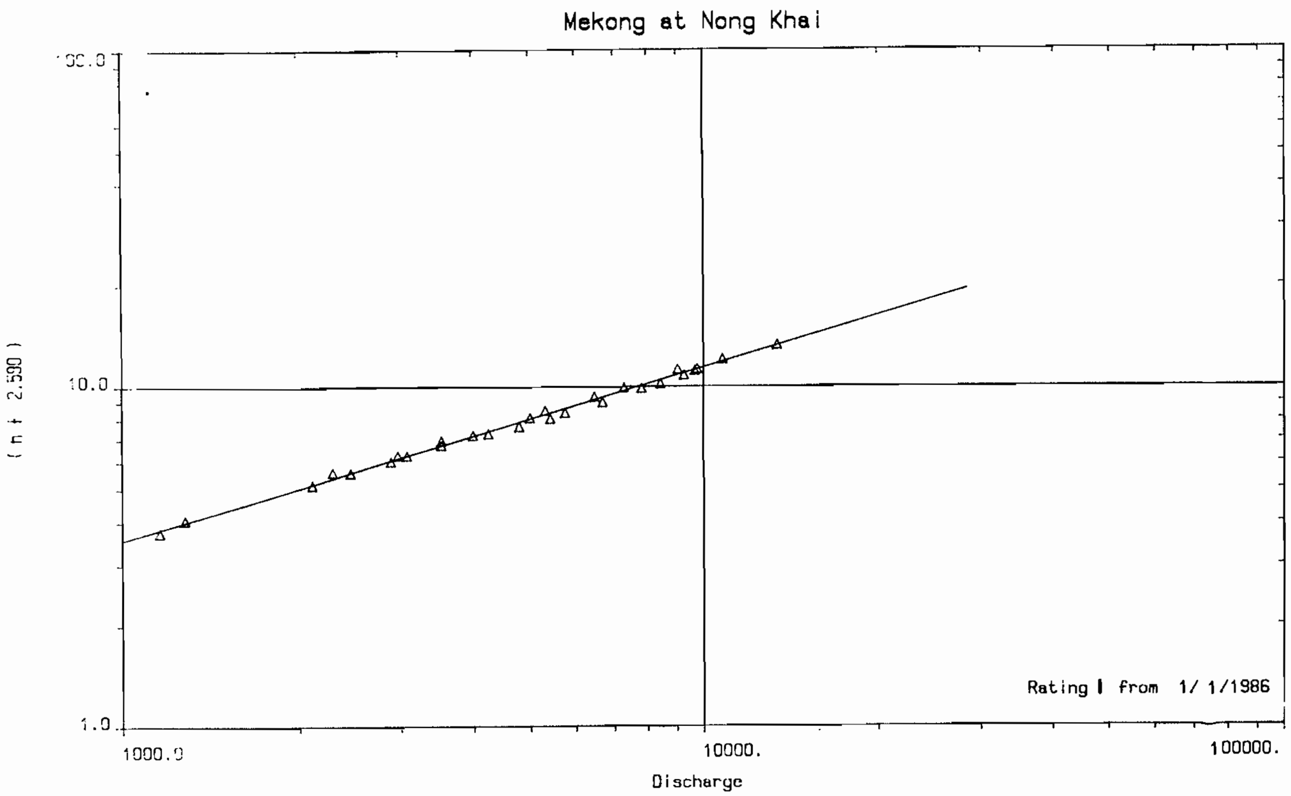


Figure C9.7.4i

Rating equations

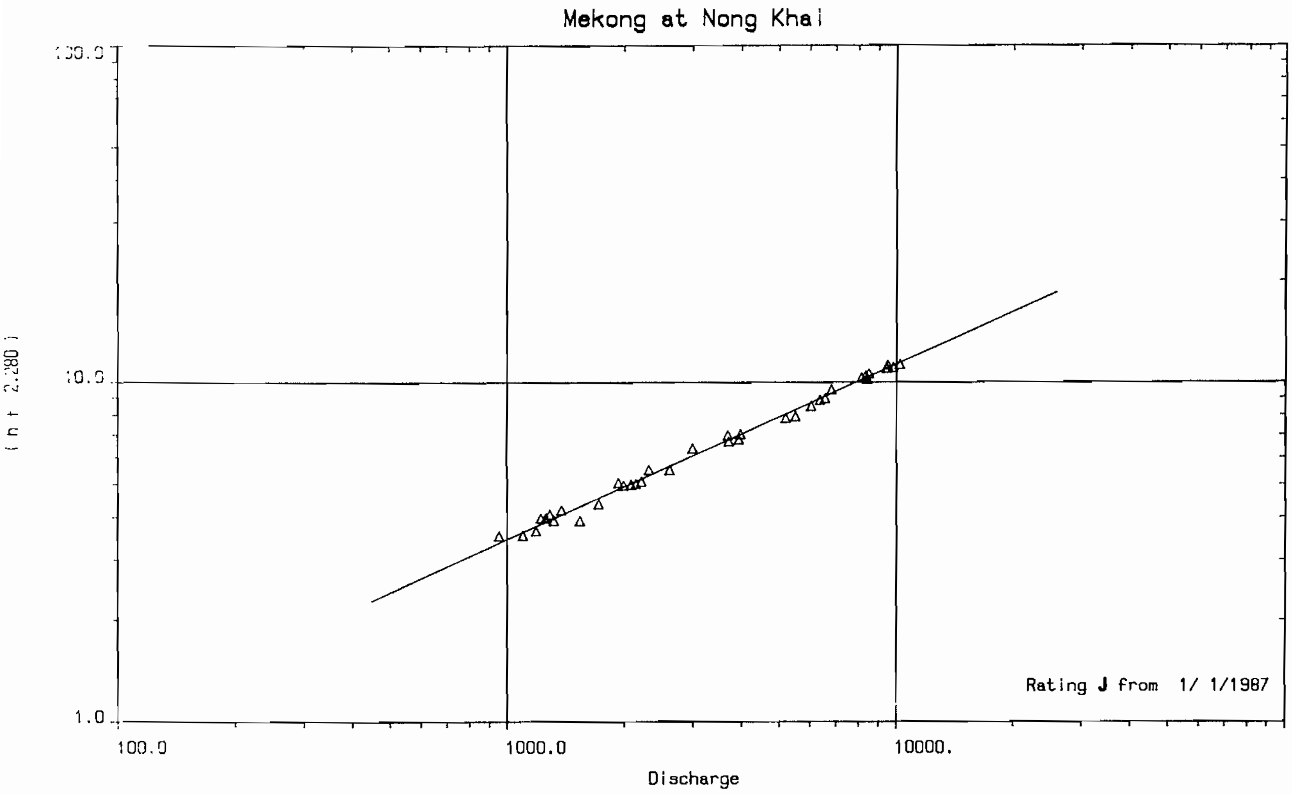


Figure C9.7.4j

River gaugings for station 12001 : Mekong at Nong Khai

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
1	9 Jan 1969	A	2.020	0.855	1797.04	1536.472	0.32/A	->>>
2	14 Jan 1969	A	1.930	0.902	1638.49	1477.921	0.31/A	->>>
3	16 Jan 1969	A	1.900	0.998	1648.19	1644.893	0.05/A	->
4	20 Jan 1969	A	1.900	1.014	1675.15	1698.606	-0.02/A	<-
5	23 Jan 1969	A	1.810	0.961	1708.10	1641.487	-0.04/A	<-
6	27 Jan 1969	A	1.710	0.943	1574.06	1484.334	0.08/A	->
7	29 Jan 1969	A	1.660	0.816	1535.00	1252.558	0.37/A	->>>>
8	4 Feb 1969	A	1.520	0.954	1462.85	1395.560	0.02/A	-
9	6 Feb 1969	A	1.490	0.977	1363.65	1332.284	0.08/A	->
10	10 Feb 1969	A	1.410	0.960	1407.42	1351.122	-0.03/A	<-
11	13 Feb 1969	A	1.360	0.931	1389.05	1293.210	0.01/A	-
12	17 Feb 1969	A	1.280	0.976	1318.84	1287.188	-0.06/A	<-
13	20 Feb 1969	A	1.180	0.930	1338.96	1245.256	-0.09/A	<-
14	25 Feb 1969	A	1.080	0.899	1302.12	1170.610	-0.08/A	<-
15	28 Feb 1969	A	1.030	0.920	1181.99	1087.427	0.01/A	-
16	4 Mar 1969	A	0.750	0.881	1204.94	1061.556	-0.23/A	<<<-
17	7 Mar 1969	A	0.910	0.843	1212.14	1021.832	0.00/A	-
18	10 Mar 1969	A	0.860	0.850	1142.61	971.216	0.04/A	->
19	13 Mar 1969	A	0.820	0.829	1160.48	962.041	0.02/A	-
20	17 Mar 1969	A	0.790	0.859	1081.11	928.676	0.05/A	->
21	19 May 1969	?	0.580	0.108	10157.41	1097.000	-0.46/A	<<<<-
22	22 May 1969	A	0.560	0.796	1005.26	800.185	0.06/A	->
23	26 May 1969	A	0.710	0.918	1055.78	969.208	-0.10/A	<-
24	29 May 1969	A	1.090	0.986	1165.73	1149.407	-0.03/A	<-
25	2 Jun 1969	A	1.880	0.946	1638.86	1550.364	0.16/A	->>
26	5 Jun 1969	?	2.940	0.953	1902.83	1813.398	0.87/A	->>>>
27	9 Jun 1969	A	2.940	1.110	2250.93	2498.535	0.06/A	->
28	12 Jun 1969	A	2.860	1.136	2183.88	2480.892	0.00/A	-
29	16 Jun 1969	A	2.640	1.096	2023.43	2217.677	0.08/A	->
30	23 Jun 1969	A	5.710	1.268	4117.07	5220.450	0.46/A	->>>>
31	26 Jun 1969	A	5.520	1.305	3757.09	4903.000	0.50/A	->>>>
32	30 Jun 1969	A	4.750	1.208	3486.70	4211.933	0.28/A	->>>
33	4 Jul 1969	A	5.030	1.240	3463.21	4294.376	0.49/A	->>>>
34	7 Jul 1969	A	4.760	1.248	3447.25	4302.174	0.21/A	->>
35	10 Jul 1969	A	4.730	1.175	3322.64	3904.100	0.51/A	->>>>
36	14 Jul 1969	A	5.980	1.276	4364.54	5569.159	0.48/A	->>>>
37	17 Jul 1969	A	7.090	1.534	4976.88	7634.540	0.25/A	->>>
38	21 Jul 1969	A	6.900	1.481	4902.93	7261.233	0.29/A	->>>
39	24 Jul 1969	?	7.670	1.151	6393.35	7358.748	1.00/A	->>>>
40	30 Jul 1969	A	8.720	1.620	6597.90	10688.601	0.22/A	->>
41	19 Aug 1969	A	12.300	2.522	7958.89	20072.321	-0.12/A	<-
42	20 Aug 1969	A	12.400	2.474	8644.22	21385.799	-0.48/A	<<<<-
43	21 Aug 1969	A	12.370	2.537	8641.99	21924.725	-0.70/A	<<<<-
44	22 Aug 1969	A	12.150	2.385	8577.74	20457.901	-0.41/A	<<<<-
45	23 Aug 1969	A	12.050	2.584	8019.35	20721.989	-0.60/A	<<<<-
46	23 Aug 1969	A	12.050	2.518	8026.69	20211.206	-0.42/A	<<<<-
47	25 Aug 1969	?	11.940	3.728	7412.24	27632.838	-2.96/A	<<<<-
48	27 Aug 1969	A	11.350	2.096	7568.92	15864.451	0.53/A	->>>>
49	29 Aug 1969	A	10.480	1.872	6936.42	12984.983	0.89/A	->>>>
50	1 Sep 1969	A	9.150	1.558	6875.64	10712.248	0.64/A	->>>>
51	3 Sep 1969	A	8.500	1.677	6177.99	10360.497	0.16/A	->>
52	5 Sep 1969	A	9.360	1.711	6090.81	10421.378	0.99/A	->>>>
53	8 Sep 1969	A	7.870	1.667	5840.44	9736.014	-0.14/A	<<-
54	10 Sep 1969	A	7.530	1.567	5652.04	8856.750	-0.01/A	-
55	12 Sep 1969	A	7.220	1.500	5396.41	8094.613	0.11/A	->
56	16 Sep 1969	A	8.000	1.666	6112.24	10182.987	-0.24/A	<<<-
57	17 Sep 1969	A	8.580	1.757	6429.99	11297.485	-0.22/A	<<<-
58	19 Sep 1969	A	8.680	1.658	6377.97	10574.680	0.24/A	->>>
59	22 Sep 1969	A	7.750	1.635	5917.40	9674.957	-0.23/A	<<<-
60	24 Sep 1969	A	7.550	1.563	5624.76	8791.496	0.05/A	->

River gaugings for station 12001 : Mekong at Nong Khai

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
61	26 Sep 1969	A	6.780	1.574	5125.21	8067.087	-0.31/A	<<<-
62	29 Sep 1969	A	6.070	1.440	4719.17	6795.606	-0.25/A	<<<-
63	1 Oct 1969	A	6.080	1.450	4668.12	6768.768	-0.22/A	<<<-
64	7 Oct 1969	A	5.550	1.345	4371.28	5879.376	-0.17/A	<<-
65	8 Oct 1969	A	5.520	1.313	4353.55	5716.210	-0.08/A	<-
66	10 Oct 1969	A	5.330	1.378	4242.42	5846.059	-0.36/A	<<<<-
67	13 Oct 1969	A	4.800	1.223	3808.38	4657.643	-0.03/A	<-
68	16 Oct 1969	A	4.510	1.260	3674.65	4630.064	-0.30/A	<<<-
69	17 Oct 1969	A	4.480	1.302	3629.92	4726.154	-0.40/A	<<<<-
70	20 Oct 1969	A	4.780	1.330	3723.12	4951.750	-0.27/A	<<<-
71	22 Oct 1969	A	4.970	1.396	3906.11	5452.930	-0.45/A	<<<<-
72	24 Oct 1969	A	4.580	1.390	3752.96	5216.610	-0.67/A	<<<<-
73	27 Oct 1969	A	4.690	1.335	3317.82	4429.291	0.04/A	->
74	29 Oct 1969	A	4.240	1.351	3456.19	4669.307	-0.60/A	<<<<-
75	31 Oct 1969	A	4.190	1.317	3077.81	4053.474	-0.15/A	<<-
76	3 Nov 1969	A	4.130	1.308	3274.52	4283.074	-0.40/A	<<<<-
77	5 Nov 1969	A	4.880	1.327	3626.68	4812.601	-0.07/A	<-
78	7 Nov 1969	A	5.250	1.297	3726.71	4833.548	0.29/A	->>>
79	10 Nov 1969	A	4.530	1.259	3421.35	4307.485	-0.02/A	<-
80	12 Nov 1969	A	4.060	1.319	2981.79	3932.985	-0.18/A	<<-
81	14 Nov 1969	A	3.740	1.230	2721.89	3347.928	0.02/A	-
82	17 Nov 1969	A	3.440	1.223	2715.52	3321.083	-0.26/A	<<<-
83	19 Nov 1969	A	3.250	1.178	2501.18	2946.392	-0.09/A	<-
84	21 Nov 1969	A	3.140	1.156	2444.11	2825.394	-0.08/A	<-
85	24 Nov 1969	A	3.040	1.190	2356.98	2804.803	-0.16/A	<<-
86	26 Nov 1969	A	3.090	1.083	2366.28	2562.678	0.15/A	->>
87	28 Nov 1969	A	2.900	1.148	2163.96	2484.222	0.04/A	->
88	1 Dec 1969	A	2.670	1.122	2057.53	2308.545	0.00/A	-
89	3 Dec 1969	A	2.550	1.128	1951.36	2201.129	0.01/A	-
90	8 Dec 1969	A	2.470	1.179	1811.52	2135.783	0.00/A	-
91	12 Dec 1969	A	2.320	1.132	1840.63	2083.592	-0.09/A	<-
92	15 Dec 1969	A	2.220	1.139	1675.77	1908.702	0.03/A	->
93	17 Dec 1969	A	2.100	1.084	1784.20	1934.072	-0.13/A	<<-
94	19 Dec 1969	A	2.060	1.131	1558.18	1762.296	0.05/A	->
95	22 Dec 1969	A	2.050	1.086	1721.90	1869.986	-0.10/A	<-
96	24 Dec 1969	A	1.950	1.091	1702.00	1856.881	-0.18/A	<<-
97	26 Dec 1969	A	1.900	1.035	1502.98	1555.584	0.17/A	->>
98	29 Dec 1969	A	1.900	1.082	1604.97	1736.575	-0.07/A	<-
99	15 Jan 1970	B	1.500	1.061	1448.12	1536.455	-0.01/B	-
100	16 Jan 1970	B	1.500	1.039	1507.20	1565.986	-0.05/B	<-
101	19 Jan 1970	B	1.460	0.971	1384.48	1344.333	0.25/B	->>>
102	21 Jan 1970	B	1.460	1.044	1432.61	1495.640	0.01/B	-
103	23 Jan 1970	B	1.380	0.967	1456.93	1408.847	0.06/B	->
104	26 Jan 1970	B	1.350	0.989	1464.15	1448.042	-0.03/B	<-
105	28 Jan 1970	B	1.260	1.087	1315.79	1430.259	-0.09/B	<-
106	30 Jan 1970	B	1.290	0.985	1307.92	1288.303	0.17/B	->>
107	2 Feb 1970	B	1.270	1.000	1435.01	1435.010	-0.09/B	<-
108	4 Feb 1970	B	1.230	1.007	1373.57	1383.180	-0.05/B	<-
109	6 Feb 1970	B	1.150	1.000	1388.75	1388.750	-0.13/B	<<-
110	9 Feb 1970	B	1.090	0.966	1321.20	1276.276	-0.01/B	-
111	12 Feb 1970	B	1.030	0.893	1310.80	1170.543	0.10/B	->
112	13 Feb 1970	B	1.020	0.890	1404.84	1250.306	-0.04/B	<-
113	16 Feb 1970	B	1.000	0.894	1368.66	1223.585	-0.02/B	-
114	18 Feb 1970	B	1.020	0.876	1300.07	1138.860	0.15/B	->>
115	23 Feb 1970	B	0.900	0.900	1330.40	1197.358	-0.07/B	<-
116	25 Feb 1970	B	0.860	0.950	1304.57	1239.342	-0.18/B	<<-
117	27 Feb 1970	B	0.800	0.866	1185.78	1026.889	0.13/B	->>
118	1 Mar 1970	B	0.750	0.923	1181.60	1090.613	-0.04/B	<-
119	4 Mar 1970	B	0.700	0.900	1249.69	1124.717	-0.15/B	<<-
120	13 Mar 1970	B	0.600	0.883	1172.41	1035.241	-0.09/B	<-

River gaugings for station 12001 : Mekong at Nong Khai

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
121	16 Mar 1970	B	0.580	0.800	1171.95	937.556	0.07/B	->
122	18 Mar 1970	B	0.600	0.855	1107.19	946.645	0.08/B	->
123	20 Mar 1970	B	0.560	0.849	1168.97	992.455	-0.05/B	<-
124	23 Mar 1970	B	0.500	0.851	1103.75	939.292	-0.01/B	-
125	27 Mar 1970	B	0.630	0.893	1182.21	1055.712	-0.10/B	<-
126	30 Mar 1970	B	0.700	0.912	1187.62	1083.107	-0.07/B	<-
127	1 Apr 1970	B	0.850	0.884	1236.78	1093.315	0.06/B	->
128	3 Apr 1970	B	0.830	0.897	1242.40	1114.437	-0.00/B	-
129	7 Apr 1970	B	0.690	0.908	1047.51	951.141	0.16/B	->>
130	8 Apr 1970	B	0.720	0.874	1089.69	952.388	0.19/B	->>
131	10 Apr 1970	B	0.900	0.909	1230.00	1118.067	0.06/B	->
132	14 Apr 1970	B	1.480	0.921	1690.34	1556.807	-0.06/B	<-
133	15 Apr 1970	B	1.430	0.941	1572.43	1479.661	0.00/B	-
134	17 Apr 1970	B	1.080	0.974	1354.70	1319.473	-0.09/B	<-
135	20 Apr 1970	B	0.940	0.960	1240.76	1191.134	-0.02/B	<-
136	22 Apr 1970	B	0.920	0.984	1232.23	1212.517	-0.08/B	<-
137	24 Apr 1970	B	0.970	0.964	1283.48	1237.271	-0.07/B	<-
138	27 Apr 1970	B	0.910	0.993	1181.89	1173.618	-0.02/B	<-
139	29 Apr 1970	B	1.030	0.976	1211.05	1181.989	0.08/B	->
140	1 May 1970	B	1.170	0.998	1320.62	1317.976	-0.00/B	-
141	4 May 1970	B	1.230	1.025	1340.55	1374.060	-0.03/B	<-
142	6 May 1970	B	1.250	1.006	1303.79	1311.610	0.09/B	->
143	7 May 1970	B	1.260	1.004	1344.21	1349.589	0.04/B	->
144	11 May 1970	B	1.520	0.948	1576.26	1494.295	0.07/B	->
145	13 May 1970	B	1.800	1.024	1697.51	1738.254	-0.00/B	-
146	18 May 1970	B	1.740	0.984	1805.47	1776.586	-0.11/B	<-
147	20 May 1970	B	1.870	0.997	1812.77	1807.334	-0.03/B	<-
148	25 May 1970	B	5.600	1.447	4235.55	6128.836	-0.42/B	<<<<-
149	28 May 1970	B	4.930	1.212	3696.04	4479.603	0.21/B	->>
150	29 May 1970	B	4.670	1.277	3515.13	4488.826	-0.06/B	<-
151	1 Jun 1970	B	4.450	1.230	3114.07	3830.303	0.31/B	->>>
152	3 Jun 1970	B	3.850	1.170	2869.41	3357.207	0.17/B	->>
153	5 Jun 1970	B	3.920	1.194	3076.06	3672.812	-0.07/B	<-
154	8 Jun 1970	B	3.670	1.156	2986.14	3451.975	-0.11/B	<-
155	10 Jun 1970	B	3.540	1.147	2927.01	3357.275	-0.15/B	<<-
156	12 Jun 1970	B	3.340	1.157	2829.86	3274.150	-0.26/B	<<<-
157	15 Jun 1970	B	4.040	1.267	3174.15	4021.644	-0.28/B	<<<-
158	17 Jun 1970	B	5.750	1.348	4162.20	5610.639	0.12/B	->
159	19 Jun 1970	B	5.530	1.392	4148.51	5774.731	-0.23/B	<<<-
160	22 Jun 1970	B	6.060	1.392	4463.35	6212.980	-0.02/B	<-
161	24 Jun 1970	B	5.780	1.368	4262.85	5831.585	-0.02/B	<-
162	26 Jun 1970	B	6.680	1.458	4822.43	7031.101	0.02/B	->
163	29 Jun 1970	B	7.450	1.578	5319.67	8394.448	-0.09/B	<-
164	13 Jul 1970	B	7.340	1.338	5515.55	7379.807	0.45/B	->>>>
165	15 Jul 1970	B	7.370	1.396	5840.23	8152.955	-0.02/B	-
166	17 Jul 1970	B	7.300	1.370	5616.74	7694.930	0.20/B	->>
167	26 Aug 1970	B	10.680	1.841	8040.34	14802.274	-0.26/B	<<<-
168	31 Aug 1970	B	10.490	1.717	7806.56	13403.870	0.21/B	->>
169	2 Sep 1970	B	10.410	1.767	7812.05	13803.885	-0.06/B	<-
170	27 Nov 1970	B	3.600	1.237	2724.33	3370.000	-0.10/B	<-
171	3 Dec 1970	B	3.130	1.167	2159.38	2520.000	0.34/B	->>>>
172	9 Dec 1970	B	3.680	1.174	2402.04	2820.000	0.55/B	->>>>
173	17 Dec 1970	B	4.780	1.437	3402.92	4890.000	-0.28/B	<<<-
174	28 Dec 1970	B	4.260	1.294	3276.66	4240.000	-0.25/B	<<<-
175	8 Jan 1971	C	2.600	1.068	2350.19	2510.000	-0.15/C	<<-
176	14 Jan 1971	C	2.330	1.037	2073.29	2150.000	0.05/C	->
177	21 Jan 1971	C	2.100	1.094	2129.80	2330.000	-0.42/C	<<<<-
178	27 Jan 1971	C	1.940	1.061	2186.62	2320.000	-0.57/C	<<<<-
179	11 Feb 1971	C	1.700	1.071	1848.74	1980.000	-0.35/C	<<<<-
180	18 Feb 1971	C	1.620	1.052	1749.05	1840.000	-0.22/C	<<<-

River gaugings for station 12001 : Mekong at Nong Khai

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
181	26 Feb 1971	C	1.430	0.928	1519.40	1410.000	0.28/C	->>>
182	12 Mar 1971	C	1.200	0.907	1312.02	1190.000	0.46/C	->>>>
183	17 Mar 1971	C	0.950	0.877	1231.47	1080.000	0.43/C	->>>>
184	25 Mar 1971	C	1.200	1.030	1388.35	1430.000	0.02/C	-
185	1 Apr 1971	C	0.830	0.946	1405.92	1330.000	-0.17/C	<<-
186	7 Apr 1971	C	0.760	0.911	1284.30	1170.000	0.06/C	->
187	16 Apr 1971	C	0.750	0.946	1257.93	1190.000	0.01/C	-
188	21 Apr 1971	C	0.640	0.940	1351.06	1270.000	-0.25/C	<<<-
189	30 Apr 1971	C	1.140	0.970	1360.82	1320.000	0.15/C	->>
190	8 May 1971	C	0.970	0.925	1394.59	1290.000	0.04/C	->
191	14 May 1971	C	1.210	0.942	1433.12	1350.000	0.17/C	->>
192	20 May 1971	C	1.450	1.020	1509.80	1540.000	0.08/C	->
193	27 May 1971	C	1.860	1.052	1711.03	1800.000	0.08/C	->
194	5 Jun 1971	C	4.260	1.141	3234.01	3690.000	0.22/C	->>
195	10 Jun 1971	C	3.670	1.112	3003.60	3340.000	-0.02/C	<-
196	17 Jun 1971	C	4.280	1.174	3194.21	3750.000	0.18/C	->>
197	24 Jun 1971	C	5.120	1.288	3625.78	4670.000	0.19/C	->>
198	29 Jul 1971	C	10.940	2.287	7477.04	17100.000	-0.69/C	<<<<-
199	6 Aug 1971	C	10.610	2.175	6942.53	15100.000	-0.22/C	<<<-
200	11 Aug 1971	C	10.560	2.261	6855.37	15500.000	-0.44/C	<<<<-
201	16 Aug 1971	C	11.960	2.554	7830.85	20000.000	-0.73/C	<<<<-
202	17 Aug 1971	C	12.170	2.571	7351.22	18899.999	-0.13/C	<<-
203	18 Aug 1971	C	12.360	2.659	7371.19	19599.999	-0.19/C	<<-
204	19 Aug 1971	C	12.480	2.868	7252.44	20800.000	-0.49/C	<<<<-
205	20 Aug 1971	C	12.750	2.956	7476.32	22100.000	-0.66/C	<<<<-
206	20 Aug 1971	C	12.750	2.956	7307.17	21600.000	-0.49/C	<<<<-
207	23 Aug 1971	C	13.070	2.814	7320.54	20600.000	0.17/C	->>
208	1 Sep 1971	C	12.980	3.148	7433.29	23399.999	-0.85/C	<<<<-
209	3 Sep 1971	C	13.060	3.060	7418.30	22699.999	-0.54/C	<<<<-
210	4 Sep 1971	C	13.030	2.744	7908.16	21699.999	-0.24/C	<<<-
211	6 Sep 1971	C	12.880	2.178	7575.76	16500.000	1.48/C	->>>>
212	7 Sep 1971	C	12.680	2.314	7692.31	17800.000	0.78/C	->>>>
213	8 Sep 1971	C	12.380	2.200	7727.27	17000.000	0.79/C	->>>>
214	9 Sep 1971	C	12.190	2.179	7388.71	16100.001	0.95/C	->>>>
215	7 Oct 1971	C	7.360	1.471	4826.65	7100.000	0.62/C	->>>>
216	14 Oct 1971	C	6.960	1.247	4530.87	5650.000	1.24/C	->>>>
217	21 Oct 1971	C	5.750	1.381	3953.66	5460.000	0.18/C	->>
218	29 Oct 1971	C	4.690	1.307	3068.09	4010.000	0.34/C	->>>>
219	4 Nov 1971	C	6.310	1.629	4395.33	7160.000	-0.47/C	<<<<-
220	11 Nov 1971	C	4.510	1.353	3237.25	4380.000	-0.17/C	<<-
221	20 Nov 1971	C	3.950	1.220	2778.69	3390.000	0.21/C	->>
222	25 Nov 1971	C	3.500	1.360	2426.47	3300.000	-0.15/C	<<-
223	2 Dec 1971	C	3.150	1.337	2453.25	3280.000	-0.48/C	<<<<-
224	9 Dec 1971	C	2.880	1.315	2266.16	2980.000	-0.42/C	<<<<-
225	16 Dec 1971	C	2.620	1.312	1928.35	2530.000	-0.16/C	<<-
226	22 Dec 1971	C	2.410	1.279	1748.24	2236.000	0.01/C	-
227	13 Jan 1972	D	2.080	1.046	1624.28	1699.000	0.29/D	->>>
228	20 Jan 1972	D	1.800	1.208	1595.20	1927.000	-0.34/D	<<<<-
229	27 Jan 1972	D	1.650	1.114	1455.12	1621.000	-0.01/D	-
230	3 Feb 1972	D	1.500	1.078	1453.62	1567.000	-0.07/D	<-
231	10 Feb 1972	D	1.520	1.097	1310.85	1438.000	0.17/D	->>
232	14 Apr 1972	D	1.360	0.945	1340.74	1267.000	0.32/D	->>>>
233	20 Apr 1972	D	1.460	0.987	1406.28	1388.000	0.20/D	->>
234	27 Apr 1972	D	0.760	0.940	1255.32	1180.000	-0.11/D	<-
235	3 May 1972	D	1.210	0.905	1345.86	1218.000	0.26/D	->>>
236	11 May 1972	D	1.610	1.005	1418.91	1426.000	0.28/D	->>>
237	18 May 1972	D	1.160	0.941	1323.06	1245.000	0.16/D	->>
238	25 May 1972	D	1.550	0.953	1458.55	1390.000	0.28/D	->>>
239	1 Jun 1972	D	1.750	1.059	1671.39	1770.000	-0.15/D	<<-
240	8 Jun 1972	D	2.020	1.127	1740.91	1962.000	-0.17/D	<<-

River gaugings for station 12001 : Mekong at Nong Khai

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
241	15 Jun 1972	D	3.100	1.171	2297.18	2690.000	-0.08/D	<-
242	21 Jun 1972	D	2.360	1.195	1876.15	2242.000	-0.23/D	<<<-
243	23 Jun 1972	D	2.400	1.206	1936.15	2335.000	-0.32/D	<<<-
244	26 Jun 1972	D	2.800	1.205	2132.78	2570.000	-0.23/D	<<<-
245	30 Jun 1972	D	3.020	1.096	2290.15	2510.000	0.07/D	->
246	3 Jul 1972	D	2.880	1.152	2106.77	2427.000	0.04/D	->
247	7 Jul 1972	D	3.270	1.309	2469.06	3232.000	-0.55/D	<<<<-
248	10 Jul 1972	D	3.340	1.263	2453.68	3099.000	-0.33/D	<<<<-
249	14 Jul 1972	D	3.020	1.230	2265.04	2786.000	-0.28/D	<<<-
250	17 Jul 1972	D	3.020	1.167	2286.20	2668.000	-0.13/D	<<-
251	21 Jul 1972	D	3.830	1.296	2712.19	3515.000	-0.30/D	<<<-
252	24 Jul 1972	D	5.660	1.341	3894.11	5222.000	-0.10/D	<-
253	26 Jul 1972	D	6.480	1.390	4312.23	5994.000	0.09/D	->
254	28 Jul 1972	D	5.920	1.319	4098.56	5406.000	0.01/D	-
255	31 Jul 1972	D	5.900	1.283	4074.05	5227.000	0.14/D	->>
256	2 Aug 1972	D	8.430	1.626	5758.30	9363.000	-0.32/D	<<<-
257	4 Aug 1972	D	8.940	1.649	5625.23	9276.000	0.25/D	->>>
258	7 Aug 1972	D	9.170	1.711	5670.95	9703.000	0.21/D	->>
259	9 Aug 1972	D	9.270	1.748	5804.35	10146.000	0.05/D	->
260	11 Aug 1972	D	9.280	1.621	5805.68	9411.001	0.50/D	->>>>
261	16 Aug 1972	D	8.560	1.745	5564.47	9710.000	-0.40/D	<<<<-
262	18 Aug 1972	?	9.870	1.414	5480.20	7749.000	2.18/D	->>>>
263	21 Aug 1972	D	8.110	1.441	5054.82	7284.000	0.75/D	->>>>
264	23 Aug 1972	D	8.290	1.366	5047.58	6895.000	1.21/D	->>>>
265	25 Aug 1972	D	8.960	1.619	5591.11	9052.001	0.41/D	->>>>
266	11 Sep 1972	D	8.250	1.438	5132.13	7380.000	0.82/D	->>>>
267	13 Sep 1972	D	7.680	1.390	4597.12	6390.000	0.98/D	->>>>
268	15 Sep 1972	D	6.990	1.351	4287.19	5792.000	0.76/D	->>>>
269	18 Sep 1972	D	6.390	1.293	4026.30	5206.000	0.65/D	->>>>
270	20 Sep 1972	D	6.060	1.290	4024.81	5192.000	0.33/D	->>>>
271	22 Sep 1972	D	5.760	1.231	4055.24	4992.000	0.20/D	->>
272	25 Sep 1972	D	5.400	1.152	3845.49	4430.000	0.36/D	->>>>
273	27 Sep 1972	D	5.540	1.174	3972.74	4664.000	0.28/D	->>>
274	29 Sep 1972	D	6.070	1.226	4071.78	4992.000	0.51/D	->>>>
275	2 Oct 1972	D	6.760	1.523	4838.48	7369.000	-0.67/D	<<<<-
276	4 Oct 1972	D	7.370	1.584	5165.40	8182.000	-0.62/D	<<<<-
277	6 Oct 1972	D	7.450	1.586	5257.88	8339.000	-0.64/D	<<<<-
278	9 Oct 1972	D	6.400	1.464	4640.71	6794.000	-0.61/D	<<<<-
279	11 Oct 1972	D	5.810	1.331	4247.93	5654.000	-0.31/D	<<<-
280	16 Oct 1972	D	6.210	1.310	4534.35	5940.000	-0.14/D	<<-
281	18 Oct 1972	D	6.220	1.340	4620.15	6191.000	-0.33/D	<<<<-
282	20 Oct 1972	D	6.360	1.465	4650.51	6813.000	-0.66/D	<<<<-
283	26 Oct 1972	D	5.860	1.302	4351.77	5666.000	-0.27/D	<<<-
284	27 Oct 1972	D	5.700	1.187	4330.24	5140.000	0.02/D	-
285	30 Oct 1972	D	5.320	1.141	3980.72	4542.000	0.17/D	->>
286	1 Nov 1972	D	5.010	1.127	3888.20	4382.000	0.01/D	-
287	3 Nov 1972	D	4.710	1.096	3624.09	3972.000	0.11/D	->
288	6 Nov 1972	D	4.200	1.073	3326.19	3569.000	0.02/D	-
289	8 Nov 1972	D	4.000	1.062	3143.13	3338.000	0.07/D	->
290	10 Nov 1972	D	3.930	1.133	2982.35	3379.000	-0.05/D	<-
291	13 Nov 1972	D	5.400	1.367	3899.05	5330.000	-0.45/D	<<<<-
292	15 Nov 1972	D	6.460	1.429	4648.01	6642.000	-0.43/D	<<<<-
293	17 Nov 1972	D	5.500	1.254	4232.85	5308.000	-0.33/D	<<<<-
294	20 Nov 1972	D	4.490	1.130	3353.10	3789.000	0.08/D	->
295	22 Nov 1972	D	4.180	1.076	3217.47	3462.000	0.11/D	->
296	24 Nov 1972	D	3.940	1.198	2876.46	3446.000	-0.11/D	<-
297	27 Nov 1972	D	4.410	1.205	3361.83	4051.000	-0.27/D	<<<-
298	29 Nov 1972	D	4.830	1.250	3397.60	4247.000	-0.04/D	<-
299	1 Dec 1972	D	4.340	1.309	3148.20	4121.000	-0.41/D	<<<<-
300	4 Dec 1972	D	5.350	1.268	4077.29	5170.000	-0.36/D	<<<<-

River gaugings for station 12001 : Mekong at Nong Khai

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
301	6 Dec 1972	D	6.010	1.447	4644.09	6720.000	-0.94/D	<<<<-
302	8 Dec 1972	D	6.080	1.288	4743.79	6110.000	-0.41/D	<<<<-
303	13 Dec 1972	D	4.480	1.045	3234.45	3380.000	0.50/D	->>>>
304	15 Dec 1972	D	4.120	1.114	3043.09	3390.000	0.13/D	->>
305	21 Dec 1972	D	4.100	1.154	3327.56	3840.000	-0.37/D	<<<<-
306	25 Dec 1972	D	3.560	0.980	3040.82	2980.000	0.03/D	->
307	27 Dec 1972	D	3.360	0.896	2823.66	2530.000	0.38/D	->>>>
308	29 Dec 1972	D	3.180	0.902	2782.70	2510.000	0.23/D	->>>
309	3 Jan 1973	E	2.860	0.844	2527.84	2133.500	0.28/E	->>>
310	5 Jan 1973	E	2.780	0.837	2488.29	2082.700	0.26/E	->>>
311	8 Jan 1973	E	2.700	0.831	2462.33	2046.200	0.22/E	->>>
312	10 Jan 1973	E	2.600	0.826	2402.54	1984.500	0.19/E	->>
313	12 Jan 1973	E	2.530	0.962	2071.41	1992.700	0.11/E	->
314	15 Jan 1973	E	2.420	0.936	2017.20	1888.100	0.12/E	->>
315	17 Jan 1973	E	2.390	0.906	1987.64	1800.800	0.20/E	->>
316	19 Jan 1973	E	2.320	0.921	1957.65	1803.000	0.13/E	->>
317	22 Jan 1973	E	2.240	0.880	1931.70	1699.900	0.17/E	->>
318	24 Jan 1973	E	2.180	0.852	1856.34	1581.600	0.26/E	->>>
319	26 Jan 1973	E	2.150	0.990	1835.66	1817.300	-0.06/E	<-
320	29 Jan 1973	E	2.070	0.882	1817.12	1602.700	0.12/E	->>
321	31 Jan 1973	E	1.990	0.962	1712.79	1647.700	-0.01/E	-
322	2 Feb 1973	E	1.940	1.120	1671.79	1872.400	-0.34/E	<<<<-
323	5 Feb 1973	E	1.860	0.990	1630.00	1613.700	-0.10/E	<-
324	7 Feb 1973	E	1.830	0.903	1588.15	1434.100	0.10/E	->
325	9 Feb 1973	E	1.800	1.039	1561.31	1622.200	-0.17/E	<<-
326	12 Feb 1973	E	1.790	1.027	1581.30	1624.000	-0.18/E	<<-
327	14 Feb 1973	E	1.750	0.982	1590.12	1561.500	-0.15/E	<<-
328	16 Feb 1973	E	1.700	0.999	1508.11	1506.600	-0.13/E	<<-
329	21 Feb 1973	E	1.590	1.019	1478.80	1506.900	-0.24/E	<<<-
330	23 Feb 1973	E	1.560	0.980	1466.02	1436.700	-0.17/E	<<-
331	26 Feb 1973	E	1.470	0.879	1391.13	1222.800	0.03/E	->
332	28 Feb 1973	E	1.450	0.908	1345.48	1221.700	0.01/E	-
333	2 Mar 1973	E	1.430	0.858	1347.20	1155.900	0.08/E	->
334	5 Mar 1973	E	1.370	1.028	1270.72	1306.300	-0.19/E	<<-
335	7 Mar 1973	E	1.350	0.874	1289.13	1126.700	0.05/E	->
336	9 Mar 1973	E	1.350	0.851	1285.90	1094.300	0.09/E	->
337	12 Mar 1973	E	1.580	0.929	1456.30	1352.900	-0.04/E	<-
338	14 Mar 1973	E	1.980	0.971	1634.19	1586.800	0.05/E	->
339	16 Mar 1973	E	2.540	1.064	2133.65	2270.200	-0.19/E	<<-
340	19 Mar 1973	E	2.540	1.100	1998.64	2198.500	-0.11/E	<-
341	21 Mar 1973	E	1.850	0.949	1661.85	1577.100	-0.07/E	<-
342	23 Mar 1973	E	1.520	0.859	1498.84	1287.500	-0.01/E	-
343	26 Mar 1973	E	1.450	0.822	1614.72	1327.300	-0.14/E	<<-
344	28 Mar 1973	E	1.470	0.851	1383.78	1177.600	0.09/E	->
345	30 Mar 1973	E	1.500	0.847	1307.44	1107.400	0.22/E	->>>
346	2 Apr 1973	E	1.470	0.839	1302.74	1093.000	0.22/E	->>
347	4 Apr 1973	E	1.430	0.800	1506.50	1205.200	0.01/E	-
348	9 Apr 1973	E	1.290	0.821	1496.59	1228.700	-0.16/E	<<-
349	11 Apr 1973	E	1.260	0.845	1320.83	1116.100	-0.03/E	<-
350	16 Apr 1973	E	1.310	0.843	1479.48	1247.200	-0.17/E	<<-
351	18 Apr 1973	E	1.310	0.861	1354.82	1166.500	-0.05/E	<-
352	20 Apr 1973	E	1.310	0.857	1366.98	1171.500	-0.06/E	<-
353	23 Apr 1973	E	1.540	0.880	1464.77	1289.000	0.01/E	-
354	25 Apr 1973	E	1.820	0.836	1570.33	1312.800	0.25/E	->>>
355	27 Apr 1973	E	2.610	0.909	1877.01	1706.200	0.53/E	->>>>
356	30 Apr 1973	E	2.280	0.731	2490.83	1820.800	0.06/E	->
357	2 May 1973	E	2.090	0.974	1767.76	1721.800	-0.01/E	-
358	4 May 1973	E	1.780	0.926	1630.45	1509.800	-0.05/E	<-
359	9 May 1973	E	1.700	0.946	1467.65	1388.400	0.03/E	->
360	11 May 1973	E	1.970	0.976	1768.03	1725.600	-0.13/E	<<-

River gaugings for station 12001 : Mekong at Nong Khai

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
361	14 May 1973	E	2.360	0.986	1889.66	1863.200	0.09/E	->
362	18 May 1973	E	2.700	0.951	2094.43	1991.800	0.28/E	->>>
363	21 May 1973	E	2.690	1.016	2132.28	2166.400	0.08/E	->
364	23 May 1973	E	2.400	0.941	1928.69	1814.900	0.19/E	->>
365	25 May 1973	E	2.520	1.026	2011.60	2063.900	0.02/E	->
366	28 May 1973	E	2.700	1.021	2161.70	2207.100	0.04/E	->
367	30 May 1973	E	2.850	1.027	2340.31	2403.500	-0.02/E	<-
368	1 Jun 1973	E	2.920	1.059	2363.46	2502.900	-0.06/E	<-
369	4 Jun 1973	E	3.330	1.119	2579.18	2886.100	-0.03/E	<-
370	6 Jun 1973	E	3.420	1.056	2643.75	2791.800	0.15/E	->>
371	8 Jun 1973	E	3.760	1.123	2820.93	3167.900	0.12/E	->>
372	11 Jun 1973	E	3.950	1.149	2985.64	3430.500	0.07/E	->
373	13 Jun 1973	E	4.120	1.151	3046.83	3506.900	0.17/E	->>
374	15 Jun 1973	E	4.530	1.205	3418.84	4119.700	0.04/E	->
375	18 Jun 1973	E	5.040	1.277	3674.00	4691.700	0.08/E	->
376	20 Jun 1973	E	5.130	1.272	3804.72	4839.600	0.05/E	->
377	22 Jun 1973	E	5.020	1.233	3782.08	4663.300	0.08/E	->
378	27 Jun 1973	E	5.270	1.209	3956.66	4783.600	0.24/E	->>>
379	29 Jun 1973	E	4.920	1.205	3474.69	4187.000	0.38/E	->>>>
380	2 Jul 1973	E	5.000	1.178	3738.88	4404.400	0.28/E	->>>
381	4 Jul 1973	E	5.860	1.222	4375.78	5347.200	0.39/E	->>>>
382	6 Jul 1973	E	6.600	1.470	4756.73	6992.400	-0.05/E	<-
383	9 Jul 1973	E	7.330	1.523	5413.85	8245.300	-0.14/E	<<-
384	11 Jul 1973	E	7.150	1.510	5204.11	7858.200	-0.07/E	<-
385	13 Jul 1973	E	7.440	1.509	5454.34	8230.600	-0.02/E	-
386	18 Jul 1973	E	8.380	1.656	6202.84	10271.900	-0.31/E	<<<-
387	20 Jul 1973	E	9.020	1.605	6870.09	11026.500	-0.10/E	<-
388	23 Jul 1973	E	8.580	1.722	6317.89	10879.401	-0.46/E	<<<<-
389	25 Jul 1973	E	7.490	1.518	5518.31	8376.801	-0.06/E	<-
390	27 Jul 1973	E	6.750	1.381	5071.03	7003.100	0.10/E	->
391	30 Jul 1973	E	7.230	1.496	5231.82	7826.800	0.03/E	->
392	1 Aug 1973	E	8.940	1.661	6696.45	11122.801	-0.23/E	<<<-
393	3 Aug 1973	E	9.200	1.930	7039.53	13586.300	-1.29/E	<<<<-
394	6 Aug 1973	E	8.810	1.716	6456.88	11080.000	-0.34/E	<<<<-
395	8 Aug 1973	E	9.080	1.997	6770.66	13521.000	-1.38/E	<<<<-
396	21 Sep 1973	E	11.280	1.863	6660.39	12408.300	1.41/E	->>>>
397	24 Sep 1973	E	10.750	1.788	6719.57	12014.599	1.09/E	->>>>
398	26 Sep 1973	E	10.550	1.927	6721.54	12952.402	0.39/E	->>>>
399	28 Sep 1973	E	10.360	1.872	6490.60	12150.400	0.62/E	->>>>
400	3 Oct 1973	E	9.450	1.562	6191.74	9671.500	1.11/E	->>>>
401	5 Oct 1973	E	8.810	1.664	5891.77	9803.901	0.39/E	->>>>
402	10 Oct 1973	E	7.480	1.486	5246.84	7796.800	0.30/E	->>>
403	12 Oct 1973	E	6.980	1.507	5170.94	7792.600	-0.20/E	<<-
404	15 Oct 1973	E	6.370	1.323	4690.40	6205.400	0.27/E	->>>
405	17 Oct 1973	E	6.000	1.398	4468.53	6247.000	-0.13/E	<<-
406	19 Oct 1973	E	5.710	1.389	4204.18	5839.600	-0.13/E	<<-
407	22 Oct 1973	E	5.320	1.373	4045.67	5554.700	-0.31/E	<<<-
408	24 Oct 1973	E	5.200	1.363	3975.72	5418.900	-0.32/E	<<<<-
409	26 Oct 1973	E	5.350	1.300	3922.62	5099.400	0.07/E	->
410	29 Oct 1973	E	5.200	1.393	3955.78	5510.400	-0.39/E	<<<<-
411	31 Oct 1973	E	5.390	1.425	3878.11	5526.300	-0.21/E	<<-
412	2 Nov 1973	E	6.090	1.525	4396.46	6704.600	-0.36/E	<<<<-
413	5 Nov 1973	E	5.160	1.371	3941.79	5404.200	-0.35/E	<<<<-
414	9 Nov 1973	E	4.640	1.388	3202.52	4445.100	-0.12/E	<-
415	12 Nov 1973	E	4.360	1.484	2877.22	4269.800	-0.25/E	<<<-
416	14 Nov 1973	E	4.900	1.631	3218.52	5249.400	-0.49/E	<<<<-
417	16 Nov 1973	E	6.120	1.754	3809.92	6682.600	-0.32/E	<<<-
418	19 Nov 1973	E	5.170	1.588	3196.10	5075.400	-0.09/E	<-
419	21 Nov 1973	E	4.860	1.631	3000.61	4894.000	-0.26/E	<<<-
420	23 Nov 1973	E	4.730	1.482	3049.73	4519.700	-0.09/E	<-

River gaugings for station 12001 : Mekong at Nong Khai

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
421	26 Nov 1973	E	4.670	1.486	3176.11	4719.700	-0.31/E	<<<-
422	28 Nov 1973	E	6.000	1.626	3937.02	6401.600	-0.24/E	<<<-
423	30 Nov 1973	E	5.480	1.499	3732.15	5594.500	-0.18/E	<<-
424	3 Dec 1973	E	4.660	1.446	3148.62	4552.900	-0.19/E	<<-
425	7 Dec 1973	E	4.140	1.322	2908.24	3844.700	-0.11/E	<-
426	12 Dec 1973	E	3.660	1.220	2605.49	3178.700	0.01/E	-
427	18 Dec 1973	E	3.360	1.183	2547.08	3013.200	-0.13/E	<<-
428	21 Dec 1973	E	3.250	1.126	2621.40	2951.700	-0.18/E	<<-
429	24 Dec 1973	E	3.100	1.204	2364.37	2846.700	-0.22/E	<<<-
430	28 Dec 1973	E	2.900	1.074	2197.95	2360.600	0.08/E	->
431	2 Jan 1974	F	2.620	1.112	2117.00	2354.100	-0.27/F	<<<-
432	4 Jan 1974	F	2.550	1.088	2059.37	2240.600	-0.20/F	<<-
433	7 Jan 1974	F	2.460	1.075	2026.23	2178.200	-0.21/F	<<-
434	9 Jan 1974	F	2.410	1.042	1977.54	2060.600	-0.11/F	<-
435	14 Jan 1974	F	2.260	1.024	1932.52	1978.900	-0.15/F	<<-
436	16 Jan 1974	F	2.240	1.014	1940.14	1967.300	-0.16/F	<<-
437	18 Jan 1974	F	2.150	0.971	1982.39	1924.900	-0.19/F	<<-
438	21 Jan 1974	F	2.080	0.972	1821.09	1770.100	-0.04/F	<-
439	23 Jan 1974	F	2.050	0.977	1780.35	1739.400	-0.03/F	<-
440	25 Jan 1974	F	2.000	0.976	1763.11	1720.800	-0.05/F	<-
441	28 Jan 1974	F	1.970	0.976	1743.95	1702.100	-0.06/F	<-
442	30 Jan 1974	F	1.930	0.951	1746.06	1660.500	-0.03/F	<-
443	1 Feb 1974	F	1.880	0.897	1783.95	1600.200	0.01/F	-
444	8 Feb 1974	F	1.640	0.863	1683.55	1452.900	-0.00/F	-
445	11 Feb 1974	F	1.570	0.875	1580.91	1383.300	0.04/F	->
446	13 Feb 1974	F	1.570	0.889	1564.23	1390.600	0.03/F	->
447	15 Feb 1974	F	1.560	0.882	1566.10	1381.300	0.03/F	->
448	18 Feb 1974	F	1.520	0.860	1504.53	1293.900	0.14/F	->>
449	20 Feb 1974	F	1.520	0.864	1515.51	1309.400	0.11/F	->
450	22 Feb 1974	F	1.480	0.840	1484.05	1246.600	0.18/F	->>
451	25 Feb 1974	F	1.450	0.829	1480.94	1227.700	0.19/F	->>
452	27 Feb 1974	F	1.420	0.811	1459.43	1183.600	0.23/F	->>>
453	1 Mar 1974	F	1.380	0.787	1466.71	1154.300	0.25/F	->>>
454	4 Mar 1974	F	1.220	0.756	1436.38	1085.900	0.22/F	->>
455	6 Mar 1974	F	1.170	0.791	1434.13	1134.400	0.07/F	->
456	8 Mar 1974	F	1.160	0.816	1419.61	1158.400	0.02/F	->
457	11 Mar 1974	F	1.150	0.850	1352.24	1149.400	0.03/F	->
458	13 Mar 1974	F	1.110	0.831	1317.81	1095.100	0.09/F	->
459	15 Mar 1974	F	1.050	0.829	1335.59	1107.200	0.01/F	-
460	18 Mar 1974	F	1.090	0.829	1322.80	1096.600	0.07/F	->
461	21 Mar 1974	F	1.040	0.813	1378.72	1120.900	-0.03/F	<-
462	22 Mar 1974	F	1.020	0.802	1368.58	1097.600	-0.01/F	-
463	25 Mar 1974	F	1.090	0.914	1348.14	1232.200	-0.18/F	<<-
464	1 Apr 1974	F	1.370	0.927	1465.80	1358.800	-0.12/F	<<-
465	3 Apr 1974	F	1.250	0.848	1380.07	1170.300	0.09/F	->
466	5 Apr 1974	F	1.260	0.887	1471.03	1304.800	-0.14/F	<<-
467	10 Apr 1974	F	1.790	0.897	1733.56	1555.000	-0.01/F	-
468	12 Apr 1974	F	2.020	0.941	1806.80	1700.200	-0.00/F	-
469	17 Apr 1974	F	1.670	0.956	1564.02	1495.200	-0.04/F	<-
470	19 Apr 1974	F	1.690	0.936	1568.16	1467.800	0.02/F	->
471	22 Apr 1974	F	1.420	0.978	1463.19	1431.000	-0.19/F	<<-
472	24 Apr 1974	F	1.270	0.898	1373.72	1233.600	-0.01/F	-
473	26 Apr 1974	F	1.260	0.897	1375.25	1233.600	-0.02/F	-
474	29 Apr 1974	F	1.520	0.928	1527.37	1417.400	-0.07/F	<-
475	1 May 1974	F	1.860	1.008	1717.06	1730.800	-0.21/F	<<-
476	3 May 1974	F	2.420	1.047	1964.37	2056.700	-0.09/F	<-
477	7 May 1974	F	2.480	1.030	1963.50	2022.400	0.01/F	-
478	10 May 1974	F	2.060	0.940	1887.87	1774.600	-0.07/F	<-
479	13 May 1974	F	1.910	0.985	1697.26	1671.800	-0.07/F	<-
480	15 May 1974	F	1.980	1.044	1700.10	1774.900	-0.15/F	<<-

River gaugings for station 12001 : Mekong at Nong Khai

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
481	17 May 1974	F	1.980	1.002	1753.09	1756.600	-0.12/F	<<-
482	20 May 1974	F	2.240	1.063	1910.91	2031.300	-0.24/F	<<<-
483	22 May 1974	F	2.210	1.044	1828.16	1908.600	-0.11/F	<-
484	24 May 1974	F	2.190	1.043	1836.24	1915.200	-0.14/F	<<-
485	29 May 1974	F	2.300	1.024	1923.73	1969.900	-0.10/F	<-
486	31 May 1974	F	2.620	1.041	2099.81	2185.900	-0.06/F	<-
487	3 Jun 1974	F	3.110	0.976	2482.99	2423.400	0.14/F	->>
488	5 Jun 1974	F	3.350	1.100	2625.27	2887.800	-0.14/F	<<-
489	7 Jun 1974	F	3.330	1.024	2666.41	2730.400	0.01/F	-
490	10 Jun 1974	F	3.250	1.003	2570.49	2578.200	0.10/F	->
491	12 Jun 1974	F	3.510	1.089	2828.93	3080.700	-0.18/F	<<-
492	14 Jun 1974	F	3.880	1.121	3126.40	3504.700	-0.23/F	<<<-
493	17 Jun 1974	F	4.690	1.175	3486.64	4096.800	0.04/F	->
494	19 Jun 1974	F	5.370	1.149	3955.27	4544.600	0.34/F	->>>>
495	21 Jun 1974	F	4.990	1.192	3727.94	4443.700	0.04/F	->
496	24 Jun 1974	F	4.830	1.196	3591.22	4295.100	0.01/F	-
497	26 Jun 1974	F	4.640	1.161	3423.08	3974.200	0.10/F	->
498	28 Jun 1974	F	4.280	1.120	3327.50	3726.800	-0.04/F	<-
499	1 Jul 1974	F	4.220	1.126	3199.73	3602.900	0.01/F	-
500	3 Jul 1974	F	4.750	1.140	3573.33	4073.600	0.12/F	->
501	5 Jul 1974	F	5.120	1.210	3807.19	4606.700	0.04/F	->
502	8 Jul 1974	F	5.170	1.211	3895.79	4717.800	0.00/F	-
503	10 Jul 1974	F	5.430	1.215	4017.37	4881.100	0.13/F	->>
504	12 Jul 1974	F	5.460	1.193	4045.43	4826.200	0.21/F	->>
505	15 Jul 1974	F	4.860	1.133	3678.11	4167.300	0.15/F	->>
506	22 Jul 1974	F	5.430	1.215	3971.03	4824.800	0.18/F	->>
507	29 Jul 1974	F	7.430	1.449	5436.85	7878.000	0.11/F	->
508	5 Aug 1974	F	8.620	1.680	6270.77	10534.901	-0.13/F	<<-
509	15 Aug 1974	F	9.250	1.785	6834.96	12200.400	-0.29/F	<<<-
510	19 Aug 1974	F	9.420	1.791	6952.43	12451.801	-0.24/F	<<<-
511	22 Aug 1974	F	8.690	1.674	6585.36	11023.901	-0.30/F	<<<-
512	26 Aug 1974	F	8.260	1.612	6310.42	10172.401	-0.31/F	<<<-
513	29 Aug 1974	F	9.040	1.797	6391.15	11484.901	-0.17/F	<<-
514	2 Sep 1974	F	11.000	2.131	7630.50	16260.600	-0.23/F	<<<-
515	5 Sep 1974	F	10.740	2.069	7277.09	15056.301	-0.02/F	<-
516	9 Sep 1974	F	10.400	1.997	7134.90	14248.400	-0.03/F	<-
517	12 Sep 1974	F	10.110	1.829	6785.35	12410.400	0.47/F	->>>>
518	16 Sep 1974	F	10.220	2.078	6714.10	13951.900	-0.09/F	<-
519	19 Sep 1974	F	9.700	1.863	6429.52	11978.200	0.26/F	->>>
520	23 Sep 1974	F	8.640	1.592	6338.76	10091.301	0.11/F	->
521	26 Sep 1974	F	8.010	1.639	5800.79	9507.501	-0.22/F	<<-
522	30 Sep 1974	F	7.830	1.626	5860.76	9529.600	-0.41/F	<<<<-
523	3 Oct 1974	F	7.730	1.617	5515.52	8918.600	-0.18/F	<<-
524	7 Oct 1974	F	7.450	1.387	5204.97	7219.300	0.53/F	->>>>
525	10 Oct 1974	F	7.020	1.357	4978.26	6755.500	0.39/F	->>>>
526	14 Oct 1974	F	6.530	1.296	4722.14	6119.900	0.33/F	->>>>
527	17 Oct 1974	F	5.890	1.341	4375.47	5867.500	-0.14/F	<<-
528	21 Oct 1974	F	5.260	1.307	4018.97	5252.800	-0.32/F	<<<<-
529	24 Oct 1974	F	4.880	1.184	3809.63	4510.600	-0.12/F	<<-
530	28 Oct 1974	F	4.480	1.100	3457.64	3803.400	0.09/F	->
531	31 Oct 1974	F	4.420	1.000	3260.60	3260.600	0.54/F	->>>>
532	4 Nov 1974	?	4.450	0.977	3286.49	3210.900	0.62/F	->>>>
533	7 Nov 1974	F	4.820	1.202	3671.46	4413.100	-0.10/F	<-
534	11 Nov 1974	?	4.340	0.960	3028.75	2907.600	0.83/F	->>>>
535	14 Nov 1974	?	4.070	0.838	2792.24	2339.900	1.20/F	->>>>
536	18 Nov 1974	?	3.950	0.786	2691.22	2115.300	1.36/F	->>>>
537	21 Nov 1974	F	4.560	1.177	3355.31	3949.200	0.04/F	->
538	25 Nov 1974	?	4.140	0.883	2932.62	2589.500	0.98/F	->>>>
539	28 Nov 1974	?	3.840	0.742	2591.37	1922.800	1.50/F	->>>>
540	9 Dec 1974	F	3.020	0.999	2417.42	2415.000	0.06/F	->

River gaugings for station 12001 : Mekong at Nong Khai

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
541	12 Dec 1974	F	2.950	0.979	2368.64	2318.900	0.11/F	->
542	16 Dec 1974	F	2.800	0.931	2295.70	2137.300	0.18/F	->>
543	19 Dec 1974	F	2.610	0.902	2177.27	1963.900	0.22/F	->>
544	23 Dec 1974	F	2.440	0.936	2074.68	1941.900	0.08/F	->
545	26 Dec 1974	F	2.330	0.946	1996.72	1888.900	0.04/F	->
546	30 Dec 1974	F	2.210	0.912	1744.85	1591.300	0.35/F	->>>>
547	2 Jan 1975	G	2.150	0.951	1744.08	1658.620	0.17/G	->>
548	6 Jan 1975	G	2.060	0.943	1753.87	1653.900	0.08/G	->
549	9 Jan 1975	G	1.970	0.926	1673.55	1549.710	0.14/G	->>
550	16 Jan 1975	G	2.250	0.961	1977.94	1900.800	-0.06/G	<-
551	20 Jan 1975	G	3.220	1.065	2407.61	2564.110	0.10/G	->
552	23 Jan 1975	G	2.600	1.017	2033.88	2068.460	0.07/G	->
553	27 Jan 1975	G	2.340	1.044	1836.75	1917.570	0.01/G	-
554	30 Jan 1975	G	1.990	0.964	1587.85	1530.690	0.19/G	->>
555	3 Feb 1975	G	1.720	0.973	1529.89	1488.580	-0.02/G	-
556	6 Feb 1975	G	1.650	0.941	1472.81	1385.910	0.07/G	->
557	10 Feb 1975	G	1.540	0.890	1396.62	1242.990	0.18/G	->>
558	13 Feb 1975	G	1.460	0.882	1362.53	1201.750	0.17/G	->>
559	17 Feb 1975	G	1.390	0.848	1370.11	1161.850	0.16/G	->>
560	20 Feb 1975	G	1.320	0.815	1280.61	1043.700	0.30/G	->>>
561	24 Feb 1975	G	1.360	0.826	1333.50	1101.470	0.24/G	->>>
562	27 Feb 1975	G	1.240	0.826	1270.91	1049.770	0.21/G	->>
563	3 Mar 1975	G	1.190	0.966	1257.78	1215.020	-0.12/G	<<-
564	10 Mar 1975	G	1.120	0.896	1234.35	1105.980	-0.01/G	-
565	13 Mar 1975	G	1.080	0.898	1167.69	1048.590	0.05/G	->
566	17 Mar 1975	G	0.970	0.871	1151.80	1003.220	0.02/G	-
567	20 Mar 1975	G	0.920	0.863	1133.02	977.800	0.02/G	-
568	24 Mar 1975	G	0.860	0.867	1129.38	979.170	-0.05/G	<-
569	27 Mar 1975	G	0.790	0.870	1116.41	971.280	-0.10/G	<-
570	3 Apr 1975	G	0.730	0.857	1095.37	938.730	-0.10/G	<-
571	7 Apr 1975	G	0.810	0.868	1099.38	954.260	-0.05/G	<-
572	10 Apr 1975	G	1.020	0.875	1182.21	1034.430	0.01/G	-
573	14 Apr 1975	G	0.970	0.874	1149.05	1004.270	0.02/G	-
574	17 Apr 1975	G	0.810	0.867	1105.11	958.130	-0.06/G	<-
575	21 Apr 1975	G	1.320	0.998	1325.85	1323.200	-0.17/G	<<-
576	24 Apr 1975	G	1.580	1.040	1372.32	1427.210	-0.07/G	<-
577	28 Apr 1975	G	1.720	1.078	1413.03	1523.250	-0.07/G	<-
578	1 May 1975	G	1.620	1.056	1366.17	1442.680	-0.05/G	<-
579	8 May 1975	G	1.390	1.006	1314.20	1322.090	-0.10/G	<-
580	12 May 1975	G	1.810	1.106	1478.34	1635.040	-0.14/G	<<-
581	15 May 1975	G	1.740	1.077	1486.32	1600.770	-0.16/G	<<-
582	19 May 1975	G	1.970	1.126	1553.00	1748.680	-0.14/G	<<-
583	22 May 1975	G	1.800	1.089	1508.67	1642.940	-0.16/G	<<-
584	26 May 1975	G	1.900	1.110	1542.59	1712.280	-0.16/G	<<-
585	29 May 1975	G	1.960	1.130	1548.53	1749.840	-0.15/G	<<-
586	3 Jun 1975	G	3.090	1.072	2319.16	2486.140	0.06/G	->
587	6 Jun 1975	G	4.650	1.272	3169.10	4031.090	0.07/G	->
588	10 Jun 1975	G	4.160	1.259	2901.99	3653.610	-0.08/G	<-
589	13 Jun 1975	G	3.410	1.104	2488.21	2746.980	0.09/G	->
590	17 Jun 1975	G	3.610	1.211	2611.36	3162.360	-0.14/G	<<-
591	20 Jun 1975	G	5.260	1.362	3515.68	4788.360	0.02/G	->
592	24 Jun 1975	G	6.950	1.488	4862.30	7235.100	-0.10/G	<-
593	27 Jun 1975	G	5.800	1.412	4233.75	5978.060	-0.36/G	<<<<-
594	1 Jul 1975	G	4.700	1.211	3467.69	4199.370	-0.03/G	<-
595	4 Jul 1975	G	3.900	1.141	3085.98	3521.100	-0.21/G	<<-
596	8 Jul 1975	G	3.840	1.065	3059.26	3258.110	-0.01/G	-
597	15 Jul 1975	G	4.720	1.225	3616.35	4430.030	-0.21/G	<<-
598	18 Jul 1975	G	4.900	1.291	3690.14	4763.970	-0.32/G	<<<-
599	22 Jul 1975	G	9.640	2.100	6374.58	13386.610	-0.91/G	<<<<-
600	25 Jul 1975	G	8.960	1.758	6029.02	10599.011	-0.13/G	<<-

River gaugings for station 12001 : Mekong at Nong Khai

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
601	29 Jul 1975	G	7.840	1.466	5045.62	7396.880	0.68/G	->>>>
602	1 Aug 1975	G	7.710	1.551	5169.76	8018.300	0.15/G	->>
603	5 Aug 1975	G	8.120	1.607	5405.98	8687.410	0.14/G	->>
604	8 Aug 1975	G	8.530	1.588	6101.26	9688.810	-0.05/G	<-
605	15 Aug 1975	G	8.080	1.590	5401.28	8588.041	0.16/G	->>
606	19 Aug 1975	G	8.200	1.511	5885.86	8893.541	0.10/G	->
607	22 Aug 1975	G	7.620	1.557	5012.76	7804.870	0.20/G	->>
608	26 Aug 1975	G	8.030	1.587	5247.30	8327.470	0.27/G	->>>
609	29 Aug 1975	G	9.120	1.606	6404.86	10286.210	0.20/G	->>
610	11 Apr 1986	I	1.140			1160.000	-0.09/I	<-
611	25 Apr 1986	I	1.480			1280.000	0.06/I	->
612	16 May 1986	I	3.680			3080.000	0.00/I	-
613	30 May 1986	I	4.360			3530.000	0.23/I	->>>
614	13 Jun 1986	I	3.000			2460.000	-0.00/I	-
615	27 Jun 1986	I	5.900			5320.000	0.22/I	->>
616	4 Jul 1986	I	4.610			4000.000	0.04/I	->
617	11 Jul 1986	I	3.440			2890.000	-0.04/I	<-
618	18 Jul 1986	I	5.500			5010.000	0.06/I	->
619	25 Jul 1986	I	8.680			9760.000	0.01/I	-
620	1 Aug 1986	I	10.660			13400.001	0.02/I	->
621	8 Aug 1986	I	9.460			10800.000	0.19/I	->>
622	15 Aug 1986	I	7.330			7290.000	0.21/I	->>
623	22 Aug 1986	I	7.290			7820.000	-0.18/I	<<-
624	29 Aug 1986	I	8.220			9260.001	-0.15/I	<<-
625	5 Sep 1986	I	6.730			6470.000	0.18/I	->>
626	12 Sep 1986	I	8.560			9670.001	-0.06/I	<-
627	19 Sep 1986	I	8.670			9030.001	0.43/I	->>>>
628	26 Sep 1986	I	7.590			8430.001	-0.27/I	<<<-
629	3 Oct 1986	I	5.460			5430.000	-0.31/I	<<<-
630	10 Oct 1986	I	5.040			4800.000	-0.22/I	<<<-
631	17 Oct 1986	?	9.420			16100.001	-2.51/I	<<<<-
632	24 Oct 1986	I	6.390			6690.000	-0.32/I	<<<-
633	31 Oct 1986	I	5.780			5760.000	-0.25/I	<<<-
634	7 Nov 1986	I	4.680			4250.000	-0.11/I	<-
635	14 Nov 1986	I	4.140			3530.000	0.01/I	-
636	28 Nov 1986	I	3.680			2970.000	0.12/I	->
637	12 Dec 1986	I	3.020			2290.000	0.22/I	->>
638	26 Dec 1986	I	2.560			2110.000	-0.02/I	<-
639	9 Jan 1987	J	3.230			2610.000	-0.14/J	<<-
640	23 Jan 1987	J	2.100			1720.000	-0.17/J	<<-
641	9 Feb 1987	J	1.920			1380.000	0.15/J	->>
642	27 Feb 1987	J	1.640			1320.000	-0.04/J	<-
643	13 Mar 1987	J	1.800			1290.000	0.17/J	->>
644	27 Mar 1987	J	1.260			1100.000	-0.06/J	<-
645	10 Apr 1987	J	1.250			954.000	0.19/J	->>
646	24 Apr 1987	J	1.710			1260.000	0.12/J	->>
647	15 May 1987	J	1.630			1540.000	-0.38/J	<<<<-
648	29 May 1987	J	1.370			1190.000	-0.10/J	<-
649	12 Jun 1987	J	2.820			2210.000	-0.08/J	<-
650	26 Jun 1987	J	4.100			2990.000	0.32/J	->>>>
651	3 Jul 1987	J	2.740			2140.000	-0.07/J	<-
652	10 Jul 1987	J	2.710			2080.000	-0.03/J	<-
653	17 Jul 1987	J	4.410			3700.000	-0.07/J	<-
654	24 Jul 1987	J	4.700			3680.000	0.23/J	->>>
655	31 Jul 1987	J	6.230			6030.000	-0.20/J	<<-
656	7 Aug 1987	J	6.680			6550.000	-0.13/J	<<-
657	14 Aug 1987	J	6.580			6360.000	-0.09/J	<-
658	21 Aug 1987	J	8.700			9450.001	0.00/J	-
659	29 Aug 1987	J	8.960			9490.001	0.24/J	->>>
660	4 Sep 1987	J	8.780			9810.001	-0.13/J	<<-

River gaugings for station 12001 : Mekong at Nong Khai

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
661	11 Sep 1987	J	8.300			8490.000	0.19/J	->>
662	18 Sep 1987	J	7.910			8400.000	-0.14/J	<<-
663	28 Sep 1987	J	8.160			8320.000	0.16/J	->>
664	2 Oct 1987	J	9.000			10200.001	-0.14/J	<<-
665	9 Oct 1987	J	8.030			8130.000	0.15/J	->>
666	16 Oct 1987	J	7.220			6800.000	0.24/J	->>>
667	22 Oct 1987	J	5.650			5500.000	-0.37/J	<<<<-
668	29 Oct 1987	J	4.750			3970.000	0.01/J	-
669	13 Nov 1987	J	5.560			5190.000	-0.22/J	<<-
670	27 Nov 1987	J	4.500			3930.000	-0.20/J	<<-
671	11 Dec 1987	J	3.240			2310.000	0.22/J	->>>
672	25 Dec 1987	J	2.780			1930.000	0.23/J	->>>
673	28 Dec 1987	J	2.690			1990.000	0.06/J	->
674	5 Feb 1988	K	1.700			1223.000	0.17/J	->>

C.9.8 Station 13101 - Nakhon Phanom

Figure C9.8.1 shows the number of gaugings per year from 1960 to 1987. Figure C9.8.2 illustrates the scatter and range of gaugings at Nakhon Phanom. However individual annual ratings fit reasonably well and account for a large ammount of this scatter. The final set of rating equations are presented in Figure C9.8.3. The spread of these ratings shows that the section at Nakhon Phanom is far from stable and that continual gauging is essential.

Individual rating curves are presented in Figures C9.8.4b to C9.8.4n and show reasonable fits although some ratings have a large scatter at low flows. The 1960/61 gaugings were typical of many of the Mekong sites in having the least scatter. In fact the quality of these gaugings enabled a two part rating to be fitted for this period.

A group of gaugings between 9th January 1962 and 27th July 1962 (numbers 64 to 92) were, for some unknown reason, very different to earlier and later gaugings. In this appendix these have been marked as dubious and have not been used in fitting here.

At this station there has been a substantial change in the rating equation during 1971, with gaugings after this date plotting above those made earlier. The scatter of gaugings in 1971 made it difficult to detect the exact date of change. A study of the station file also gave no indication of the change but it was thought that the most likely cause was a change in gauge location. Although it is difficult to identify the exact date of the change, a study of gaugings in the period suggests that the change probably occurred about may 1st. On this assumption, gaugings prior to this date were combined with 1970 gaugings and one rating fitted over this period. In the same way, gaugings after 1st May 1971 were combined with gaugings from 1972 to derive one rating equation for this period also.

Gauging History - 013101 Nakhon Phanom

Year	Gauging numbers	Number of gaugings	Rating letter	Shifts (Y=yes)	Fitting method
1924+		0	A		1
1960	1 - 4	4			
1961	5 - 63	59	B		2 *
1962	64 - 106	43	C	Y	1
1963	107 - 128	22	D	Y	1
1964	129 - 175	47	E	Y	1
1965	176 - 203	28	F	Y	1
1966		0	G		1
1967	204 - 234	31	H	Y	1
1968	235 - 242	8			
1969	243 - 305	63	I	Y	1
1970/71	306 - 406	101	J	Y	1
1971/72	407 - 525	119	K	Y	1
1973	526 - 582	57	L	Y	1
1974	583 - 632	50	M	Y	1
1975	633 - 668	36	N		1
1976+		0	O		2 *
	Total =	668			

+ = and subsequent years

Dubious gaugings (HYDATA flag ?) - 64-92,214,259,265,319,442
Rare flood gaugings (HYDATA flag +) - None

Observed stage range 0.52 metres to 13.30 metres
Gauged stage range 0.07 metres to 12.79 metres

See Section C.9.1 for description of the table

* Notes on special fitting :

Ratings A,O . A two part rating improved the fit at flood flows.

Rating Equations - 13101 Mekong at Nakhon Phanom

Rating Letter	Rating Date	Parameters ($Q = a\,(h + c)^{b}$)	Maximum Stage
A from	1 Jan 1924	$Q = 125.231\,(h + 2.950)^{1.995}$	15.00 m
B from	1 Jan 1960	$Q = 199.026\,(h + 2.433)^{1.814}$ $Q = 86.358\,(h + 2.433)^{2.166}$	8.31 m 15.00 m
C from	1 Jan 1962	$Q = 38.758\,(h + 4.570)^{2.332}$	15.00 m
D from	1 Jan 1963	$Q = 91.559\,(h + 3.510)^{2.098}$	15.00 m
E from	1 Jan 1964	$Q = 172.261\,(h + 2.810)^{1.877}$	15.00 m
F from	1 Jan 1965	$Q = 37.330\,(h + 4.530)^{2.374}$	15.00 m
G from	1 Jan 1966	$Q = 125.231\,(h + 2.950)^{1.995}$	15.00 m
H from	1 Jan 1967	$Q = 309.677\,(h + 1.660)^{1.743}$	15.00 m
I from	1 Jan 1969	$Q = 258.577\,(h + 2.050)^{1.759}$	15.00 m
J from	3 Jan 1970	$Q = 107.457\,(h + 3.100)^{2.040}$	15.00 m
K from	1 May 1971	$Q = 109.904\,(h + 2.610)^{2.044}$	15.00 m
L from	1 Jan 1973	$Q = 82.978\,(h + 3.040)^{2.132}$	15.00 m
M from	1 Jan 1974	$Q = 404.108\,(h + 1.280)^{1.577}$	15.00 m
N from	1 Jan 1975	$Q = 233.223\,(h + 2.040)^{1.766}$	15.00 m
O from	1 Jan 1976	$Q = 145.422\,(h + 2.410)^{1.939}$ $Q = 20.385\,(h + 2.410)^{2.694}$	11.10 m 15.00 m

Ratings A and G are the average rating before 1971
Rating O is the average rating after 1971

Number of gaugings per year

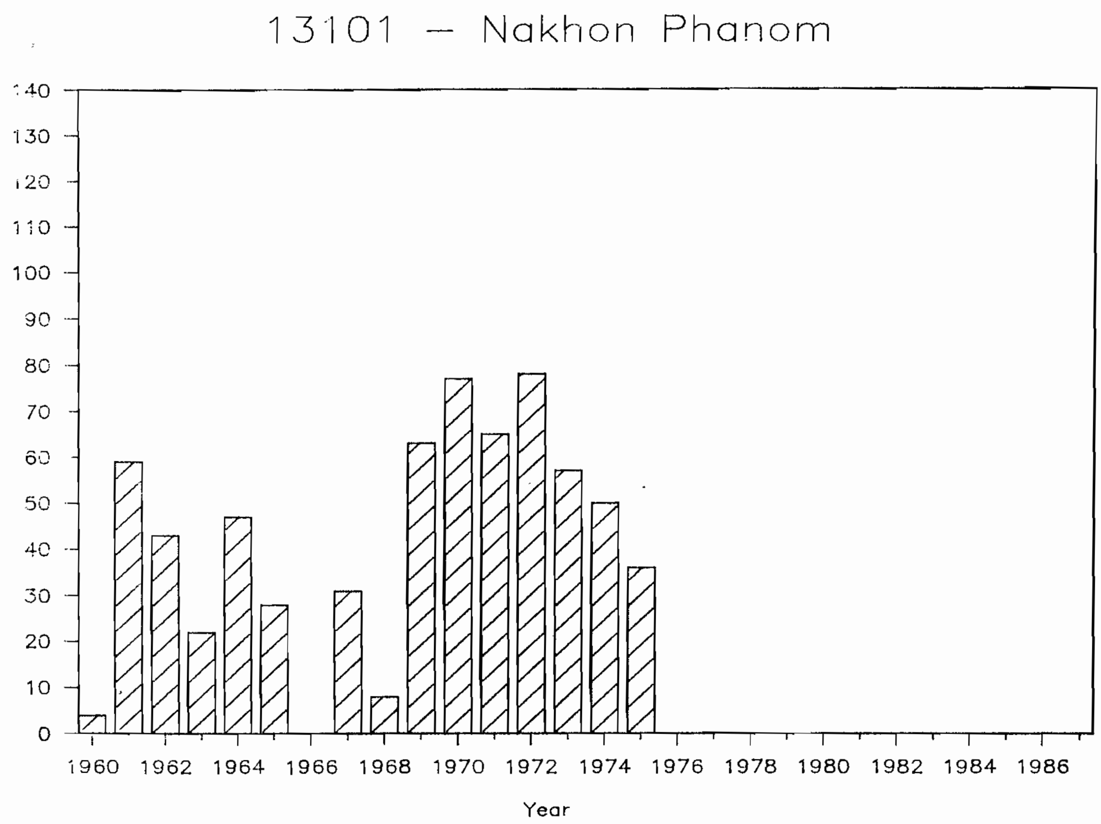


Figure C9.8.1

Rating equations

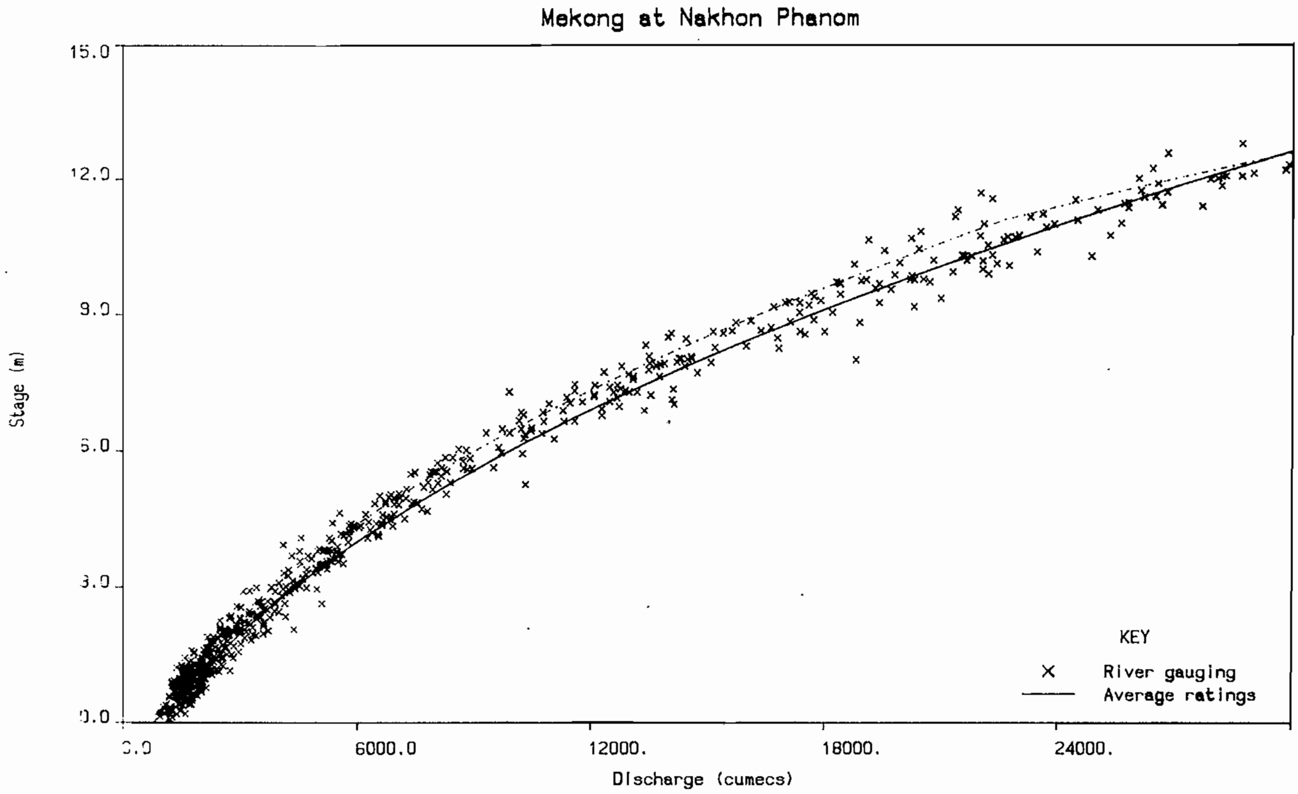


Figure C9.8.2

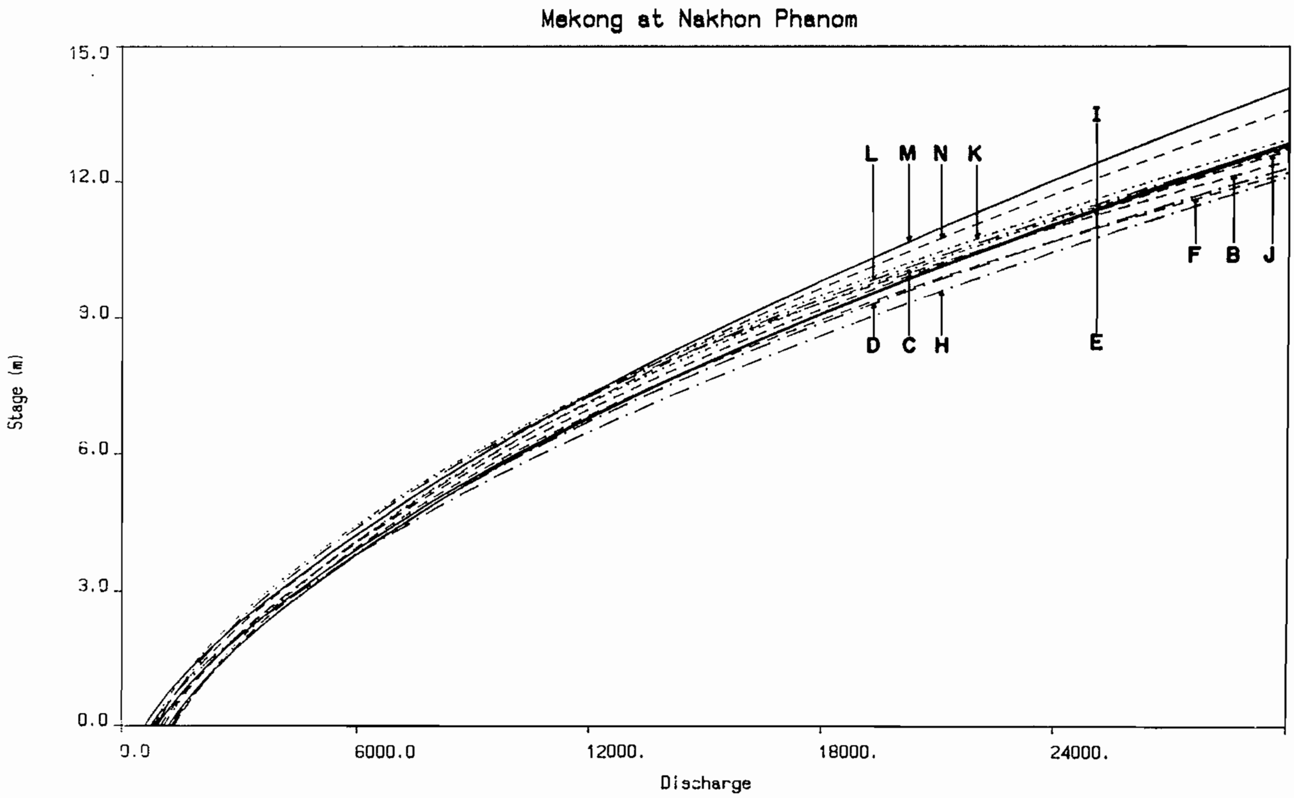


Figure C9.8.3

Rating equations

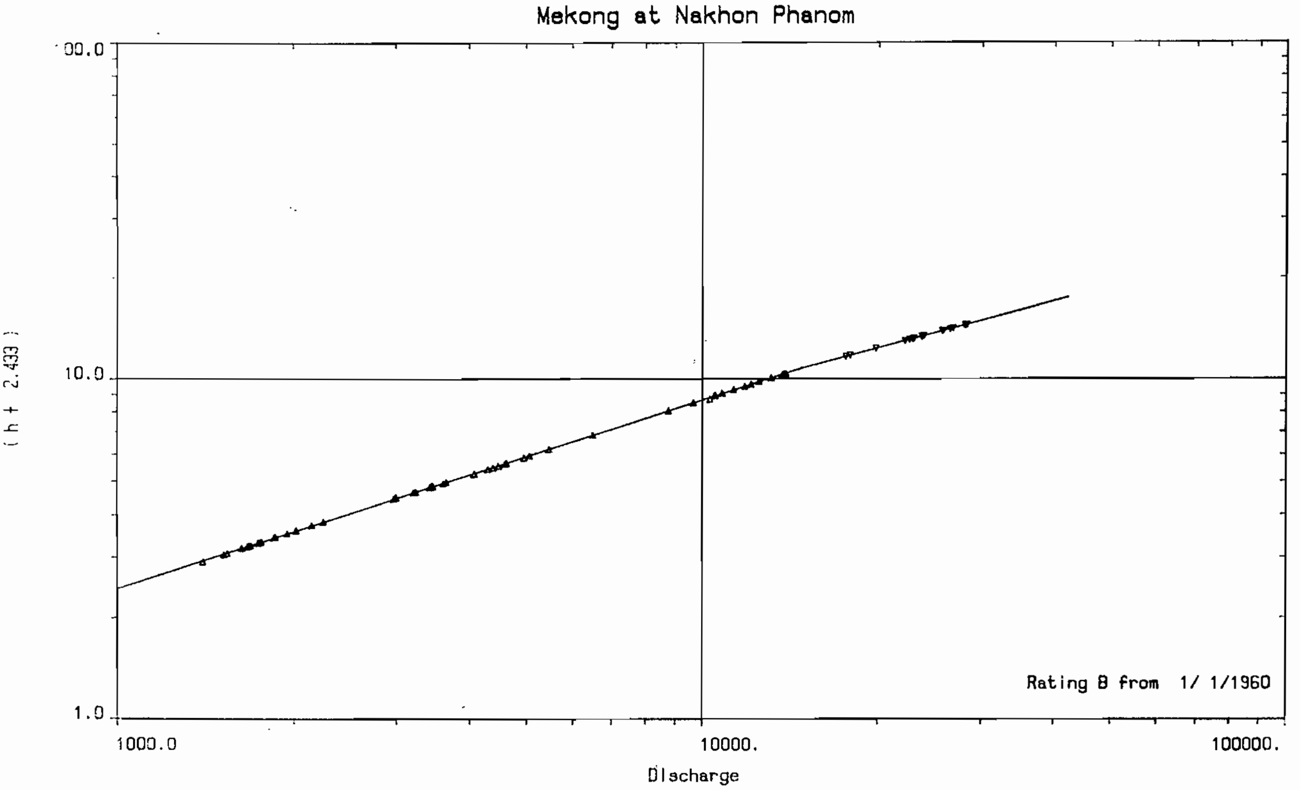


Figure C9.8.4b

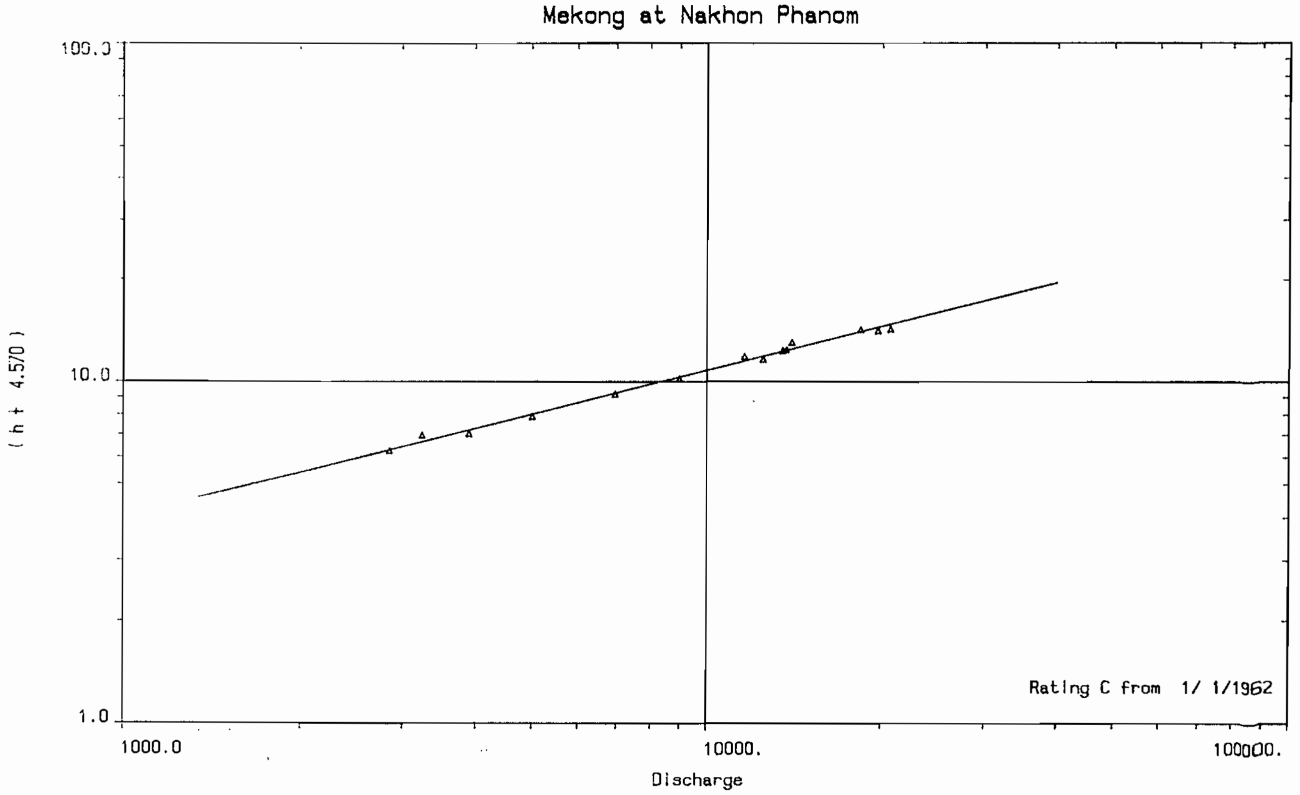


Figure C9.8.4c

Rating equations

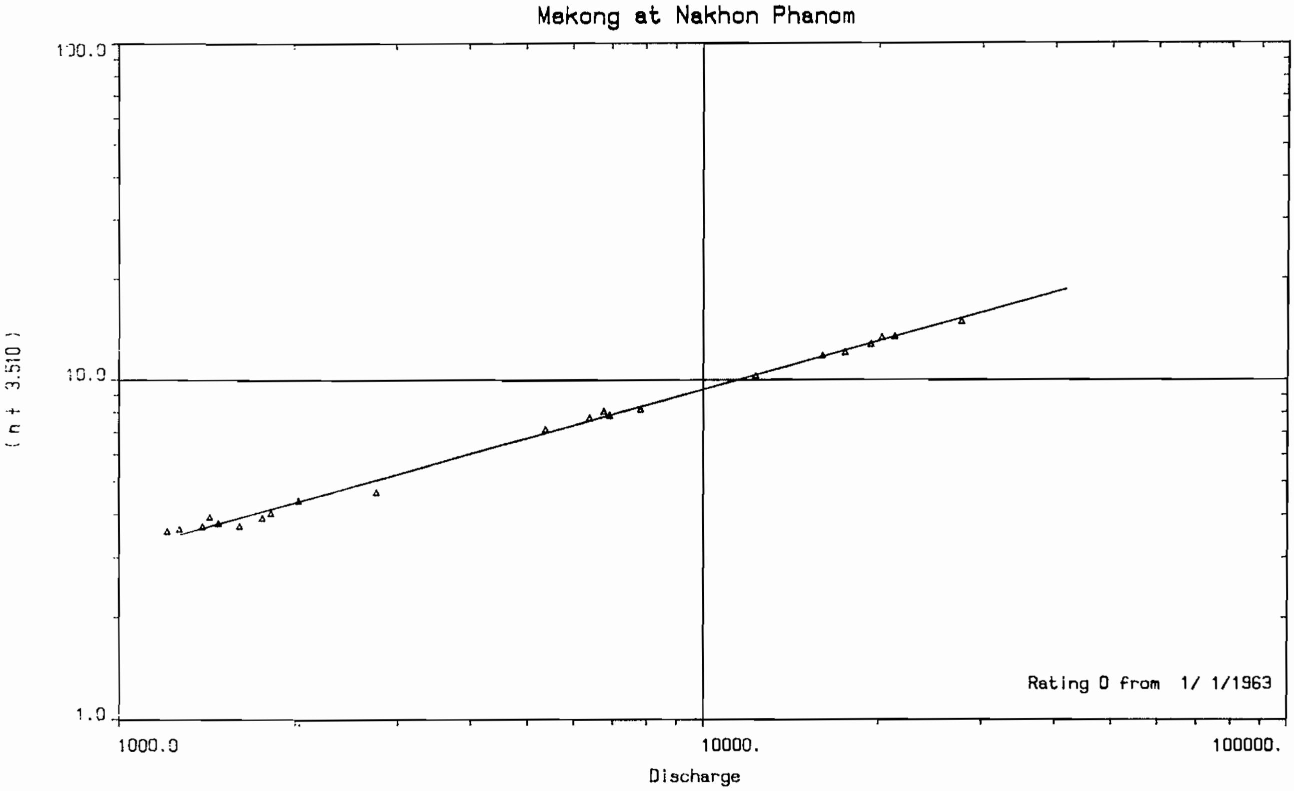


Figure C9.8.4d

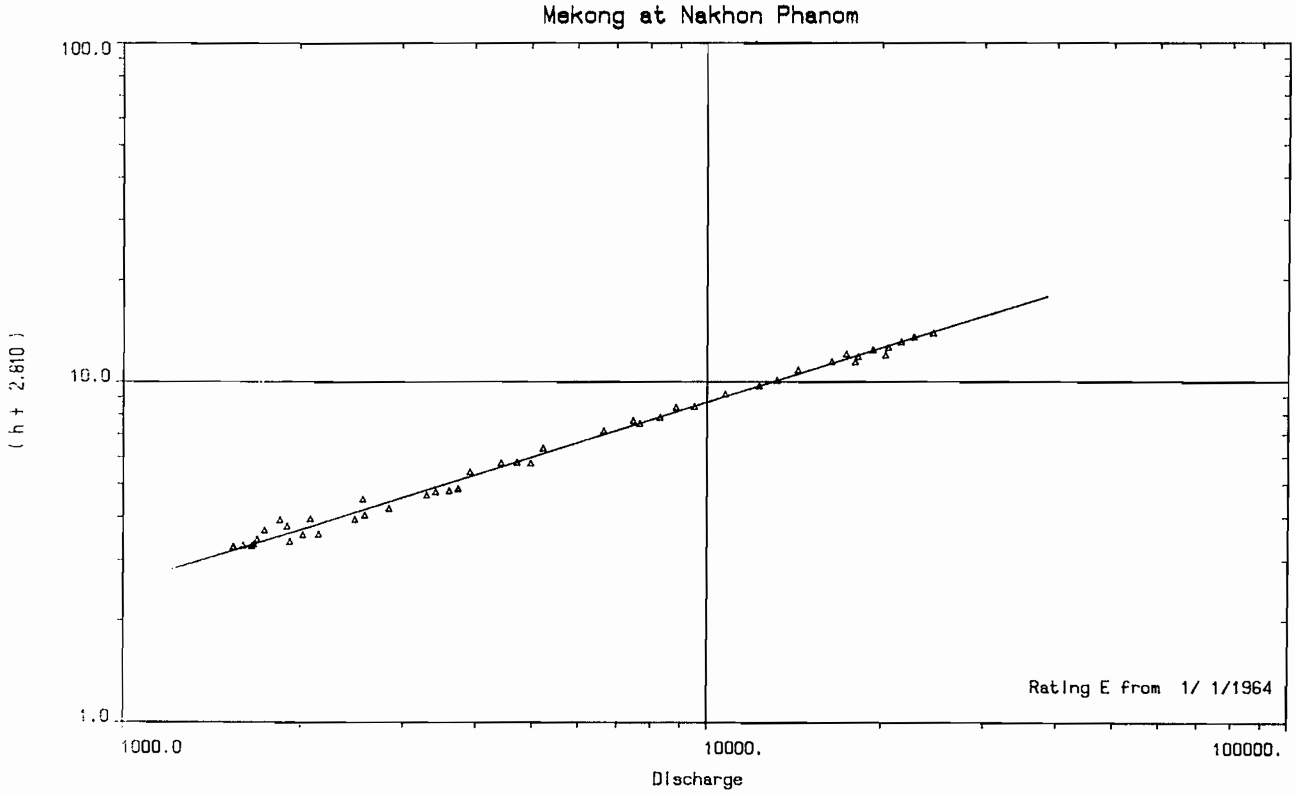


Figure C9.8.4e

Rating equations

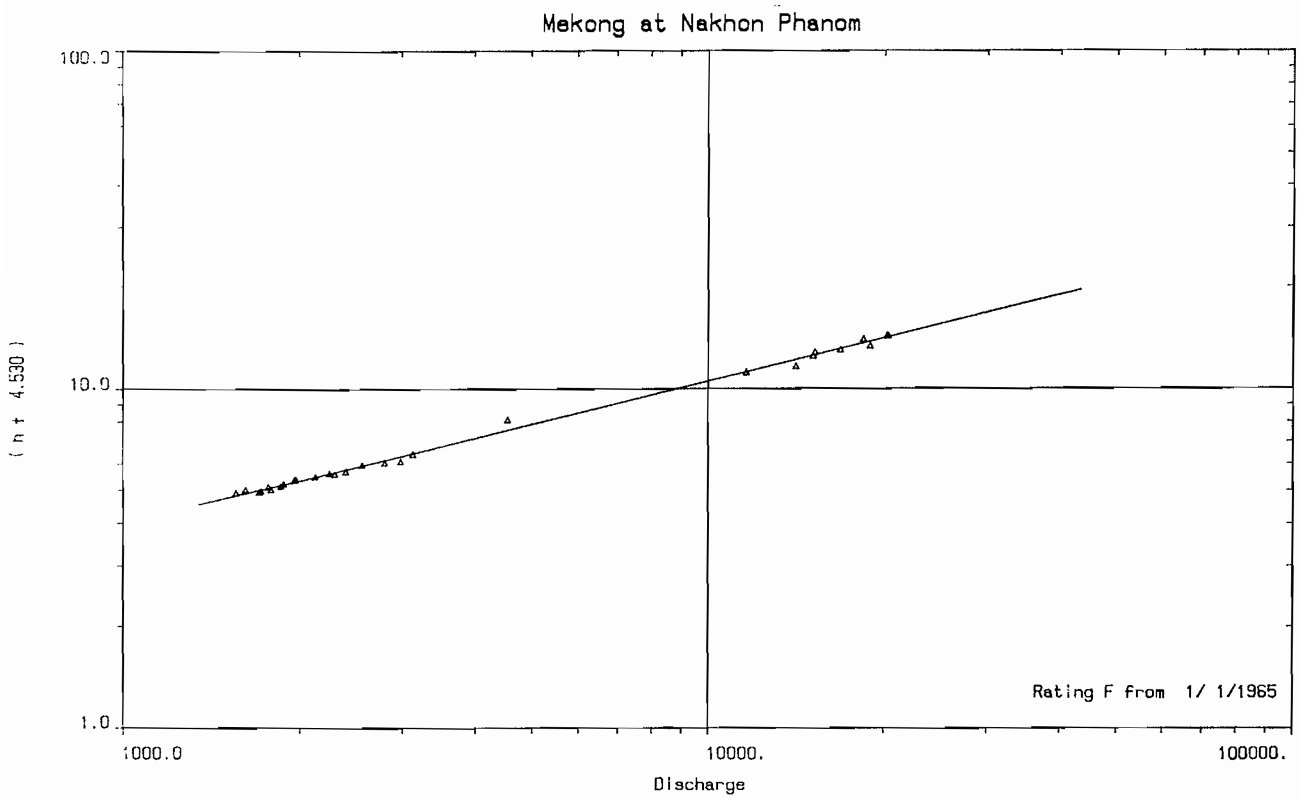


Figure C9.8.4f

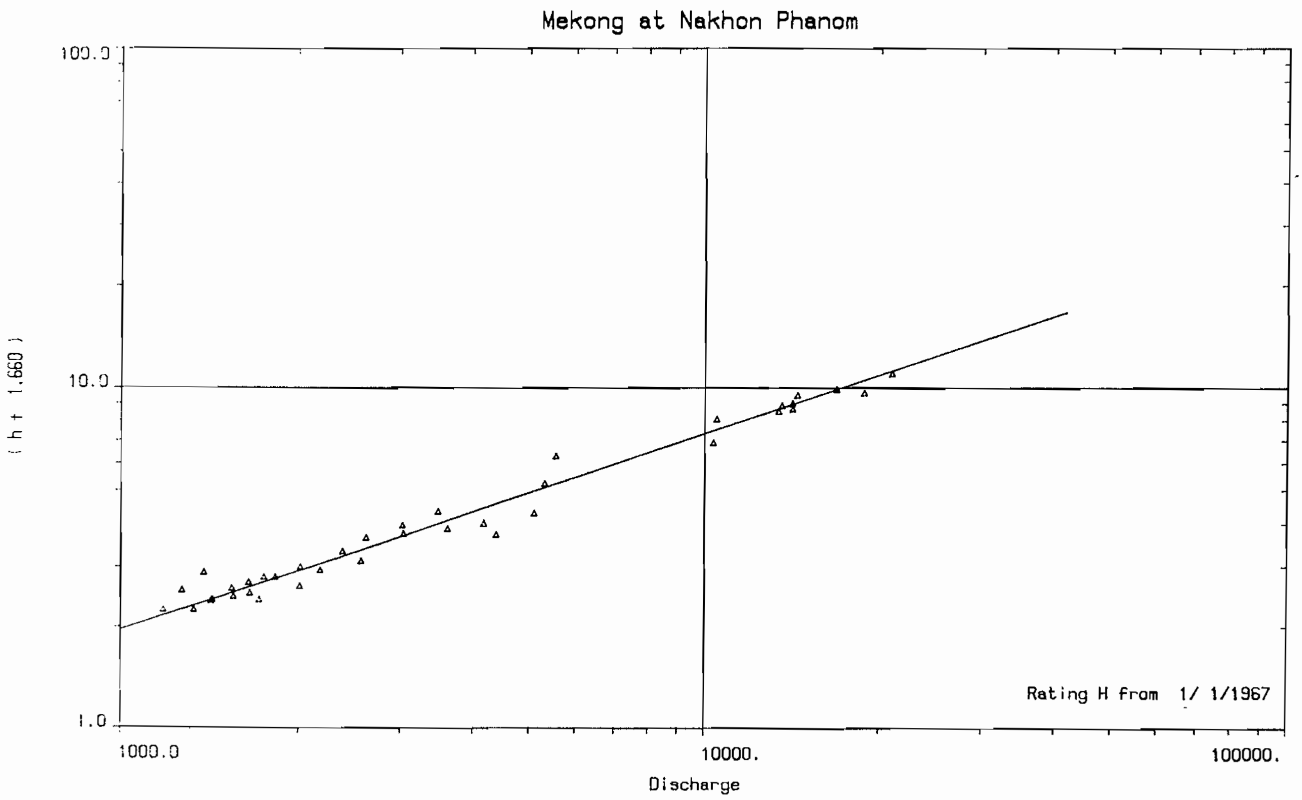


Figure C9.8.4h

Rating equations

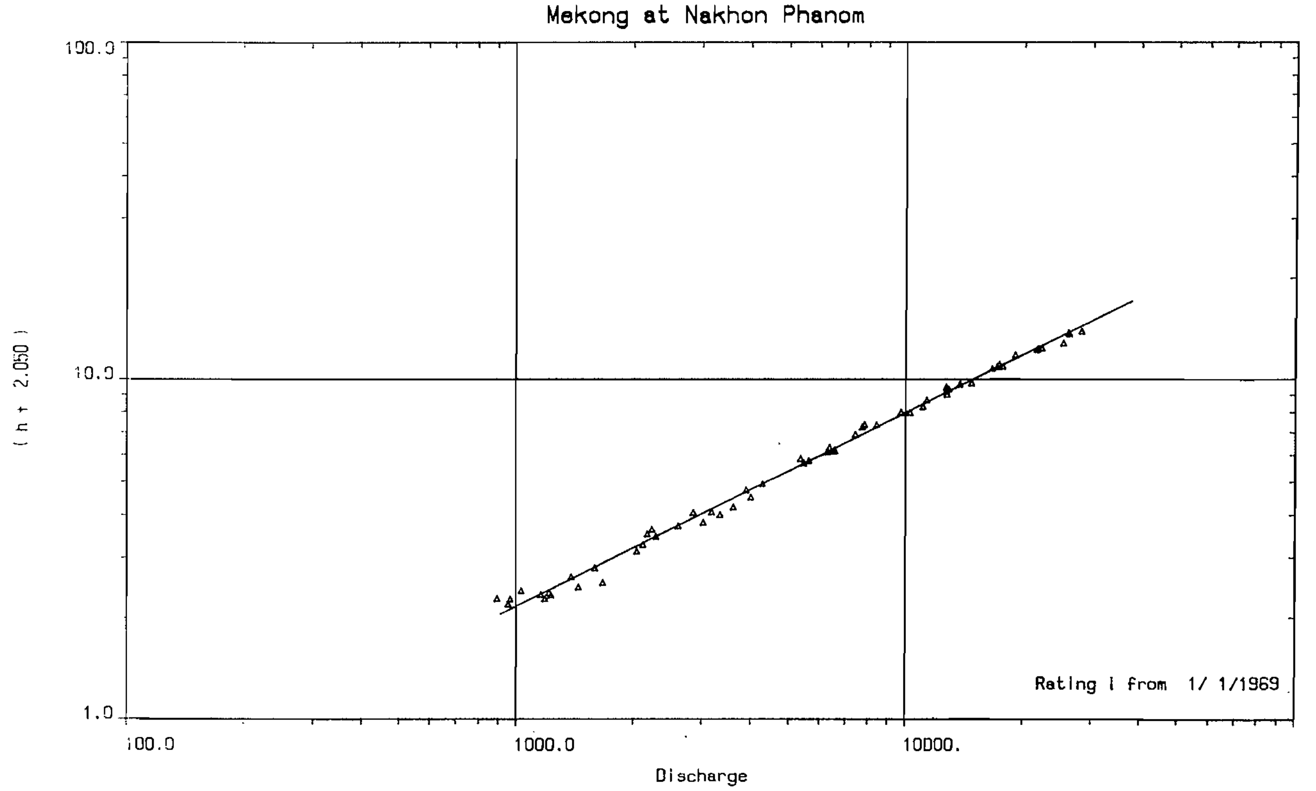


Figure C9.8.4i

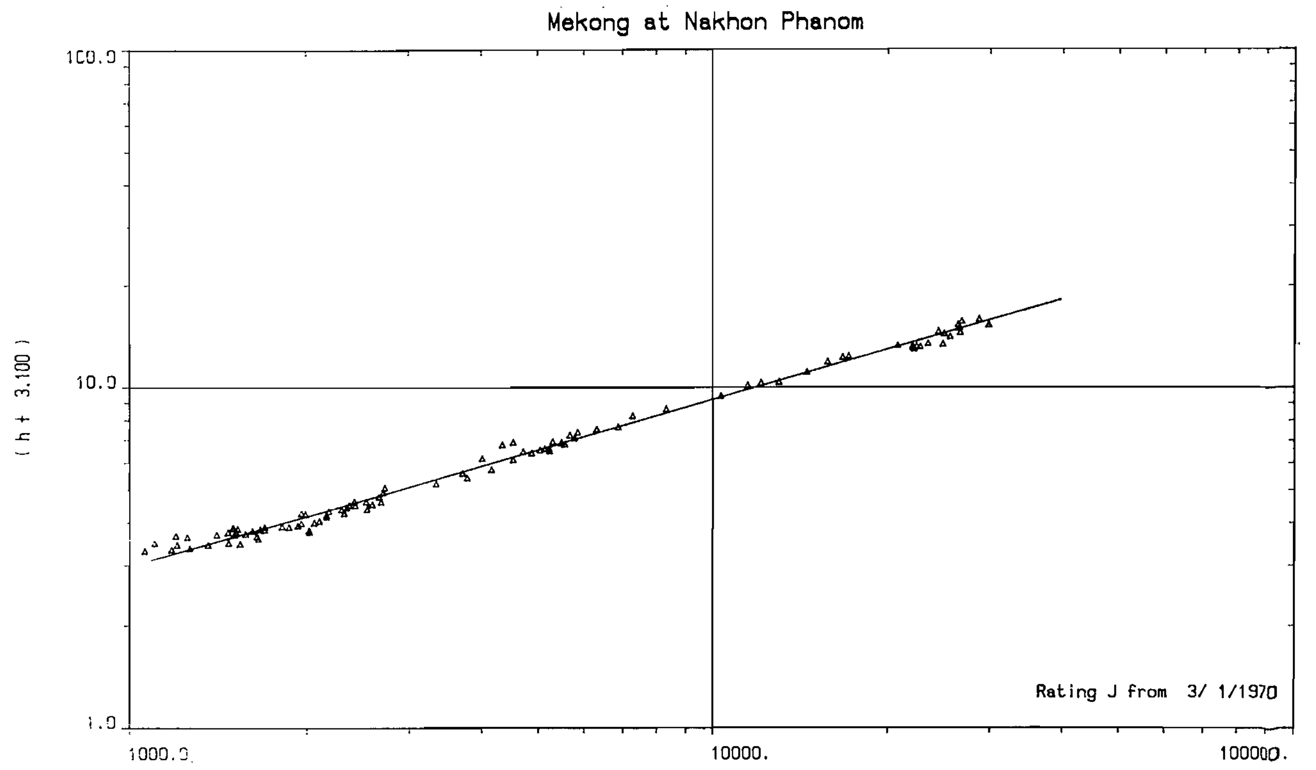


Figure C9.8.4j

Rating equations

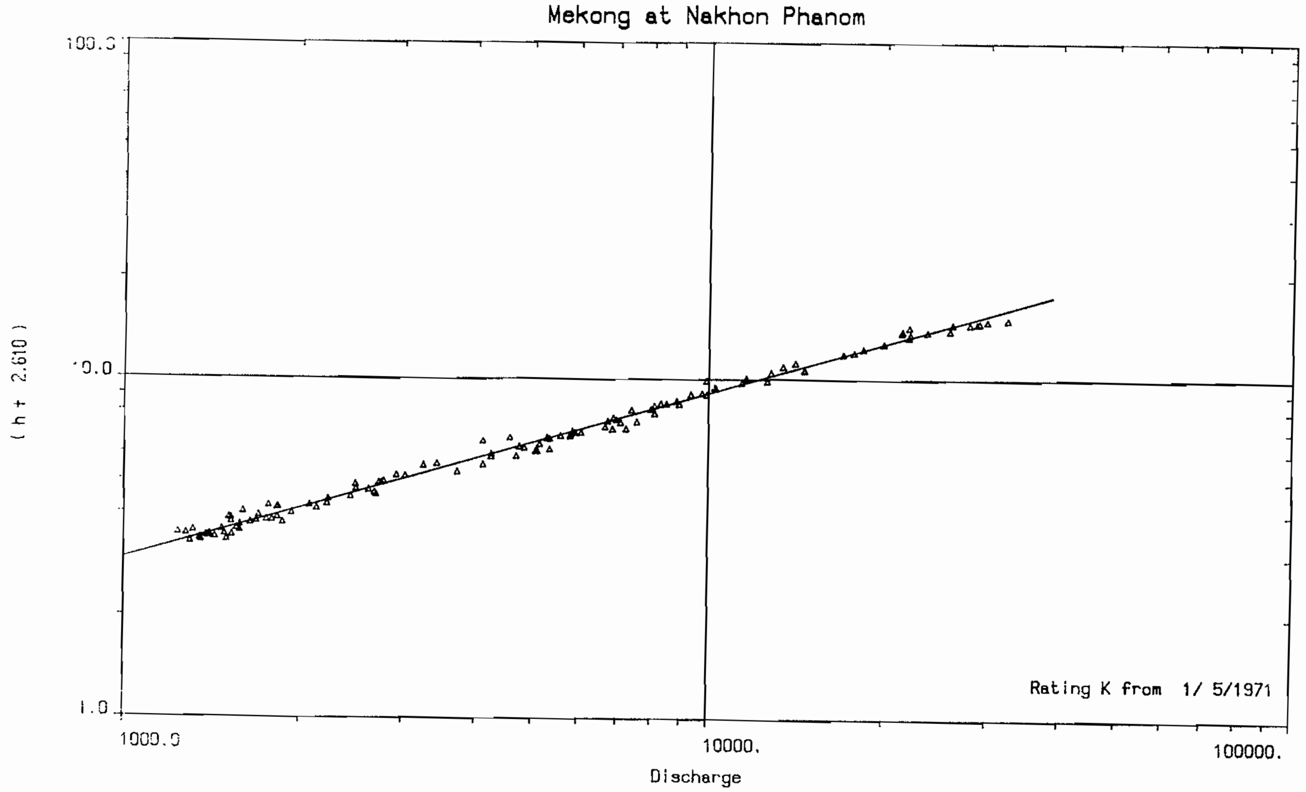


Figure C9.8.4k

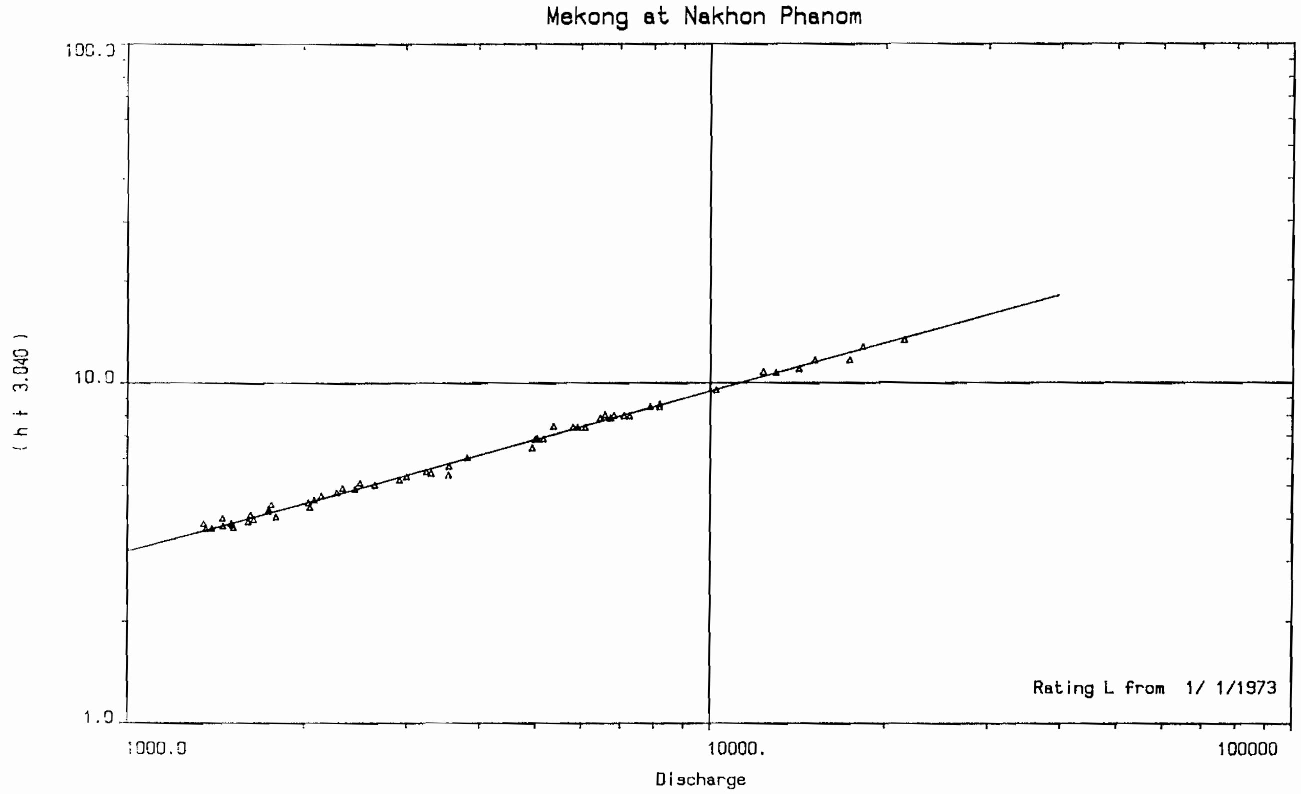


Figure C9.8.4l

Rating equations

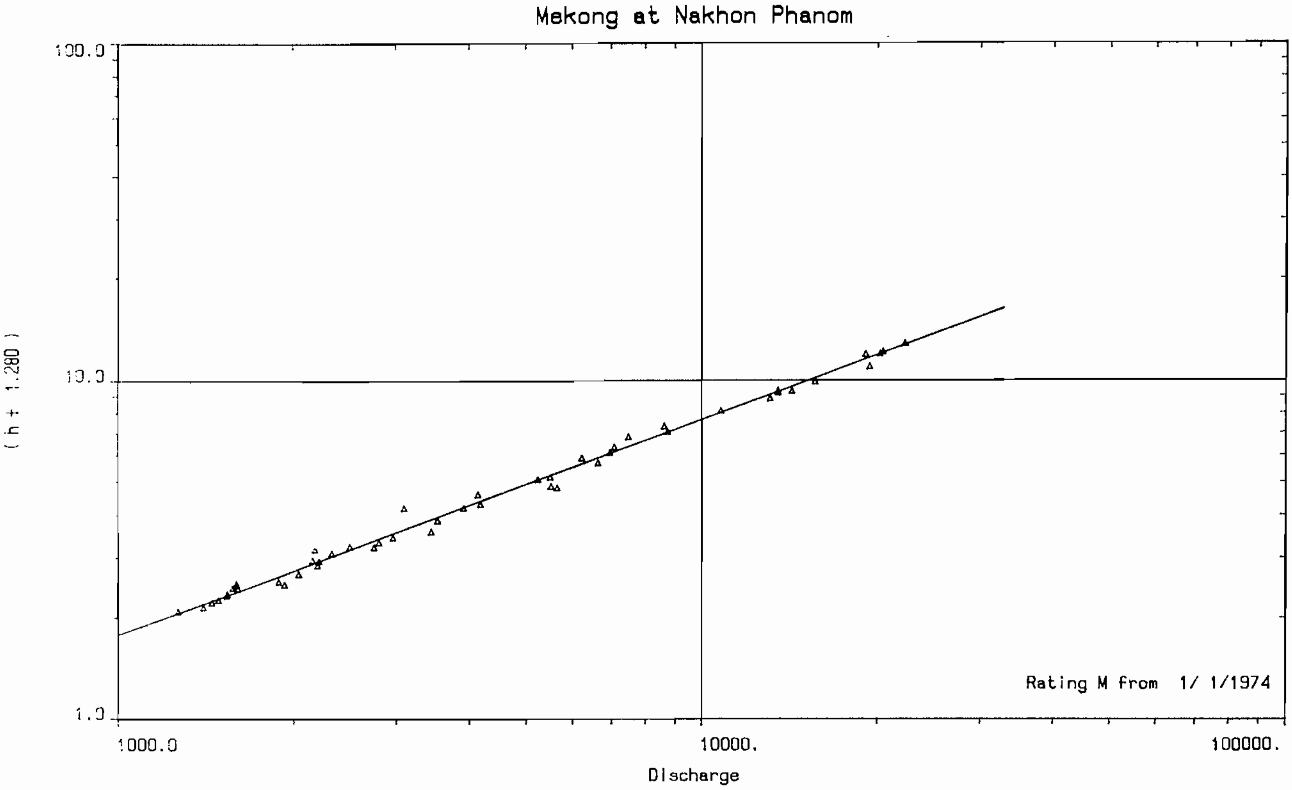


Figure C9.8.4m

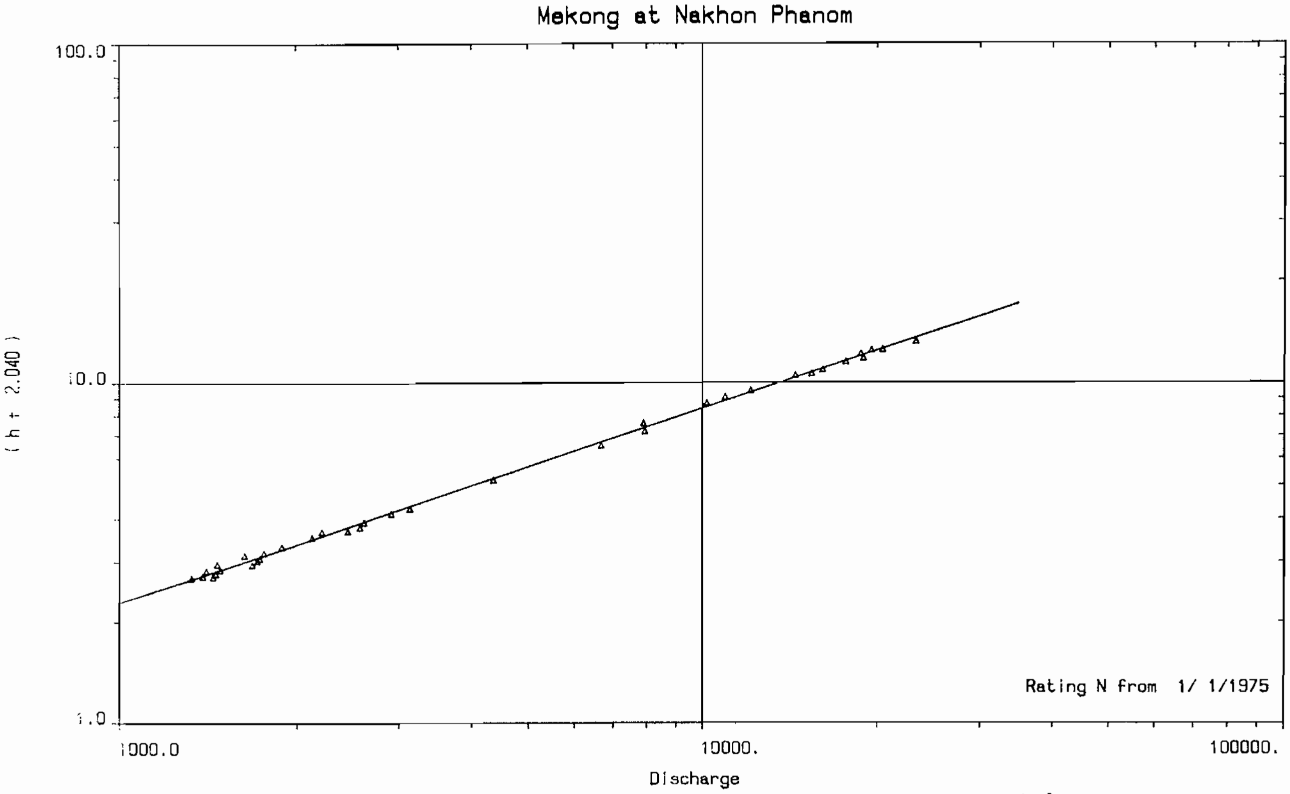


Figure C9.8.4n

River gaugings for station 13101 : Mekong at Nakhon Phanom

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
1	22 Nov 1960	B	2.827			4080.000	-0.03/B	<-
2	29 Nov 1960	B	2.397			3460.000	0.00/B	-
3	2 Dec 1960	B	2.377			3430.000	0.01/B	-
4	19 Dec 1960	B	2.057			3000.000	0.03/B	->
5	10 Jan 1961	B	1.387			2250.000	0.01/B	-
6	23 Jan 1961	B	1.167			2020.000	0.01/B	-
7	30 Jan 1961	B	1.007			1860.000	0.01/B	-
8	6 Feb 1961	B	0.877			1740.000	0.01/B	-
9	14 Feb 1961	B	0.797			1670.000	-0.00/B	-
10	22 Feb 1961	B	0.897			1760.000	0.00/B	-
11	27 Feb 1961	B	0.757			1630.000	0.00/B	-
12	13 Mar 1961	B	0.617			1520.000	-0.02/B	-
13	20 Mar 1961	B	0.477			1400.000	-0.02/B	<-
14	12 Apr 1961	B	0.807			1680.000	-0.00/B	-
15	18 Apr 1961	B	0.647			1540.000	-0.01/B	-
16	25 Apr 1961	B	0.817			1690.000	-0.00/B	-
17	9 May 1961	B	0.997			1850.000	0.01/B	-
18	15 May 1961	B	1.097			1950.000	0.01/B	-
19	23 May 1961	B	1.297			2150.000	0.02/B	-
20	1 Jun 1961	B	2.537			3650.000	-0.00/B	-
21	6 Jun 1961	B	2.997			4300.000	-0.01/B	-
22	13 Jun 1961	B	6.277			10300.000	-0.10/B	<-
23	21 Jun 1961	B	6.497			10500.000	0.03/B	->
24	28 Jun 1961	B	6.497			10500.000	0.03/B	->
25	6 Jul 1961	B	6.077			9650.000	0.01/B	-
26	12 Jul 1961	B	7.067			11800.000	0.01/B	-
27	20 Jul 1961	B	6.637			10800.000	0.03/B	->
28	25 Jul 1961	B	7.397			12500.001	0.03/B	->
29	26 Jul 1961	B	7.197			12100.000	0.00/B	-
30	3 Aug 1961	B	6.877			11300.001	0.04/B	->
31	10 Aug 1961	B	7.917			13900.001	-0.04/B	<-
32	11 Aug 1961	B	7.897			13800.001	-0.02/B	-
33	17 Aug 1961	B	9.207			17599.999	-0.01/B	-
34	18 Aug 1961	B	9.307			17900.000	-0.00/B	-
35	24 Aug 1961	B	10.717			22900.000	-0.01/B	-
36	25 Aug 1961	B	10.757			23000.000	0.01/B	-
37	26 Aug 1961	B	10.657			22599.999	0.01/B	-
38	30 Aug 1961	B	10.537			22200.000	0.00/B	-
39	7 Sep 1961	B	11.457			25699.999	0.01/B	-
40	8 Sep 1961	B	11.477			25799.998	0.01/B	-
41	13 Sep 1961	B	12.017			28099.998	-0.01/B	-
42	15 Sep 1961	B	11.707			26800.000	-0.01/B	-
43	20 Sep 1961	B	10.937			23700.000	0.00/B	-
44	21 Sep 1961	B	11.007			23899.999	0.02/B	->
45	28 Sep 1961	B	12.057			28200.000	0.01/B	-
46	29 Sep 1961	B	12.067			28299.999	-0.01/B	-
47	5 Oct 1961	B	11.617			26499.998	-0.02/B	<-
48	10 Oct 1961	B	9.877			19799.999	0.01/B	-
49	18 Oct 1961	B	7.877			13700.000	0.00/B	-
50	19 Oct 1961	B	7.637			13100.001	0.01/B	-
51	3 Nov 1961	B	5.627			8750.001	0.01/B	-
52	10 Nov 1961	B	4.417			6500.000	0.02/B	-
53	16 Nov 1961	B	3.777			5470.000	-0.00/B	-
54	22 Nov 1961	B	3.507			5070.000	-0.02/B	-
55	23 Nov 1961	B	3.437			4960.000	-0.02/B	-
56	27 Nov 1961	B	3.117			4480.000	-0.02/B	-
57	28 Nov 1961	B	3.057			4390.000	-0.01/B	-
58	7 Dec 1961	B	3.217			4630.000	-0.02/B	-
59	8 Dec 1961	B	3.197			4600.000	-0.02/B	-
60	13 Dec 1961	B	2.497			3610.000	-0.01/B	-

River gaugings for station 13101 : Mekong at Nakhon Phanom

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
61	20 Dec 1961	B	2.227			3240.000	0.00/B	-
62	21 Dec 1961	B	2.207			3210.000	0.01/B	-
63	27 Dec 1961	B	2.017			2970.000	0.01/B	-
64	9 Jan 1962	?	3.300	0.473	5813.95	2750.000	1.65/C	->>>>
65	15 Jan 1962	?	3.140	0.462	5865.80	2710.000	1.53/C	->>>>
66	23 Jan 1962	?	2.890	0.416	5697.11	2370.000	1.63/C	->>>>
67	1 Feb 1962	?	2.680	0.375	5466.67	2050.000	1.77/C	->>>>
68	8 Feb 1962	?	2.560	0.380	5342.11	2030.000	1.67/C	->>>>
69	12 Feb 1962	?	2.560	0.374	5374.33	2010.000	1.69/C	->>>>
70	22 Feb 1962	?	2.360	0.349	5329.51	1860.000	1.67/C	->>>>
71	1 Mar 1962	?	2.220	0.348	5057.47	1760.000	1.66/C	->>>>
72	5 Mar 1962	?	2.180	0.356	5140.45	1830.000	1.53/C	->>>>
73	12 Mar 1962	?	2.140	0.328	5000.00	1640.000	1.73/C	->>>>
74	19 Mar 1962	?	2.100	0.322	4937.89	1590.000	1.75/C	->>>>
75	29 Mar 1962	?	1.800	0.299	4682.27	1400.000	1.72/C	->>>>
76	6 Apr 1962	?	1.820	0.292	4726.03	1380.000	1.76/C	->>>>
77	11 Apr 1962	?	1.920	0.281	4839.86	1360.000	1.89/C	->>>>
78	18 Apr 1962	?	1.930	0.337	4005.93	1350.000	1.92/C	->>>>
79	1 May 1962	?	2.230	0.335	5074.63	1700.000	1.74/C	->>>>
80	3 May 1962	?	2.420	0.372	5161.29	1920.000	1.66/C	->>>>
81	8 May 1962	?	2.450	0.372	5349.46	1990.000	1.61/C	->>>>
82	16 May 1962	?	2.900	0.444	5675.68	2520.000	1.48/C	->>>>
83	22 May 1962	?	2.950	0.439	5444.19	2390.000	1.67/C	->>>>
84	31 May 1962	?	3.350	0.493	6044.62	2980.000	1.48/C	->>>>
85	5 Jun 1962	?	4.540	0.678	6755.16	4580.000	1.37/C	->>>>
86	14 Jun 1962	?	5.490	0.833	7815.13	6510.000	1.06/C	->>>>
87	20 Jun 1962	?	9.400	1.320	10075.76	13300.000	1.75/C	->>>>
88	28 Jun 1962	?	8.020	1.109	9287.65	10300.000	1.64/C	->>>>
89	5 Jul 1962	?	7.760	1.087	9291.63	10100.001	1.47/C	->>>>
90	11 Jul 1962	?	8.340	1.200	9666.67	11600.001	1.38/C	->>>>
91	19 Jul 1962	?	9.120	1.224	10130.72	12400.001	1.83/C	->>>>
92	27 Jul 1962	?	8.460	1.160	9913.79	11500.000	1.55/C	->>>>
93	3 Aug 1962	C	7.320	1.180	9830.51	11600.001	0.36/C	->>>>
94	14 Aug 1962	C	9.680	1.552	11855.67	18400.000	0.20/C	->>
95	22 Aug 1962	C	9.560	1.599	12320.20	19699.999	-0.33/C	<<<<-
96	29 Aug 1962	C	9.720	1.676	12350.83	20700.000	-0.48/C	<<<<-
97	11 Sep 1962	C	8.500	1.366	10248.90	14000.001	0.58/C	->>>>
98	20 Sep 1962	C	7.860	1.275	10745.10	13700.000	0.05/C	->
99	21 Sep 1962	C	7.780	1.282	10530.42	13500.002	0.05/C	->
100	5 Oct 1962	C	7.080	1.224	10212.42	12500.001	-0.25/C	<<<-
101	16 Oct 1962	C	5.620	0.995	9015.08	8970.000	-0.13/C	<<-
102	27 Oct 1962	C	4.620	0.871	7990.82	6960.000	-0.07/C	<-
103	8 Nov 1962	C	3.340	0.727	6891.33	5010.000	-0.13/C	<<-
104	23 Nov 1962	C	2.480	0.616	6331.17	3900.000	-0.17/C	<<-
105	29 Nov 1962	C	2.410	0.532	6090.23	3240.000	0.31/C	->>>
106	13 Dec 1962	C	1.710	0.492	5792.68	2850.000	-0.03/C	<-
107	4 Jan 1963	D	1.160	0.420	6571.43	2760.000	-0.40/D	<<<<-
108	15 Jan 1963	D	0.900	0.380	5342.11	2030.000	0.03/D	->
109	8 Feb 1963	D	0.540	0.360	5055.55	1820.000	-0.11/D	<-
110	22 Feb 1963	D	0.410	0.360	4888.89	1760.000	-0.17/D	<<-
111	15 Mar 1963	D	0.200	0.350	4600.00	1610.000	-0.21/D	<<-
112	28 Mar 1963	D	0.270	0.310	4774.19	1480.000	0.01/D	-
113	2 Apr 1963	D	0.190	0.280	4964.29	1390.000	0.04/D	->
114	20 Apr 1963	D	0.070	0.260	4653.85	1210.000	0.16/D	->>
115	6 May 1963	D	0.120	0.270	4703.70	1270.000	0.13/D	->>
116	24 May 1963	D	0.430	0.290	4931.03	1430.000	0.23/D	->>>
117	8 Jun 1963	D	3.650	0.730	7369.86	5380.000	0.19/D	->>
118	14 Jun 1963	D	4.360	0.860	8046.51	6920.000	0.01/D	-
119	22 Jun 1963	D	4.680	0.900	8688.89	7820.000	-0.14/D	<<-
120	5 Jul 1963	D	6.770	0.553	22242.32	12300.001	-0.06/D	<-

River gaugings for station 13101 : Mekong at Nakhon Phanom

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
121	24 Aug 1963	D	9.940	1.684	12648.46	21299.999	0.01/D	-
122	31 Aug 1963	D	9.260	1.560	12435.90	19400.000	-0.08/D	<-
123	7 Sep 1963	D	8.300	1.400	11428.57	16000.001	0.09/D	->
124	14 Sep 1963	D	11.400	2.000	13850.00	27700.001	-0.32/D	<<<<-
125	22 Sep 1963	D	9.850	1.581	12802.03	20239.999	0.25/D	->>>
126	28 Sep 1963	D	8.560	1.467	11929.11	17499.999	-0.17/D	<<-
127	26 Oct 1963	D	4.560	0.859	7881.26	6770.000	0.29/D	->>>
128	31 Oct 1963	D	4.220	0.756	8465.61	6400.000	0.16/D	->>
129	7 Jan 1964	E	1.720	0.498	5140.56	2560.000	0.32/E	->>>>
130	16 Jan 1964	E	1.440	0.488	5819.67	2840.000	-0.20/E	<<-
131	22 Jan 1964	E	1.260	0.463	5572.35	2580.000	-0.16/E	<<-
132	29 Jan 1964	E	1.140	0.489	5071.57	2480.000	-0.19/E	<<-
133	5 Feb 1964	E	1.120	0.395	4683.54	1850.000	0.39/E	->>>>
134	13 Feb 1964	E	0.970	0.380	5000.00	1900.000	0.19/E	->>
135	19 Feb 1964	E	0.870	0.370	4702.70	1740.000	0.25/E	->>>
136	25 Feb 1964	E	0.760	0.453	4459.16	2020.000	-0.14/E	<<-
137	3 Mar 1964	E	0.650	0.348	4856.32	1690.000	0.09/E	->
138	12 Mar 1964	E	0.770	0.434	4953.92	2150.000	-0.26/E	<<<-
139	18 Mar 1964	E	0.530	0.279	5978.49	1668.000	-0.01/E	-
140	26 Mar 1964	E	0.500	0.368	4500.00	1656.000	-0.03/E	<-
141	3 Apr 1964	E	0.510	0.333	4804.80	1600.000	0.04/E	->
142	12 Apr 1964	E	0.480	0.349	4412.61	1540.000	0.08/E	->
143	16 Apr 1964	E	0.480	0.394	3908.63	1540.000	0.08/E	->
144	22 Apr 1964	E	0.600	0.380	5052.63	1920.000	-0.20/E	<<-
145	7 May 1964	E	1.160	0.390	5333.33	2080.000	0.20/E	->>
146	17 May 1964	E	1.840	0.551	5989.11	3300.000	-0.17/E	<<-
147	21 May 1964	E	1.940	0.474	7215.19	3420.000	-0.16/E	<<-
148	28 May 1964	E	1.980	0.592	6097.97	3610.000	-0.27/E	<<<-
149	2 Jun 1964	E	2.970	0.732	6803.28	4980.000	-0.22/E	<<<-
150	11 Jun 1964	E	5.050	0.933	8906.75	8310.000	-0.02/E	<-
151	25 Jun 1964	E	4.730	0.844	9087.68	7670.000	-0.01/E	-
152	3 Jul 1964	E	5.640	1.018	9351.67	9520.000	-0.02/E	<-
153	9 Jul 1964	E	8.620	1.422	12658.23	18000.000	-0.47/E	<<<<-
154	17 Jul 1964	E	9.170	1.643	12355.45	20299.999	-0.70/E	<<<<-
155	24 Jul 1964	E	7.290	1.248	10576.92	13199.999	0.01/E	-
156	8 Aug 1964	E	6.920	1.228	10016.29	12300.001	0.02/E	-
157	18 Aug 1964	E	9.050	1.506	12084.99	18199.999	-0.11/E	<-
158	25 Aug 1964	E	10.720	1.743	13023.52	22699.999	0.07/E	->
159	31 Aug 1964	E	11.090	1.771	13833.99	24500.000	-0.12/E	<-
160	6 Sep 1964	E	9.580	1.565	12332.27	19300.000	0.04/E	->
161	12 Sep 1964	E	9.780	1.662	12356.80	20536.999	-0.17/E	<<-
162	18 Sep 1964	E	10.300	1.703	12683.50	21600.000	0.00/E	-
163	30 Sep 1964	E	9.260	1.463	11868.76	17363.999	0.40/E	->>>>
164	13 Oct 1964	E	8.650	1.408	11633.52	16380.001	0.15/E	->>
165	17 Oct 1964	E	8.030	1.304	10992.33	14334.002	0.30/E	->>>
166	25 Oct 1964	E	6.380	1.095	9822.83	10756.001	0.15/E	->>
167	31 Oct 1964	E	5.600	0.993	8913.39	8851.001	0.26/E	->>>
168	5 Nov 1964	E	4.880	0.892	8372.87	7468.600	0.24/E	->>>
169	12 Nov 1964	E	4.370	0.798	8339.60	6655.000	0.18/E	->>
170	18 Nov 1964	E	3.580	0.693	7549.78	5232.000	0.23/E	->>>
171	28 Nov 1964	E	3.000	0.669	7052.32	4718.000	-0.02/E	<-
172	7 Dec 1964	E	2.980	0.635	6976.38	4430.000	0.15/E	->>
173	16 Dec 1964	E	2.640	0.590	6640.68	3918.000	0.17/E	->>
174	18 Dec 1964	E	2.050	0.587	6371.38	3740.000	-0.29/E	<<<-
175	28 Dec 1964	E	2.050	0.587	6371.38	3740.000	-0.29/E	<<<-
176	6 Jan 1965	F	1.890	0.500	6260.00	3130.000	-0.04/F	<-
177	15 Jan 1965	F	1.580	0.510	5843.14	2980.000	-0.22/F	<<-
178	19 Jan 1965	F	1.520	0.480	5833.33	2800.000	-0.11/F	<-
179	27 Jan 1965	F	1.430	0.440	5818.18	2560.000	0.02/F	->
180	9 Feb 1965	F	1.170	0.370	6486.49	2400.000	-0.08/F	<-

River gaugings for station 13101 : Mekong at Nakhon Phanom

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
181	18 Feb 1965	F	1.100	0.400	5625.00	2250.000	0.01/F	-
182	23 Feb 1965	F	1.070	0.420	5476.19	2300.000	-0.07/F	<-
183	2 Mar 1965	F	0.980	0.540	3944.44	2130.000	0.02/F	-
184	10 Mar 1965	F	0.700	0.530	3547.17	1880.000	0.02/F	-
185	23 Mar 1965	F	0.490	0.340	5264.71	1790.000	-0.09/F	<-
186	7 Apr 1965	F	0.380	0.310	5032.26	1560.000	0.09/F	->
187	15 Apr 1965	F	0.400	0.340	5029.41	1710.000	-0.08/F	<-
188	21 Apr 1965	F	0.450	0.340	5058.82	1720.000	-0.04/F	<-
189	29 Apr 1965	F	0.620	0.360	5166.67	1860.000	-0.04/F	<-
190	6 May 1965	F	0.490	0.320	5062.50	1620.000	0.12/F	->>
191	11 May 1965	F	0.600	0.340	5205.88	1770.000	0.05/F	->
192	19 May 1965	F	0.840	0.390	5025.64	1960.000	0.07/F	->
193	27 May 1965	F	0.880	0.370	5324.32	1970.000	0.09/F	->
194	5 Jun 1965	F	3.580	0.310	14677.42	4550.000	0.55/F	->>>>
195	15 Jun 1965	F	7.120	0.560	25178.57	14100.000	-0.53/F	<<<<-
196	1 Jul 1965	F	9.770	1.610	12608.69	20299.999	0.10/F	->
197	9 Jul 1965	F	8.270	1.340	11343.28	15200.001	0.23/F	->>>
198	20 Jul 1965	F	6.650	1.150	10086.96	11600.001	-0.04/F	<-
199	1 Aug 1965	F	9.450	1.290	14263.57	18400.000	0.36/F	->>>>
200	7 Aug 1965	F	9.780	1.590	12704.40	20200.000	0.14/F	->>
201	19 Aug 1965	F	8.480	1.450	11586.21	16799.999	-0.10/F	<-
202	27 Aug 1965	F	8.820	1.450	13034.48	18899.999	-0.43/F	<<<<-
203	22 Sep 1965	F	7.940	1.370	11021.90	15100.000	-0.07/F	<-
204	17 Feb 1967	H	1.140	0.324	5410.52	1753.010	0.10/H	->
205	20 Feb 1967	H	1.040	0.352	4690.80	1651.160	0.09/H	->
206	1 Mar 1967	H	0.940	0.308	5022.05	1546.791	0.08/H	->
207	8 Mar 1967	H	0.800	0.322	4836.71	1557.420	-0.07/H	<-
208	15 Mar 1967	H	0.750	0.291	4926.41	1433.586	0.00/H	-
209	27 Mar 1967	H	0.730	0.304	4690.62	1425.950	-0.01/H	-
210	19 Apr 1967	H	0.590	0.283	4712.08	1333.520	-0.06/H	<-
211	24 Apr 1967	H	0.910	0.254	5012.01	1273.050	0.32/H	->>>>
212	19 May 1967	H	0.590	0.256	4620.66	1182.890	0.09/H	->
213	31 May 1967	H	1.230	0.306	4531.47	1386.630	0.53/H	->>>>
214	12 Jun 1967	?	3.840	0.507	6108.64	3097.081	1.75/H	->>>>
215	28 Jun 1967	H	2.220	0.519	6981.11	3623.195	-0.22/H	<<-
216	6 Jul 1967	H	3.590	0.794	6698.32	5318.470	0.14/H	->>
217	22 Jul 1967	H	4.650	0.847	6565.38	5560.876	1.07/H	->>>>
218	27 Jul 1967	H	7.220	1.187	11421.76	13557.629	0.14/H	->>
219	3 Aug 1967	H	7.350	1.299	10882.72	14136.651	0.06/H	->
220	18 Aug 1967	H	7.020	1.296	10922.36	14155.384	-0.28/H	<<<-
221	31 Aug 1967	H	8.000	1.569	11985.99	18806.020	-0.88/H	<<<<-
222	7 Sep 1967	H	6.440	1.096	9564.43	10482.617	0.56/H	->>>>
223	14 Sep 1967	H	7.860	1.231	11719.21	14426.346	0.46/H	->>>>
224	29 Sep 1967	H	9.350	1.566	13403.47	20989.841	-0.22/H	<<-
225	5 Oct 1967	H	8.250	1.399	12036.95	16839.687	0.01/H	-
226	10 Oct 1967	H	6.880	1.210	11063.78	13387.177	-0.14/H	<<-
227	17 Oct 1967	H	5.260	1.086	9524.96	10344.109	-0.56/H	<<<<-
228	10 Nov 1967	H	2.360	0.635	6581.18	4179.049	-0.43/H	<<<<-
229	16 Nov 1967	H	2.080	0.640	6864.04	4392.985	-0.84/H	<<<<-
230	24 Nov 1967	H	2.650	0.670	7617.25	5103.555	-0.68/H	<<<<-
231	8 Dec 1967	H	2.690	0.556	6268.80	3485.452	0.34/H	->>>>
232	15 Dec 1967	H	2.320	0.488	6199.06	3025.140	0.28/H	->>>
233	21 Dec 1967	H	2.100	0.517	5875.67	3037.721	0.05/H	->
234	26 Dec 1967	H	2.000	0.444	5893.11	2616.541	0.26/H	->>>
235	4 Jan 1968	H	1.680	0.401	5941.25	2382.440	0.12/H	->
236	10 Jan 1968	H	1.470	0.448	5729.32	2566.737	-0.23/H	<<<-
237	18 Jan 1968	H	1.350	0.372	5425.43	2018.259	0.08/H	->
238	24 Jan 1968	H	1.280	0.392	5564.04	2181.102	-0.12/H	<<-
239	7 Feb 1968	H	1.140	0.353	5188.19	1831.430	0.03/H	->
240	22 Feb 1968	H	0.860	0.315	5269.00	1659.734	-0.10/H	<-

River gaugings for station 13101 : Mekong at Nakhon Phanom

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
241	8 Mar 1968	H	0.980	0.385	5226.29	2012.121	-0.29/H	<<<-
242	14 Mar 1968	H	0.750	0.356	4833.33	1720.666	-0.26/H	<<<-
243	9 Jan 1969	I	1.410	0.401	5717.36	2292.662	0.00/I	-
244	21 Jan 1969	I	1.220	0.398	5331.25	2121.836	-0.04/I	<-
245	30 Jan 1969	I	1.080	0.384	5331.33	2047.231	-0.11/I	<-
246	6 Feb 1969	I	0.750	0.339	4708.96	1596.339	-0.01/I	-
247	13 Feb 1969	I	0.750	0.339	4708.96	1596.339	-0.01/I	-
248	26 Feb 1969	I	0.590	0.310	4475.09	1387.277	0.04/I	->
249	3 Mar 1969	I	0.490	0.374	4469.57	1671.618	-0.35/I	<<<<-
250	14 Mar 1969	I	0.410	0.332	4357.61	1446.725	-0.20/I	<<-
251	19 Mar 1969	I	0.350	0.241	4284.62	1032.593	0.20/I	->>
252	25 Mar 1969	I	0.320	0.271	4486.48	1215.837	-0.04/I	<-
253	10 Apr 1969	I	0.140	0.230	4158.18	956.382	0.09/I	->
254	22 Apr 1969	I	0.280	0.273	4509.03	1230.965	-0.10/I	<-
255	29 Apr 1969	I	0.220	0.278	4268.94	1186.766	-0.11/I	<-
256	7 May 1969	I	0.230	0.210	4258.66	894.318	0.26/I	->>>
257	14 May 1969	I	0.290	0.264	4390.00	1158.961	-0.01/I	-
258	21 May 1969	I	0.220	0.226	4284.96	968.400	0.15/I	->>
259	28 May 1969	?	0.900	0.255	4948.29	1261.815	0.49/I	->>>>
260	3 Jun 1969	I	2.020	0.481	5937.43	2855.905	0.15/I	->>
261	11 Jun 1969	I	5.320	0.953	8217.98	7831.737	0.42/I	->>>>
262	14 Jun 1969	I	5.210	0.926	8343.54	7726.116	0.36/I	->>>>
263	18 Jun 1969	I	5.940	1.170	8775.41	10267.227	-0.12/I	<<-
264	25 Jun 1969	I	7.440	1.265	10036.14	12695.723	0.34/I	->>>>
265	28 Jun 1969	?	7.160	0.787	9898.11	7789.814	2.28/I	->>>>
266	2 Jul 1969	I	6.640	1.237	9154.14	11323.668	0.12/I	->
267	5 Jul 1969	I	7.320	1.295	9961.55	12900.212	0.14/I	->>
268	9 Jul 1969	I	7.710	1.481	9962.44	14754.369	-0.21/I	<<-
269	15 Jul 1969	I	9.040	1.538	11285.48	17357.061	0.16/I	->>
270	18 Jul 1969	I	8.710	1.508	11032.91	16637.630	0.09/I	->
271	25 Jul 1969	I	8.840	1.528	11204.59	17120.608	0.04/I	->
272	30 Jul 1969	I	10.200	1.770	12236.89	21659.289	-0.15/I	<<-
273	3 Aug 1969	I	9.770	1.635	11660.66	19065.171	0.29/I	->>>
274	8 Aug 1969	I	10.320	1.776	12563.74	22313.199	-0.24/I	<<<-
275	13 Aug 1969	I	11.850	2.101	13420.27	28195.983	-0.50/I	<<<<-
276	16 Aug 1969	I	11.740	1.922	13589.76	26119.512	-0.00/I	-
277	20 Aug 1969	I	11.600	1.930	13577.24	26204.073	-0.17/I	<<-
278	27 Aug 1969	I	10.750	1.949	12995.18	25327.607	-0.75/I	<<<<-
279	30 Aug 1969	I	10.300	1.744	12490.22	21782.949	-0.09/I	<-
280	3 Sep 1969	I	8.880	1.547	11456.71	17723.539	-0.13/I	<<-
281	10 Sep 1969	I	7.630	1.351	10196.69	13775.728	0.09/I	->
282	13 Sep 1969	I	6.970	1.278	9970.19	12741.902	-0.15/I	<<-
283	17 Sep 1969	I	7.160	1.274	9959.15	12687.958	0.06/I	->
284	24 Sep 1969	I	7.360	1.290	9899.57	12770.439	0.23/I	->>>
285	27 Sep 1969	I	6.260	1.178	9402.35	11075.971	-0.16/I	<<-
286	1 Oct 1969	I	5.960	1.136	8558.40	9722.340	0.15/I	->>
287	8 Oct 1969	I	5.310	1.019	8252.62	8409.425	0.12/I	->
288	11 Oct 1969	I	4.850	0.916	8089.80	7410.258	0.16/I	->>
289	15 Oct 1969	I	4.270	0.836	7592.93	6347.690	0.15/I	->>
290	22 Oct 1969	I	4.090	0.845	7429.41	6277.851	0.01/I	-
291	25 Oct 1969	I	4.160	0.869	7527.61	6541.497	-0.07/I	<-
292	29 Oct 1969	I	3.730	0.776	7245.28	5622.338	0.02/I	->
293	5 Nov 1969	I	3.640	0.762	7167.82	5461.880	0.03/I	->
294	8 Nov 1969	I	4.120	0.867	7574.91	6567.449	-0.12/I	<<-
295	12 Nov 1969	I	3.810	0.771	6953.58	5361.209	0.25/I	->>>
296	19 Nov 1969	I	2.890	0.656	6541.30	4291.096	0.00/I	-
297	22 Nov 1969	I	2.680	0.617	6314.42	3895.998	0.06/I	->
298	26 Nov 1969	I	2.460	0.642	6238.56	4005.159	-0.24/I	<<<-
299	3 Dec 1969	I	2.160	0.599	6032.86	3613.685	-0.27/I	<<<-
300	6 Dec 1969	I	2.030	0.532	5981.49	3182.150	-0.09/I	<-

River gaugings for station 13101 : Mekong at Nakhon Phanom

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
301	10 Dec 1969	I	1.960	0.586	5708.26	3345.038	-0.28/I	<<<-
302	17 Dec 1969	I	1.760	0.543	5588.56	3034.590	-0.25/I	<<<-
303	20 Dec 1969	I	1.670	0.524	4990.67	2615.113	-0.01/I	-
304	24 Dec 1969	I	1.580	0.478	4681.96	2237.977	0.22/I	->>
305	31 Dec 1969	I	1.470	0.459	4743.30	2177.173	0.16/I	->>
306	3 Jan 1970	J	1.440	0.505	5124.69	2587.971	-0.22/J	<<-
307	7 Jan 1970	J	1.300	0.501	5059.71	2534.912	-0.31/J	<<<-
308	14 Jan 1970	J	1.180	0.446	5194.03	2316.539	-0.22/J	<<<-
309	17 Jan 1970	J	1.130	0.426	5071.19	2160.328	-0.12/J	<<-
310	21 Jan 1970	J	1.090	0.427	5063.40	2162.073	-0.16/J	<<-
311	28 Jan 1970	J	0.970	0.416	5052.24	2101.733	-0.22/J	<<<-
312	31 Jan 1970	J	0.920	0.429	4802.99	2060.481	-0.23/J	<<<-
313	4 Feb 1970	J	0.840	0.397	4871.10	1933.828	-0.18/J	<<-
314	11 Feb 1970	J	0.720	0.423	4771.31	2018.263	-0.39/J	<<<<-
315	14 Feb 1970	J	0.680	0.430	4702.52	2022.084	-0.43/J	<<<<-
316	18 Feb 1970	J	0.620	0.336	4700.81	1579.473	-0.01/J	-
317	25 Feb 1970	J	0.560	0.350	4712.71	1649.448	-0.15/J	<<-
318	28 Feb 1970	J	0.500	0.360	4609.27	1659.336	-0.22/J	<<<-
319	4 Mar 1970	?	1.420	0.338	4422.95	1494.956	0.89/J	->>>>
320	10 Mar 1970	J	0.400	0.338	4371.75	1477.650	-0.11/J	<-
321	14 Mar 1970	J	0.350	0.263	4588.68	1206.823	0.18/J	->>
322	18 Mar 1970	J	0.270	0.293	4331.56	1269.147	0.02/J	-
323	25 Mar 1970	J	0.210	0.248	4284.20	1062.482	0.24/J	->>>
324	28 Mar 1970	J	0.240	0.276	4274.98	1179.895	0.10/J	->
325	1 Apr 1970	J	0.380	0.344	4492.64	1545.469	-0.21/J	<<-
326	8 Apr 1970	J	0.390	0.247	4471.90	1104.560	0.36/J	->>>>
327	11 Apr 1970	J	0.350	0.305	4471.95	1363.944	-0.02/J	<-
328	15 Apr 1970	J	0.660	0.313	4708.56	1473.778	0.15/J	->>
329	22 Apr 1970	J	0.600	0.320	4726.04	1512.333	0.05/J	->
330	25 Apr 1970	J	0.540	0.269	4672.47	1256.894	0.30/J	->>>
331	29 Apr 1970	J	0.570	0.260	4616.66	1200.332	0.41/J	->>>>
332	6 May 1970	J	0.770	0.301	4983.51	1500.038	0.23/J	->>>
333	8 May 1970	J	0.760	0.311	4843.00	1506.172	0.21/J	->>
334	15 May 1970	J	1.420	0.456	5182.29	2363.124	-0.03/J	<-
335	19 May 1970	J	1.520	0.484	5219.99	2526.475	-0.08/J	<-
336	23 May 1970	J	3.040	0.692	6556.81	4537.313	-0.12/J	<<-
337	27 May 1970	J	4.450	0.841	7502.96	6309.989	0.19/J	->>
338	2 Jun 1970	J	4.000	0.814	7100.03	5779.422	0.05/J	->
339	6 Jun 1970	J	3.510	0.769	6799.14	5228.535	-0.10/J	<-
340	10 Jun 1970	J	3.460	0.753	6694.47	5040.936	-0.03/J	<-
341	16 Jun 1970	J	4.290	0.774	7560.84	5852.087	0.30/J	->>>
342	20 Jun 1970	J	6.360	1.134	9111.82	10332.801	0.09/J	->
343	24 Jun 1970	J	7.050	1.319	8706.19	11483.468	0.28/J	->>>
344	1 Jul 1970	J	9.900	1.869	11886.31	22215.503	-0.64/J	<<<<-
345	4 Jul 1970	J	10.300	1.986	12516.37	24857.500	-1.01/J	<<<<-
346	7 Jul 1970	J	10.080	1.854	12268.25	22745.339	-0.62/J	<<<<-
347	14 Jul 1970	J	8.820	1.491	10554.58	15736.874	0.40/J	->>>>
348	18 Jul 1970	J	9.170	1.536	10872.41	16700.021	0.41/J	->>>>
349	22 Jul 1970	J	10.000	1.812	12178.82	22068.023	-0.49/J	<<<<-
350	28 Jul 1970	J	10.190	1.780	12399.60	22071.279	-0.31/J	<<<-
351	1 Aug 1970	J	10.130	1.824	12296.63	22429.050	-0.47/J	<<<<-
352	5 Aug 1970	J	10.390	1.845	12715.06	23459.281	-0.52/J	<<<<-
353	11 Aug 1970	J	11.430	2.031	13128.25	26663.479	-0.38/J	<<<<-
354	20 Aug 1970	J	12.200	2.083	14316.31	29820.880	-0.46/J	<<<<-
355	25 Aug 1970	J	12.790	1.960	14649.05	28712.132	0.42/J	->>>>
356	29 Aug 1970	J	12.580	1.876	14293.04	26813.745	0.72/J	->>>>
357	2 Sep 1970	J	12.240	1.896	13938.18	26426.783	0.49/J	->>>>
358	8 Sep 1970	J	11.900	1.904	13950.58	26561.903	0.11/J	->
359	12 Sep 1970	J	11.540	1.861	13132.12	24438.865	0.35/J	->>>>
360	16 Sep 1970	J	11.320	1.866	13403.36	25010.669	-0.03/J	<-

River gaugings for station 13101 : Mekong at Nakhon Phanom

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
361	22 Sep 1970	J	11.020	1.994	12847.57	25618.055	-0.51/J	<<<<-
362	26 Sep 1970	J	10.210	1.679	12384.16	20792.999	0.11/J	->
363	2 Oct 1970	J	9.280	1.511	11317.01	17100.000	0.38/J	->>>>
364	6 Oct 1970	J	8.010	1.313	11043.41	14500.001	0.04/J	->
365	9 Oct 1970	J	7.230	1.190	10168.07	12100.000	0.20/J	->>
366	14 Oct 1970	J	7.290	1.284	10124.61	13000.001	-0.10/J	<-
367	21 Oct 1970	J	5.560	0.951	8748.69	8320.000	0.23/J	->>>
368	24 Oct 1970	J	5.170	0.891	8170.59	7280.000	0.38/J	->>>>
369	28 Oct 1970	J	4.560	0.893	7693.17	6870.000	-0.01/J	-
370	3 Nov 1970	J	4.150	0.765	7411.76	5670.000	0.27/J	->>>
371	7 Nov 1970	J	3.800	0.762	7199.47	5486.000	0.03/J	->
372	12 Nov 1970	J	3.730	0.769	7230.17	5560.000	-0.09/J	<-
373	17 Nov 1970	J	3.410	0.764	6858.64	5240.000	-0.21/J	<<-
374	21 Nov 1970	J	3.330	0.786	6208.65	4880.000	-0.06/J	<-
375	25 Nov 1970	J	3.400	0.687	6870.45	4720.000	0.12/J	->
376	1 Dec 1970	J	3.800	0.660	6878.79	4540.000	0.64/J	->>>>
377	6 Dec 1970	J	3.700	0.664	6539.16	4342.000	0.67/J	->>>>
378	9 Dec 1970	J	2.650	0.680	6117.65	4160.000	-0.25/J	<<<-
379	14 Dec 1970	J	3.530	0.721	7128.99	5140.000	-0.03/J	<-
380	18 Dec 1970	J	3.510	0.737	6974.22	5140.000	-0.05/J	<-
381	22 Dec 1970	J	3.840	0.745	7114.09	5300.000	0.18/J	->>
382	28 Dec 1970	J	3.100	0.588	6819.73	4010.000	0.31/J	->>>
383	2 Jan 1971	J	2.510	0.602	6162.79	3710.000	-0.06/J	<-
384	5 Jan 1971	J	2.340	0.629	6009.54	3780.000	-0.29/J	<<<-
385	10 Jan 1971	J	2.120	0.558	5985.66	3340.000	-0.17/J	<<-
386	14 Jan 1971	J	1.990	0.467	5824.41	2720.000	0.22/J	->>
387	19 Jan 1971	J	1.820	0.477	5660.38	2700.000	0.06/J	->
388	25 Jan 1971	J	1.680	0.467	5695.93	2660.000	-0.04/J	<-
389	29 Jan 1971	J	1.540	0.468	5149.57	2410.000	0.05/J	->
390	2 Feb 1971	J	1.520	0.492	5447.15	2680.000	-0.22/J	<<-
391	8 Feb 1971	J	1.410	0.467	5182.01	2420.000	-0.09/J	<-
392	12 Feb 1971	J	1.350	0.440	5318.18	2340.000	-0.08/J	<-
393	16 Feb 1971	J	1.290	0.439	5216.40	2290.000	-0.09/J	<-
394	21 Feb 1971	J	1.240	0.420	5190.48	2180.000	-0.03/J	<-
395	26 Feb 1971	J	1.180	0.375	5226.67	1960.000	0.13/J	->>
396	1 Mar 1971	J	1.160	0.376	5292.55	1990.000	0.08/J	->
397	12 Mar 1971	J	0.900	0.394	4974.62	1960.000	-0.15/J	<<-
398	16 Mar 1971	J	0.810	0.366	4972.68	1820.000	-0.09/J	<-
399	22 Mar 1971	J	0.740	0.342	4883.04	1670.000	0.00/J	-
400	25 Mar 1971	J	0.750	0.331	4622.36	1530.000	0.17/J	->>
401	30 Mar 1971	J	0.800	0.365	4657.53	1700.000	0.03/J	->
402	5 Apr 1971	J	0.720	0.346	4913.29	1700.000	-0.05/J	<-
403	9 Apr 1971	J	0.680	0.308	4935.06	1520.000	0.12/J	->
404	12 Apr 1971	J	0.600	0.294	4795.92	1410.000	0.17/J	->>
405	22 Apr 1971	J	0.700	0.324	5000.00	1620.000	0.02/J	->
406	28 Apr 1971	J	0.800	0.375	4986.67	1870.000	-0.16/J	<<-
407	3 May 1971	K	0.840	0.302	5066.23	1530.000	-0.18/K	<<-
408	7 May 1971	K	0.690	0.271	4797.05	1300.000	-0.05/K	<-
409	11 May 1971	K	0.740	0.307	4885.99	1500.000	-0.24/K	<<<-
410	17 May 1971	K	1.000	0.300	5200.00	1560.000	-0.05/K	<-
411	21 May 1971	K	1.150	0.358	5223.46	1870.000	-0.24/K	<<<-
412	25 May 1971	K	1.540	0.384	5572.92	2140.000	-0.12/K	<<-
413	31 May 1971	K	2.090	0.435	6045.98	2630.000	-0.03/K	<-
414	4 Jun 1971	K	3.700	0.649	7318.95	4750.000	-0.00/K	-
415	8 Jun 1971	K	4.830	0.852	8309.86	7080.000	-0.24/K	<<<-
416	14 Jun 1971	K	4.180	0.726	7699.72	5590.000	-0.05/K	<-
417	18 Jun 1971	K	4.240	0.768	7565.10	5810.000	-0.12/K	<-
418	22 Jun 1971	K	4.320	0.782	7570.33	5920.000	-0.10/K	<-
419	29 Jun 1971	K	6.400	1.037	9575.70	9930.000	-0.05/K	<-
420	2 Jul 1971	K	7.280	1.255	10039.84	12600.001	-0.29/K	<<<-

River gaugings for station 13101 : Mekong at Nakhon Phanom

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
421	6 Jul 1971	K	7.170	1.182	9644.67	11400.000	0.09/K	->
422	23 Aug 1971	K	12.500	2.125	15247.06	32400.000	-1.05/K	<<<<-
423	27 Aug 1971	K	12.320	2.083	14354.30	29899.999	-0.60/K	<<<<-
424	30 Aug 1971	K	12.130	2.031	14278.68	28999.999	-0.56/K	<<<<-
425	3 Sep 1971	K	12.000	1.930	14455.96	27900.001	-0.41/K	<<<<-
426	7 Sep 1971	K	12.070	1.986	14451.16	28700.000	-0.54/K	<<<<-
427	14 Sep 1971	K	11.370	1.888	13665.25	25799.998	-0.47/K	<<<<-
428	18 Sep 1971	K	10.750	1.646	13365.74	21999.999	-0.01/K	-
429	22 Sep 1971	K	9.260	1.409	12065.29	17000.000	0.09/K	->
430	28 Sep 1971	K	8.030	1.346	10846.95	14599.999	-0.30/K	<<<-
431	2 Oct 1971	K	7.460	1.189	9756.10	11600.001	0.30/K	->>>
432	6 Oct 1971	K	7.860	1.251	10231.81	12800.000	0.21/K	->>
433	18 Oct 1971	K	7.300	1.080	9185.18	9920.001	0.86/K	->>>>
434	29 Oct 1971	K	5.300	0.964	8392.12	8090.000	-0.28/K	<<<-
435	2 Nov 1971	K	4.610	0.850	7839.06	6663.200	-0.23/K	<<<-
436	8 Nov 1971	K	5.050	0.830	8289.19	6880.024	0.09/K	->
437	12 Nov 1971	K	4.150	0.770	7535.48	5802.318	-0.20/K	<<-
438	16 Nov 1971	K	3.800	0.710	7246.91	5145.304	-0.16/K	<<-
439	22 Nov 1971	K	3.500	0.725	6988.32	5066.531	-0.41/K	<<<<-
440	26 Nov 1971	K	3.270	0.636	6684.03	4251.040	-0.10/K	<-
441	2 Dec 1971	K	2.930	0.497	6563.82	3262.220	0.29/K	->>>
442	8 Dec 1971	?	2.710	0.613	6771.40	4150.869	-0.59/K	<<<<-
443	11 Dec 1971	K	2.580	0.459	6391.48	2933.691	0.20/K	->>
444	14 Dec 1971	K	2.560	0.472	6431.98	3035.895	0.10/K	->
445	20 Dec 1971	K	2.330	0.459	5963.53	2737.260	0.12/K	->
446	24 Dec 1971	K	2.370	0.451	6186.05	2789.909	0.11/K	->
447	29 Dec 1971	K	2.330	0.449	6158.18	2765.023	0.09/K	->
448	6 Jan 1972	K	2.120	0.406	6162.56	2502.000	0.12/K	->
449	10 Jan 1972	K	2.000	0.448	6002.23	2689.000	-0.17/K	<<-
450	14 Jan 1972	K	1.940	0.464	5836.21	2708.000	-0.25/K	<<<-
451	16 Jan 1972	K	1.880	0.409	5990.46	2450.100	-0.08/K	<-
452	18 Jan 1972	K	1.800	0.390	5743.59	2240.000	0.04/K	->
453	24 Jan 1972	K	1.660	0.392	5688.78	2230.000	-0.09/K	<-
454	28 Jan 1972	K	1.570	0.335	5483.58	1837.000	0.21/K	->>
455	4 Feb 1972	K	1.440	0.295	5423.73	1600.000	0.34/K	->>>>
456	7 Feb 1972	K	1.400	0.382	5075.92	1939.000	-0.06/K	<-
457	12 Feb 1972	K	1.340	0.326	5220.86	1702.000	0.13/K	->>
458	15 Feb 1972	K	1.270	0.349	4338.11	1514.000	0.27/K	->>>
459	21 Feb 1972	K	1.260	0.311	4906.75	1526.000	0.25/K	->>>
460	25 Feb 1972	K	1.160	0.304	5023.03	1527.000	0.15/K	->>
461	29 Feb 1972	K	1.090	0.318	4965.41	1579.000	0.02/K	-
462	6 Mar 1972	K	0.940	0.265	4962.26	1315.000	0.18/K	->>
463	10 Mar 1972	K	0.890	0.256	4839.84	1239.000	0.23/K	->>>
464	14 Mar 1972	K	0.870	0.254	5035.43	1279.000	0.16/K	->>
465	20 Mar 1972	K	0.860	0.313	4750.80	1487.000	-0.11/K	<-
466	24 Mar 1972	K	0.850	0.291	4821.31	1403.000	-0.02/K	-
467	28 Mar 1972	K	0.830	0.288	4809.03	1385.000	-0.01/K	-
468	3 Apr 1972	K	0.720	0.278	4877.70	1356.000	-0.09/K	<-
469	7 Apr 1972	K	0.790	0.295	4857.63	1433.000	-0.11/K	<-
470	12 Apr 1972	K	0.970	0.289	5093.43	1472.000	0.02/K	->
471	17 Apr 1972	K	1.180	0.319	5285.27	1686.000	-0.01/K	-
472	21 Apr 1972	K	1.210	0.342	5245.61	1794.000	-0.10/K	<-
473	26 Apr 1972	K	0.950	0.301	5245.85	1579.000	-0.12/K	<<-
474	1 May 1972	K	0.760	0.293	4604.09	1349.000	-0.04/K	<-
475	5 May 1972	K	0.810	0.300	4653.33	1396.000	-0.05/K	<-
476	10 May 1972	K	1.220	0.353	4974.50	1756.000	-0.05/K	<-
477	15 May 1972	K	1.280	0.364	5032.97	1832.000	-0.07/K	<-
478	19 May 1972	K	1.140	0.338	4869.82	1646.000	-0.01/K	-
479	24 May 1972	K	1.620	0.397	5239.29	2080.000	0.01/K	-
480	29 May 1972	K	1.550	0.354	5166.67	1829.000	0.20/K	->>

River gaugings for station 13101 : Mekong at Nakhon Phanom

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
481	3 Jun 1972	K	1.610	0.331	5350.45	1771.000	0.32/K	->>>>
482	7 Jun 1972	K	2.270	0.424	5884.43	2495.000	0.27/K	->>>
483	12 Jun 1972	K	4.040	0.745	7186.58	5354.000	-0.05/K	<-
484	16 Jun 1972	K	3.940	0.595	6919.33	4117.000	0.66/K	->>>>
485	21 Jun 1972	K	4.520	0.950	7609.47	7229.000	-0.62/K	<<<<-
486	26 Jun 1972	K	3.000	0.534	6438.20	3438.000	0.22/K	->>
487	30 Jun 1972	K	4.870	0.954	7911.95	7548.000	-0.44/K	<<<<-
488	5 Jul 1972	K	5.860	1.015	8162.56	8285.000	0.18/K	->>
489	10 Jul 1972	K	4.900	0.851	7910.69	6732.000	0.02/K	->
490	14 Jul 1972	K	5.500	0.884	8356.33	7387.000	0.27/K	->>>
491	19 Jul 1972	K	6.480	1.095	8898.63	9744.001	0.12/K	->
492	26 Jul 1972	K	8.320	1.201	11176.52	13423.000	0.43/K	->>>>
493	31 Jul 1972	K	8.580	1.268	11099.37	14074.000	0.45/K	->>>>
494	4 Aug 1972	K	9.700	1.541	11922.78	18373.000	0.07/K	->
495	9 Aug 1972	K	11.320	1.738	12329.11	21427.999	0.73/K	->>>>
496	14 Aug 1972	K	12.020	1.913	13625.72	26065.999	0.11/K	->
497	18 Aug 1972	K	11.690	1.692	13007.09	22008.000	0.93/K	->>>>
498	23 Aug 1972	K	11.170	1.647	12968.43	21358.999	0.60/K	->>>>
499	28 Aug 1972	K	11.230	1.785	13227.45	23611.000	0.00/K	-
500	1 Sep 1972	K	11.010	1.690	13076.33	22099.000	0.22/K	->>>
501	6 Sep 1972	K	10.150	1.318	15114.57	19921.000	0.03/K	->
502	11 Sep 1972	K	9.400	1.047	16937.92	17734.000	-0.02/K	-
503	15 Sep 1972	K	8.070	1.318	11071.32	14592.000	-0.25/K	<<<-
504	20 Sep 1972	K	6.790	1.047	9829.04	10291.000	0.18/K	->>
505	25 Sep 1972	K	5.840	0.956	9326.36	8916.000	-0.14/K	<<-
506	29 Sep 1972	K	5.560	0.895	8972.07	8030.000	0.01/K	-
507	4 Oct 1972	K	6.400	0.988	9445.34	9332.001	0.22/K	->>>
508	9 Oct 1972	K	6.840	1.018	10052.06	10233.000	0.26/K	->>>
509	13 Oct 1972	K	5.740	0.886	9119.64	8080.000	0.16/K	->>
510	18 Oct 1972	K	6.020	0.936	9419.87	8817.000	0.08/K	->
511	23 Oct 1972	K	5.860	0.927	9140.24	8473.001	0.09/K	->
512	27 Oct 1972	K	5.540	0.894	8917.23	7972.000	0.02/K	-
513	1 Nov 1972	K	4.970	0.816	8530.64	6961.000	-0.03/K	<-
514	6 Nov 1972	K	4.100	0.598	7657.19	4579.000	0.51/K	->>>>
515	10 Nov 1972	K	3.640	0.655	7403.05	4849.000	-0.13/K	<<-
516	15 Nov 1972	K	4.090	0.672	7883.93	5298.000	0.04/K	->
517	20 Nov 1972	K	4.410	0.715	8193.01	5858.000	0.02/K	->
518	24 Nov 1972	K	3.580	0.724	7396.41	5355.000	-0.51/K	<<<<-
519	29 Nov 1972	K	3.390	0.593	7173.69	4254.000	0.02/K	-
520	4 Dec 1972	K	3.510	0.715	7132.87	5100.000	-0.42/K	<<<<-
521	8 Dec 1972	K	4.500	0.832	8243.99	6859.000	-0.45/K	<<<<-
522	13 Dec 1972	K	4.330	0.760	7973.68	6060.000	-0.17/K	<<-
523	17 Dec 1972	K	3.300	0.658	7138.30	4697.000	-0.37/K	<<<<-
524	21 Dec 1972	K	2.970	0.598	6891.30	4121.000	-0.31/K	<<<-
525	28 Dec 1972	K	2.700	0.555	6709.91	3724.000	-0.30/K	<<<-
526	2 Jan 1973	L	2.350	0.545	6507.16	3546.400	-0.43/L	<<<<-
527	6 Jan 1973	L	2.180	0.461	6344.04	2924.600	-0.10/L	<-
528	11 Jan 1973	L	2.010	0.434	6112.67	2652.900	-0.03/L	<-
529	16 Jan 1973	L	1.880	0.409	5990.46	2450.100	0.03/L	->
530	3 Feb 1973	L	1.440	0.323	6307.74	2037.400	-0.01/L	-
531	8 Feb 1973	L	1.300	0.331	6193.96	2050.200	-0.16/L	<<-
532	13 Feb 1973	L	1.240	0.307	5681.43	1744.200	0.11/L	->
533	17 Feb 1973	L	1.180	0.295	5891.19	1737.900	0.06/L	->
534	22 Feb 1973	L	1.080	0.293	5538.57	1622.800	0.09/L	->
535	27 Feb 1973	L	0.990	0.262	5546.18	1453.100	0.20/L	->>
536	3 Mar 1973	L	0.840	0.244	5527.46	1348.700	0.18/L	->>
537	6 Mar 1973	L	0.860	0.272	5528.68	1503.800	0.01/L	-
538	12 Mar 1973	L	1.020	0.309	5805.83	1794.000	-0.17/L	<<-
539	16 Mar 1973	L	1.020	0.309	5805.83	1794.000	-0.17/L	<<-
540	20 Mar 1973	L	1.650	0.357	6001.68	2142.600	0.10/L	->

River gaugings for station 13101 : Mekong at Nakhon Phanom

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
541	3 Apr 1973	L	0.950	0.299	5495.65	1643.200	-0.07/L	<-
542	6 Apr 1973	L	0.890	0.299	5375.92	1607.400	-0.08/L	<-
543	10 Apr 1973	L	0.810	0.286	5281.47	1510.500	-0.05/L	<-
544	12 Apr 1973	L	0.720	0.261	5339.08	1393.500	0.01/L	-
545	16 Apr 1973	L	0.710	0.264	5150.00	1359.600	0.04/L	->
546	20 Apr 1973	L	0.740	0.286	5307.34	1517.900	-0.13/L	<<-
547	24 Apr 1973	L	0.780	0.275	5291.64	1455.200	-0.01/L	-
548	1 May 1973	L	1.380	0.314	5608.92	1761.200	0.23/L	->>>
549	7 May 1973	L	1.520	0.346	6024.28	2084.400	0.02/L	->
550	15 May 1973	L	1.750	0.375	6077.33	2279.000	0.06/L	->
551	21 May 1973	L	2.070	0.406	6153.20	2498.200	0.17/L	->>
552	25 May 1973	L	1.900	0.379	6150.66	2331.100	0.16/L	->>
553	29 May 1973	L	2.300	0.458	6565.72	3007.100	-0.05/L	<-
554	4 Jun 1973	L	2.420	0.506	6547.23	3312.900	-0.18/L	<<-
555	8 Jun 1973	L	3.420	0.627	7884.85	4943.800	-0.34/L	<<<<-
556	12 Jun 1973	L	4.850	0.781	8632.14	6741.700	0.03/L	->
557	18 Jun 1973	L	5.640	0.879	9313.88	8186.900	0.07/L	->
558	22 Jun 1973	L	5.490	0.835	9439.40	7881.900	0.07/L	->
559	27 Jun 1973	L	4.980	0.809	8779.48	7102.600	-0.04/L	<-
560	2 Jul 1973	L	4.370	0.728	8381.32	6101.600	-0.09/L	<-
561	6 Jul 1973	L	4.990	0.773	8830.79	6826.200	0.12/L	->
562	10 Jul 1973	L	7.950	1.258	11309.78	14227.701	-0.17/L	<<-
563	16 Jul 1973	L	8.620	1.456	11932.07	17373.099	-0.60/L	<<<<-
564	30 Jul 1973	L	7.680	1.226	10587.77	12980.601	0.03/L	->
565	28 Sep 1973	L	10.320	1.694	12715.35	21539.801	-0.20/L	<<-
566	3 Oct 1973	L	9.720	1.474	12417.16	18302.901	0.20/L	->>
567	8 Oct 1973	L	8.620	1.260	12023.89	15150.099	0.16/L	->>
568	12 Oct 1973	L	7.730	1.109	11133.36	12346.901	0.32/L	->>>>
569	17 Oct 1973	L	6.480	1.021	10022.33	10232.800	-0.04/L	<-
570	22 Oct 1973	L	5.460	0.891	9177.22	8176.900	-0.11/L	<-
571	26 Oct 1973	L	4.970	0.863	8416.11	7263.100	-0.13/L	<<-
572	31 Oct 1973	L	4.850	0.761	8500.92	6469.200	0.18/L	->>
573	5 Nov 1973	L	5.020	0.766	8601.17	6588.500	0.28/L	->>>
574	8 Nov 1973	L	4.380	0.747	7922.76	5918.300	0.02/L	->
575	14 Nov 1973	L	3.850	0.663	7598.49	5037.800	0.03/L	->
576	21 Nov 1973	L	4.430	0.670	8029.10	5379.500	0.40/L	->>>>
577	26 Nov 1973	L	3.810	0.649	7701.85	4998.500	0.02/L	-
578	30 Nov 1973	L	4.380	0.717	8100.98	5808.400	0.09/L	->
579	5 Dec 1973	L	3.820	0.702	7361.68	5167.900	-0.08/L	<-
580	13 Dec 1973	L	3.010	0.558	6845.88	3820.000	0.02/L	->
581	20 Dec 1973	L	2.680	0.536	6631.90	3554.700	-0.11/L	<-
582	27 Dec 1973	L	2.470	0.502	6479.28	3252.600	-0.08/L	<-
583	3 Jan 1974	M	2.160	0.484	6124.17	2964.100	-0.10/M	<-
584	10 Jan 1974	M	1.950	0.459	5991.29	2750.000	-0.14/M	<<-
585	17 Jan 1974	M	1.820	0.408	5703.19	2326.900	0.06/M	->
586	24 Jan 1974	M	1.660	0.386	5733.16	2213.000	-0.00/M	-
587	31 Jan 1974	M	1.580	0.386	5697.41	2199.200	-0.07/M	<-
588	7 Feb 1974	M	1.420	0.365	5590.96	2040.700	-0.09/M	<-
589	11 Feb 1974	M	1.290	0.342	5516.75	1886.730	-0.09/M	<-
590	14 Feb 1974	M	1.240	0.352	5485.51	1930.900	-0.18/M	<<-
591	22 Feb 1974	M	1.180	0.294	5346.26	1571.800	0.09/M	->
592	28 Feb 1974	M	1.060	0.287	5359.93	1538.300	0.03/M	->
593	7 Mar 1974	M	0.940	0.267	5426.59	1448.900	-0.03/M	<-
594	14 Mar 1974	M	0.870	0.261	5364.37	1400.100	-0.05/M	<-
595	21 Mar 1974	M	0.810	0.246	5154.06	1267.900	0.02/M	->
596	2 Apr 1974	M	0.980	0.282	5270.92	1486.400	-0.02/M	<-
597	11 Apr 1974	M	1.050	0.286	5374.82	1537.200	-0.00/M	-
598	19 Apr 1974	M	1.250	0.291	5482.82	1595.500	0.14/M	->>
599	25 Apr 1974	M	1.170	0.300	5350.00	1605.000	0.05/M	->
600	2 May 1974	M	1.220	0.294	5417.35	1592.700	0.11/M	->

River gaugings for station 13101 : Mekong at Nakhon Phanom

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
601	9 May 1974	M	1.960	0.419	5962.05	2498.100	0.07/M	->
602	13 May 1974	M	1.680	0.369	5842.55	2155.900	0.07/M	->
603	27 May 1974	M	1.900	0.372	5851.61	2176.800	0.27/M	->>>
604	6 Jun 1974	M	2.920	0.471	6573.46	3096.100	0.56/M	->>>>
605	13 Jun 1974	M	3.320	0.581	7123.75	4138.900	0.23/M	->>>
606	20 Jun 1974	M	5.540	0.882	8495.35	7492.900	0.45/M	->>>>
607	28 Jun 1974	M	4.840	0.862	8075.29	6960.900	0.04/M	->
608	4 Jul 1974	M	3.900	0.758	7264.64	5506.600	-0.06/M	<-
609	11 Jul 1974	M	6.040	0.960	8981.15	8621.901	0.35/M	->>>>
610	18 Jul 1974	M	5.070	0.876	8091.32	7088.000	0.20/M	->>
611	25 Jul 1974	M	8.640	1.423	10996.27	15647.700	-0.25/M	<<<-
612	1 Aug 1974	M	7.920	1.295	10448.49	13530.799	-0.07/M	<-
613	8 Aug 1974	M	8.030	1.365	10461.17	14279.501	-0.28/M	<<<-
614	23 Aug 1974	M	10.690	1.616	12513.86	20222.400	0.01/M	-
615	28 Aug 1974	M	10.660	1.537	12435.85	19113.899	0.40/M	->>>>
616	5 Sep 1974	M	11.570	1.663	13412.93	22305.698	0.12/M	->>
617	12 Sep 1974	M	10.850	1.573	13008.01	20461.599	0.08/M	->
618	19 Sep 1974	M	9.680	1.575	12319.81	19403.699	-0.69/M	<<<<-
619	26 Sep 1974	M	8.080	1.263	10696.36	13509.501	0.10/M	->
620	3 Oct 1974	M	7.570	1.232	10628.49	13094.301	-0.23/M	<<<-
621	10 Oct 1974	M	6.840	1.082	9970.42	10788.001	0.09/M	->
622	17 Oct 1974	M	5.780	0.964	9064.73	8738.401	0.04/M	->
623	24 Oct 1974	M	4.620	0.769	8104.03	6232.000	0.23/M	->>>
624	31 Oct 1974	M	3.030	0.542	7716.79	4182.500	-0.09/M	<-
625	5 Nov 1974	M	3.820	0.708	7405.23	5242.900	0.02/M	-
626	12 Nov 1974	M	4.430	0.836	7945.10	6642.100	-0.19/M	<<-
627	19 Nov 1974	M	3.530	0.778	7271.21	5657.000	-0.52/M	<<<<-
628	26 Nov 1974	M	3.580	0.769	7182.05	5523.000	-0.39/M	<<<<-
629	4 Dec 1974	M	2.920	0.586	6677.13	3912.800	-0.02/M	<-
630	10 Dec 1974	M	2.580	0.564	6262.41	3532.000	-0.09/M	<-
631	17 Dec 1974	M	2.300	0.548	6287.04	3445.300	-0.31/M	<<<-
632	25 Dec 1974	M	2.050	0.469	5977.61	2803.500	-0.09/M	<-
633	7 Jan 1975	N	1.740	0.446	5764.04	2570.760	-0.11/N	<-
634	14 Jan 1975	N	1.650	0.426	5751.78	2450.260	-0.10/N	<-
635	21 Jan 1975	N	2.240	0.508	6172.91	3135.840	-0.07/N	<-
636	28 Jan 1975	N	1.870	0.444	5885.45	2613.140	-0.02/N	-
637	4 Feb 1975	N	1.500	0.377	5641.67	2126.910	0.04/N	->
638	11 Feb 1975	N	1.290	0.342	5516.75	1886.730	0.06/N	->
639	18 Feb 1975	N	1.150	0.329	5350.00	1760.150	0.05/N	->
640	25 Feb 1975	N	1.040	0.322	5380.50	1732.520	-0.03/N	<-
641	11 Mar 1975	N	0.920	0.279	5252.87	1465.550	0.13/N	->>
642	18 Mar 1975	N	0.810	0.290	5113.76	1482.990	0.00/N	-
643	25 Mar 1975	N	0.740	0.281	5185.16	1457.030	-0.04/N	<-
644	1 Apr 1975	N	0.690	0.275	5035.49	1384.760	-0.01/N	-
645	8 Apr 1975	N	0.660	0.264	5019.32	1325.100	0.03/N	->
646	15 Apr 1975	N	0.790	0.273	5142.49	1403.900	0.07/N	->
647	22 Apr 1975	N	0.680	0.281	5132.95	1442.360	-0.09/N	<-
648	29 Apr 1975	N	0.990	0.325	5277.97	1715.340	-0.06/N	<-
649	6 May 1975	N	0.910	0.361	4656.93	1681.150	-0.11/N	<-
650	13 May 1975	N	1.100	0.302	5401.42	1631.230	0.13/N	->>
651	20 May 1975	N	1.640	0.378	5846.11	2209.830	0.11/N	->
652	27 May 1975	N	2.100	0.474	6147.91	2914.110	-0.04/N	<-
653	3 Jun 1975	N	3.150	0.629	6938.39	4364.250	-0.06/N	<-
654	10 Jun 1975	N	5.160	0.935	8503.24	7950.530	-0.17/N	<<-
655	17 Jun 1975	N	4.490	0.827	8079.95	6682.120	-0.15/N	<<-
656	27 Jun 1975	N	7.440	1.180	10271.78	12120.701	0.12/N	->
657	1 Jul 1975	N	6.660	1.059	9608.69	10175.599	0.22/N	->>>
658	8 Jul 1975	N	5.560	0.912	8672.43	7909.260	0.25/N	->>>
659	15 Jul 1975	N	7.030	1.094	10005.13	10945.610	0.23/N	->>>
660	22 Jul 1975	N	8.860	1.412	11413.42	16115.751	-0.10/N	<-

River gaugings for station 13101 : Mekong at Nakhon Phanom

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
661	29 Jul 1975	N	8.460	1.460	9901.98	14456.890	0.16/N	->>
662	4 Aug 1975	N	8.580	1.363	11307.96	15412.750	-0.11/N	<-
663	7 Aug 1975	N	9.470	1.484	11897.18	17655.409	-0.07/N	<-
664	11 Aug 1975	N	9.750	1.579	11992.94	18936.850	-0.26/N	<<<-
665	18 Aug 1975	N	10.430	1.595	12246.17	19532.640	0.20/N	->>
666	21 Aug 1975	N	10.120	1.521	12326.99	18749.359	0.18/N	->>
667	25 Aug 1975	N	10.460	1.624	12576.08	20423.559	-0.08/N	<-
668	28 Aug 1975	N	11.160	1.784	13054.06	23288.439	-0.35/N	<<<<-

C.9.9 Station 13402 - Mukdahan

Figure C9.9.1 shows the number of gaugings per year from 1960 to 1987. There have been a large number of gaugings at this site over many years. In terms of number of gaugings and years of gaugings Mukdahan is best gauged station on Mekong. There is however considerable scatter amongst the gaugings throughout the period as Figure C9.9.2 illustrates. Figure C9.9.2 also shows the average rating curve for the station.

Figure C9.9.3 shows the spread of annual rating curves derived for this station.

Individual years have reasonably well defined ratings as shown in Figures C9.9.4b to C9.9.4q but with instability at low flows in some years. As might be expected from the scatter noted in Figure C9.9.2, the range of ratings fitted is large. There is no consistent trend of rating change with time.

In the middle of 1971 there appeared to be a large shift in the rating at Mukdahan. Before 22nd May gaugings were more consistent with the 1970 rating; after 2nd June gaugings were more consistent with the 1971 rating. Fitting a single rating to 1971 was not satisfactory. Therefore the 1970 rating, rating K, was extended until 1st June 1971 using all gaugings in that period. Similarly rating L was defined to run from 2nd June 1971 until 31st December 1972.

Of interest is the fact that rating O was in operation during the ungauged period from 1975 until 1986. This is significant because rating O is one of the extreme ratings at this station as Figure C9.9.3 shows. Consequently flow data calculated during this period using rating O may be too low. In this situation it may be better to use an average, long term, rating.

Gaugings made between April 1983 and March 1984 were not available until after this study was complete and are therefore not considered here.

Gauging History - 013402 Mukdahan

Year	Gauging numbers	Number of gaugings	Rating letter	Shifts (Y=yes)	Fitting method
1923+		0	A		1
1960	1 - 9	9		Y	
1961	10 - 69	60	B	Y	2
1962	70 - 141	72	C	Y	2
1963	142 - 182	41	D	Y	2
1964	183 - 229	47	E	Y	2,4 *
1965	230 - 274	45	F	Y	1
1966	275 - 318	44	G	Y	1
1967	319 - 369	51	H	Y	1
1968	370 - 428	59	I	Y	1
1969	429 - 515	87	J	Y	1
1970/71	1 - 135	135	K	Y	1
1971/72	136 - 275	140	L	Y	1
1973	276 - 349	74	M	Y	1
1974	350 - 443	94	N	Y	1
1975	444 - 497	54	O	Y	3 *
1976+		0	P		1
1987	498 - 516	19	Q		1
	Total =	1031			

+ = and subsequent years

Dubious gaugings (HYDATA flag ?) - 165,247,250,383-386, 391 (1960-1969)

Dubious gaugings (HYDATA flag ?) - 312,387,502,506 (1960-1987)

Rare flood gaugings (HYDATA flag +) - None

Observed stage range 0.72 metres to 14.22 metres

Gauged stage range 0.86 metres to 13.62 metres

See Section C.9.1 for description of the table

Note that gaugings from 1960 to 1969 are stored in HYDATA under rating station 13499 ("99" being used to indicate a special station). This is to allow space under normal station number 13402 for future gaugings. All rating equations are stored under station number 13402.

* Notes on special fitting :

Rating E . In addition to a two part curve the exponent of the lower part was restricted to a minimum value of 1.0.

Rating O . With a free fit this produced a rating which was unaccepable at the high flow end, differing considerably from all other ratings. Fitting technique (3) helped to alleviate this problem. Rating O remains an extreme rating at high flows but is now more consistent with other ratings.

Rating Equations - 13402 Mekong at Mukdahan

Rating Letter	Date	Parameters (a, c, b)	Maximum Stage
A from	1 Jan 1923	$Q = 428.053\ (h + 0.850)^{1.651}$	15.00 m
B from	1 Jan 1960	$Q = 1193.132\ (h + 0.080)^{1.171}$ $Q = 681.788\ (h + 0.080)^{1.500}$	5.41 m 15.00 m
C from	1 Jan 1962	$Q = 1736.191\ (h - 0.350)^{1.002}$ $Q = 935.778\ (h - 0.350)^{1.404}$	5.01 m 15.00 m
D from	1 Jan 1963	$Q = 1445.695\ (h - 0.070)^{1.069}$ $Q = 749.607\ (h - 0.070)^{1.499}$	4.67 m 15.00 m
E from	1 Jan 1964	$Q = 1467.454\ (h - 0.070)^{1.000}$ $Q = 743.825\ (h - 0.070)^{1.498}$	3.98 m 15.00 m
F from	1 Jan 1965	$Q = 746.025\ (h + 0.500)^{1.444}$	15.00 m
G from	1 Jan 1966	$Q = 375.478\ (h + 1.270)^{1.696}$	15.00 m
H from	1 Jan 1967	$Q = 132.161\ (h + 2.130)^{2.070}$	15.00 m
I from	1 Jan 1968	$Q = 912.361\ (h + 0.050)^{1.363}$	15.00 m
J from	1 Jan 1969	$Q = 608.728\ (h + 0.530)^{1.539}$	15.00 m
K from	1 Jan 1970	$Q = 855.356\ (h + 0.270)^{1.369}$	15.00 m
L from	2 Jun 1971	$Q = 712.132\ (h - 0.070)^{1.500}$	15.00 m
M from	1 Jan 1973	$Q = 311.578\ (h + 1.050)^{1.759}$	15.00 m
N from	1 Jan 1974	$Q = 796.275\ (h + 0.050)^{1.381}$	15.00 m
O from	1 Jan 1975	$Q = 628.570\ (h + 0.550)^{1.425}$	15.00 m
P from	1 Jan 1976	$Q = 428.053\ (h + 0.850)^{1.651}$	15.00 m
Q from	1 Jan 1987	$Q = 492.550\ (h + 0.780)^{1.595}$	15.00 m

Ratings A and P are the average rating

Number of gaugings per year

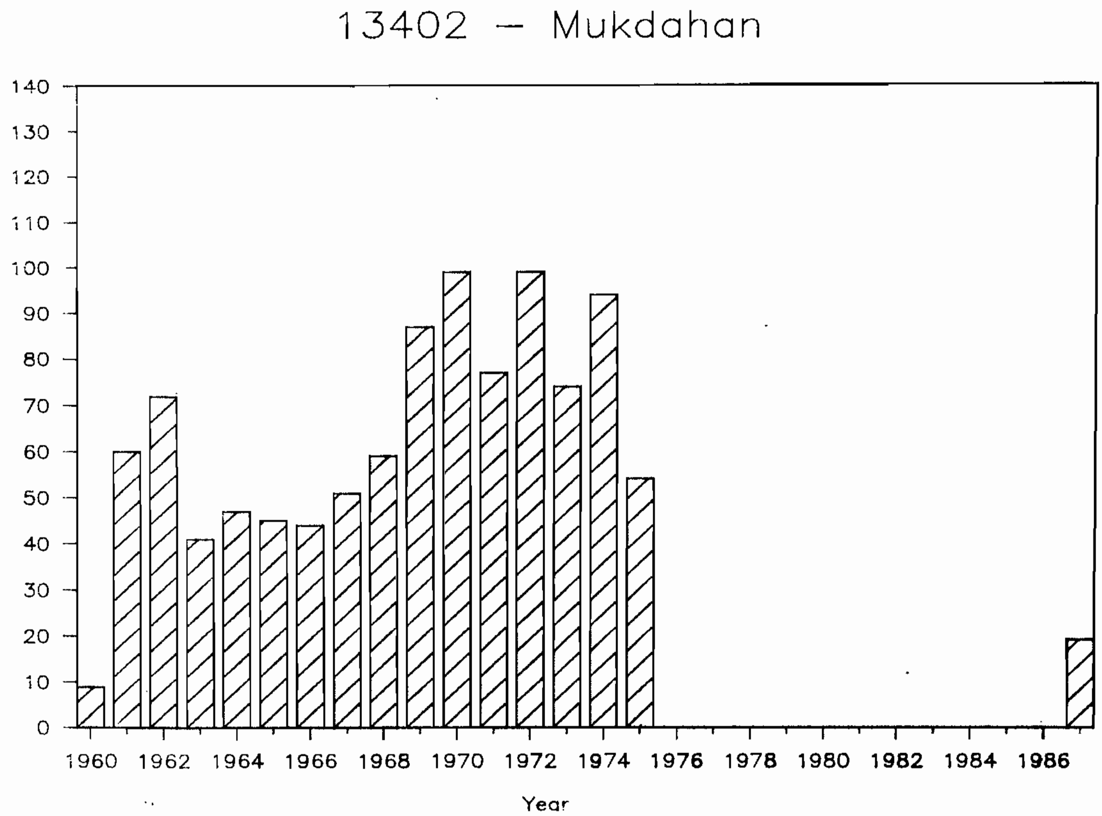


Figure C9.9.1

Rating equations

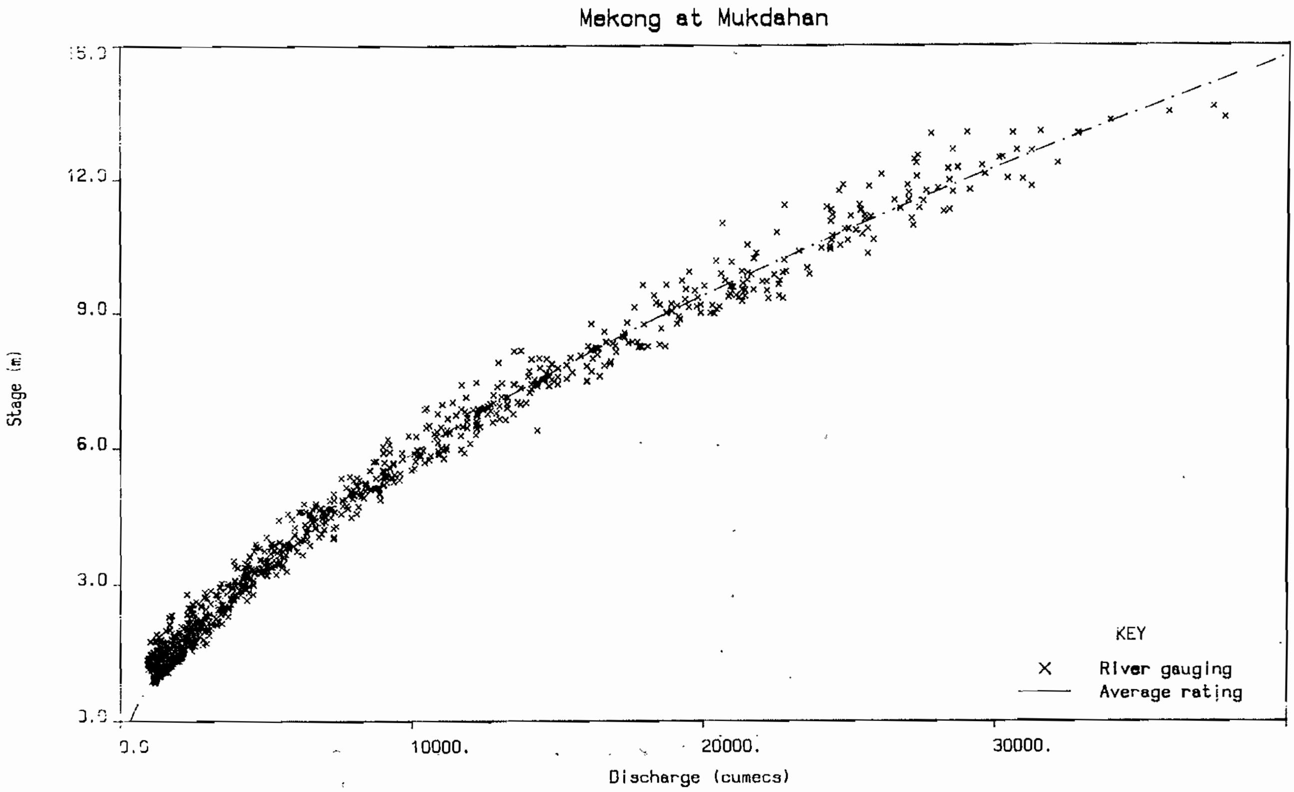


Figure C9.9.2

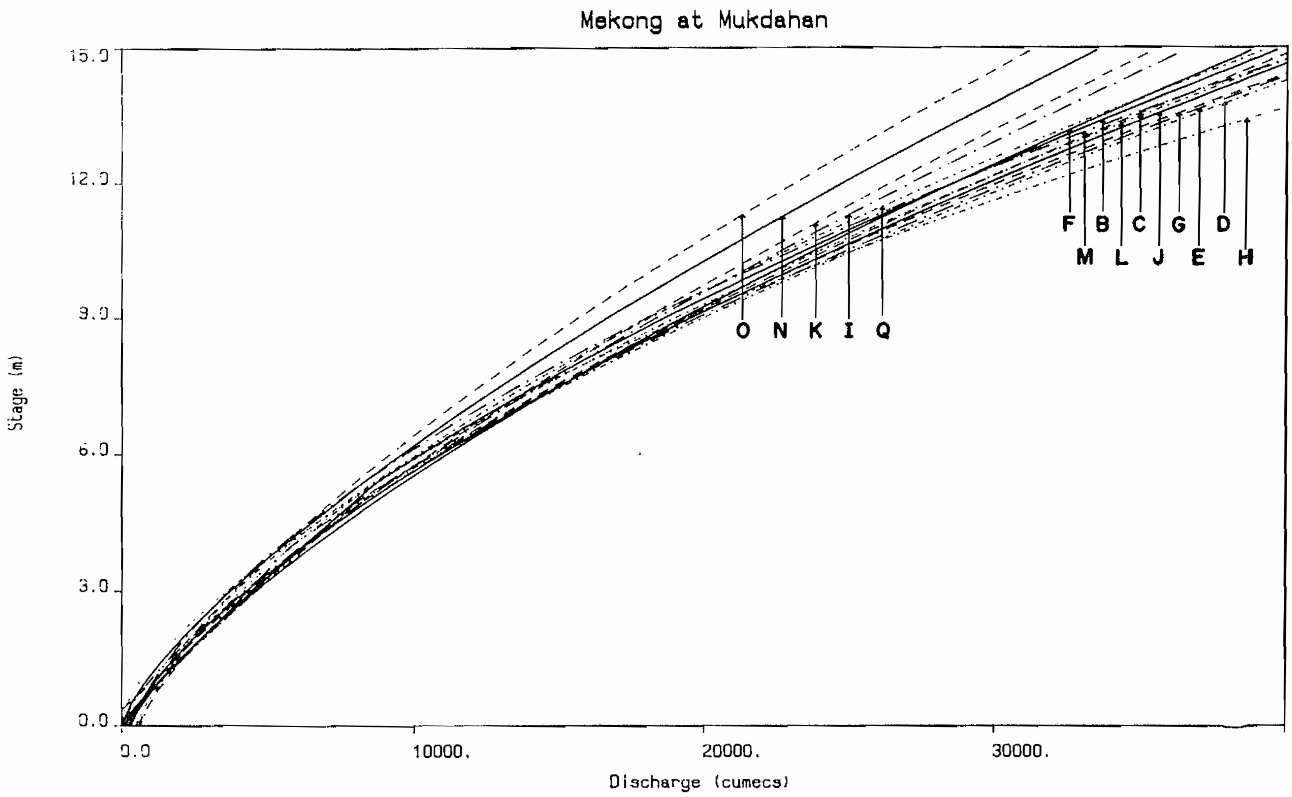


Figure C9.9.3

Rating equations

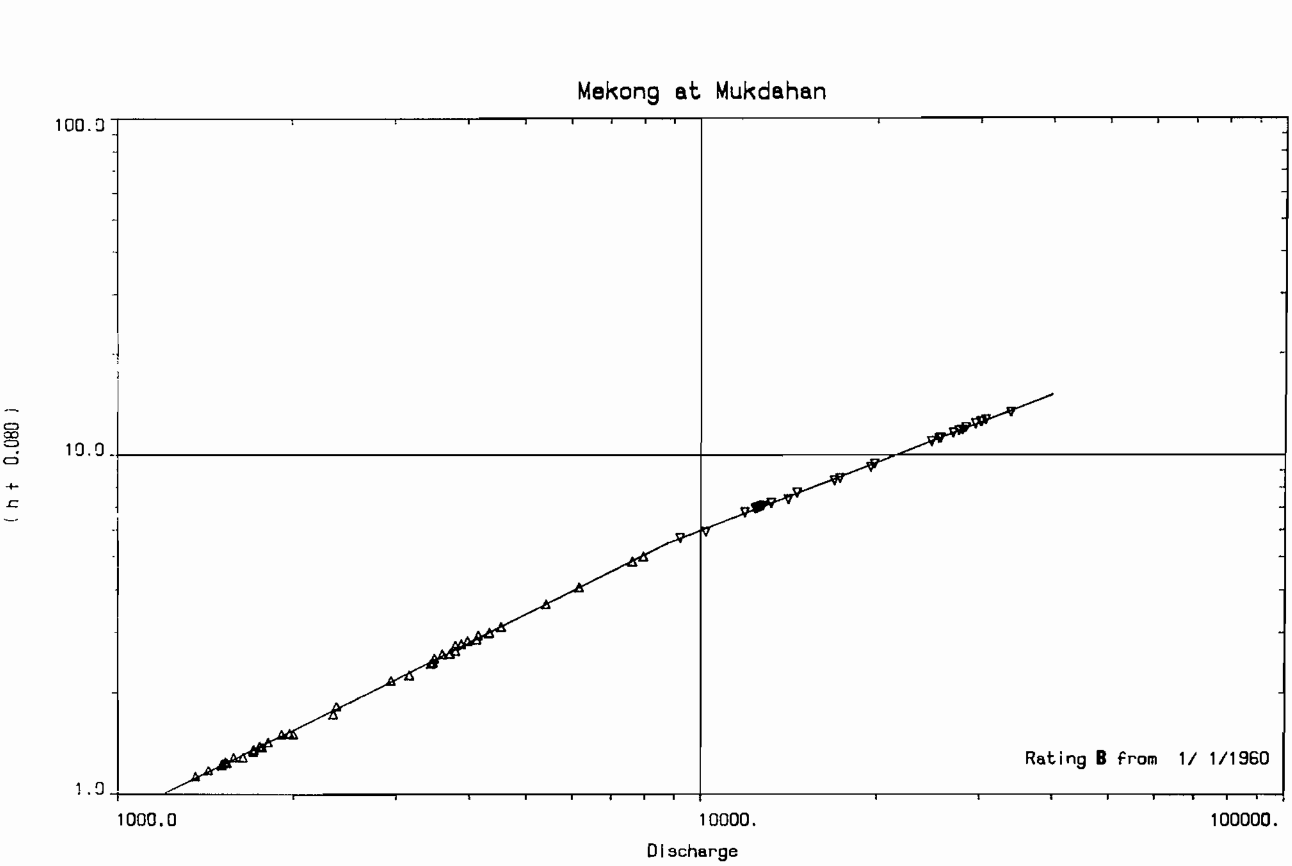


Figure C9.9.4b

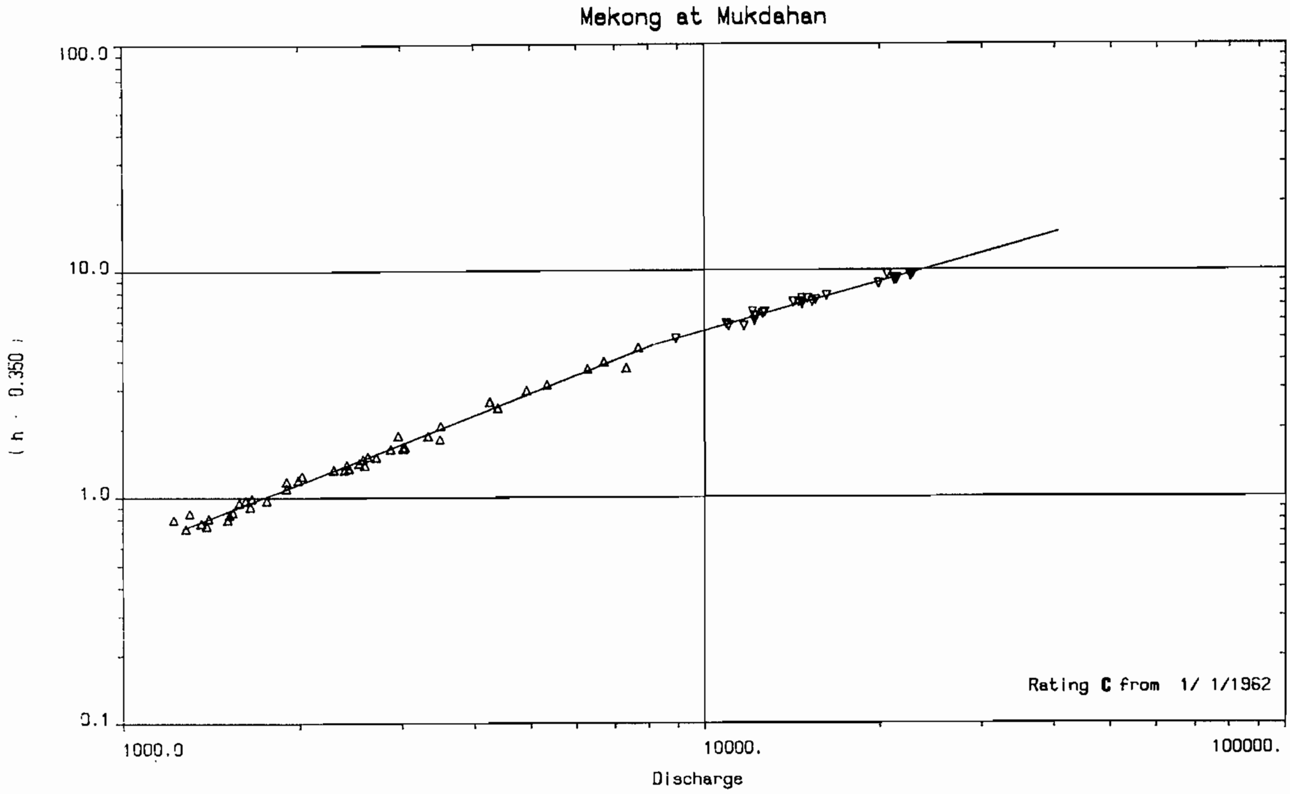


Figure C9.9.4c

Rating equations

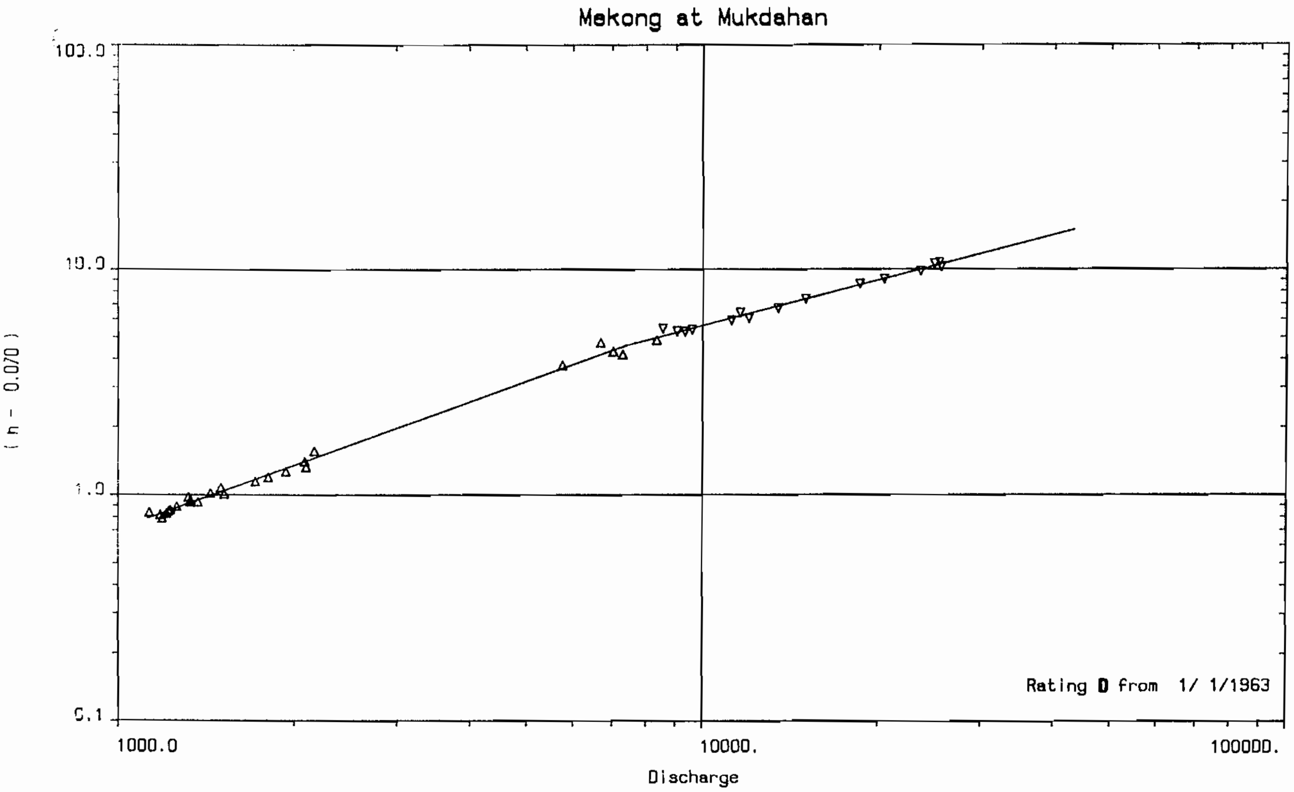


Figure C9.9.4d

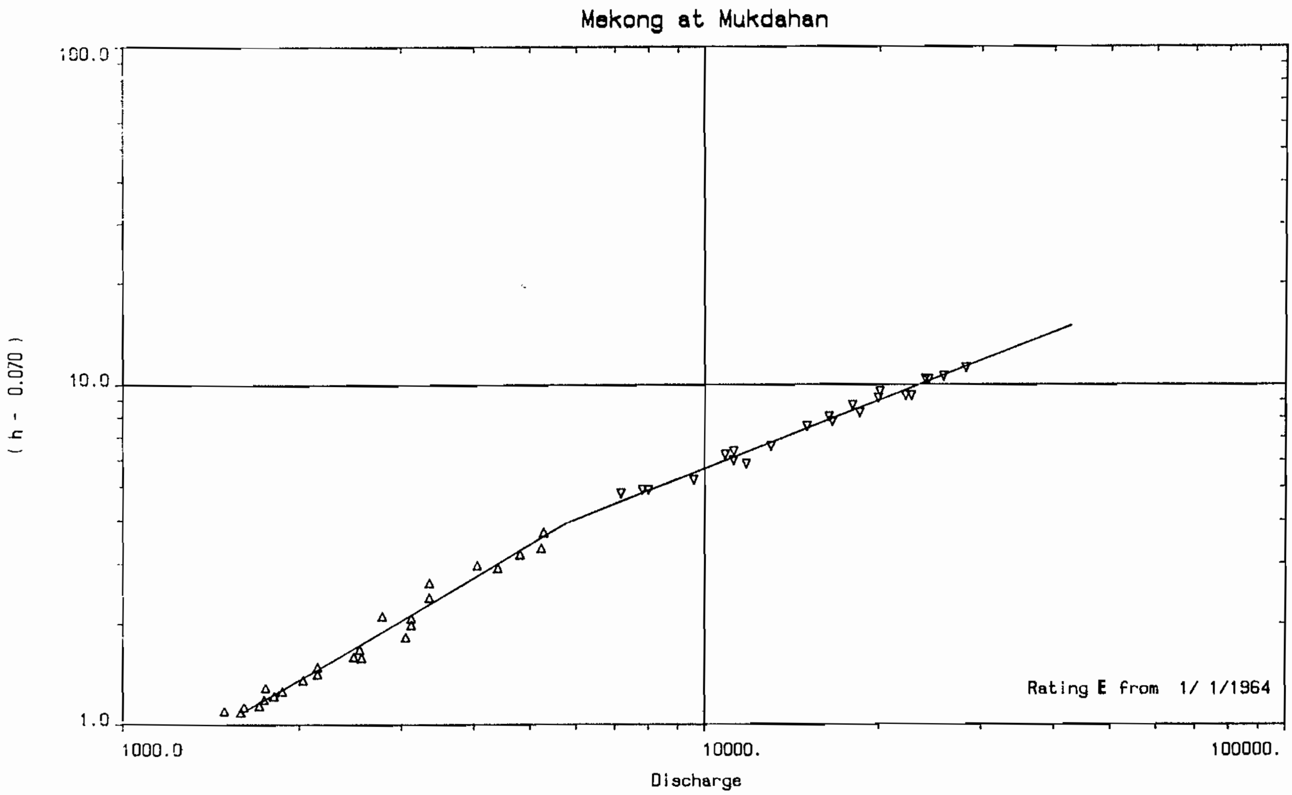


Figure C9.9.4e

Rating equations

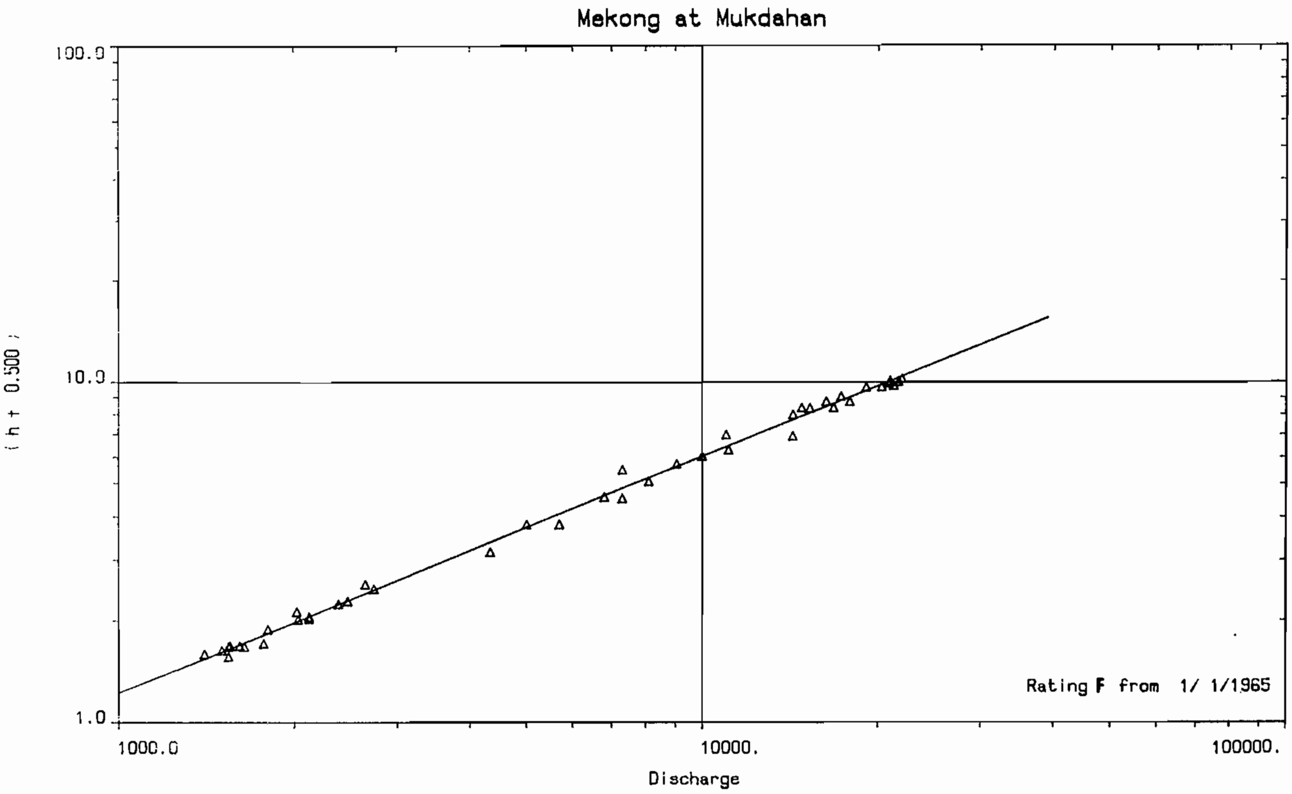


Figure C9.9.4f

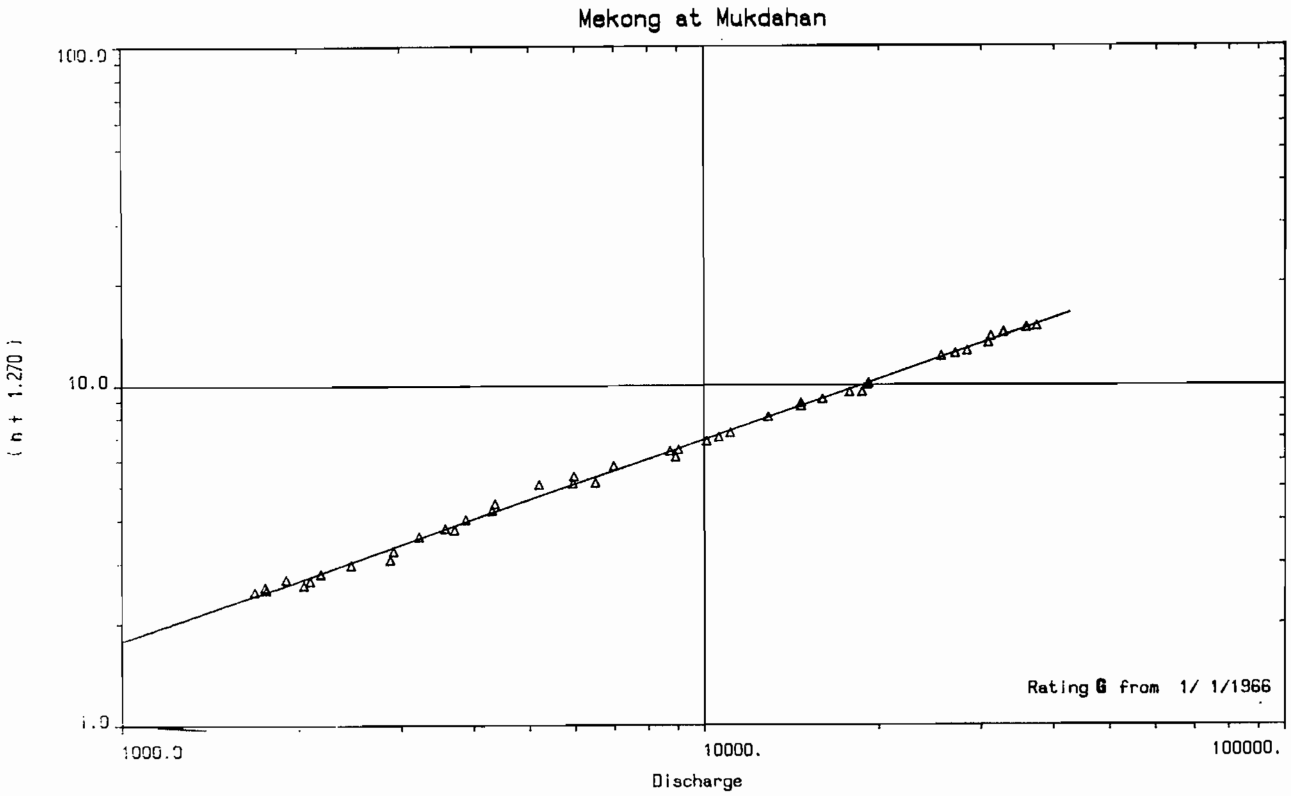


Figure C9.9.4g

Rating equations

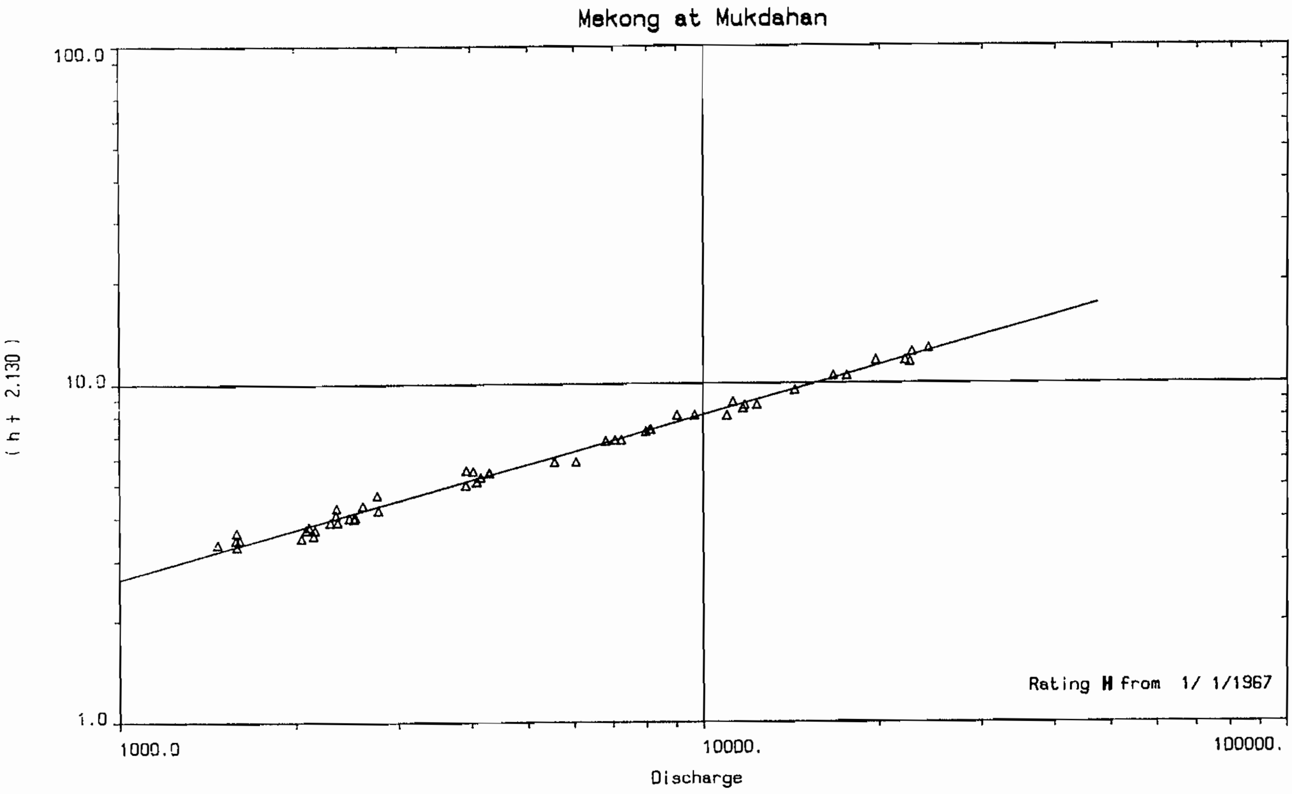


Figure C9.9.4h

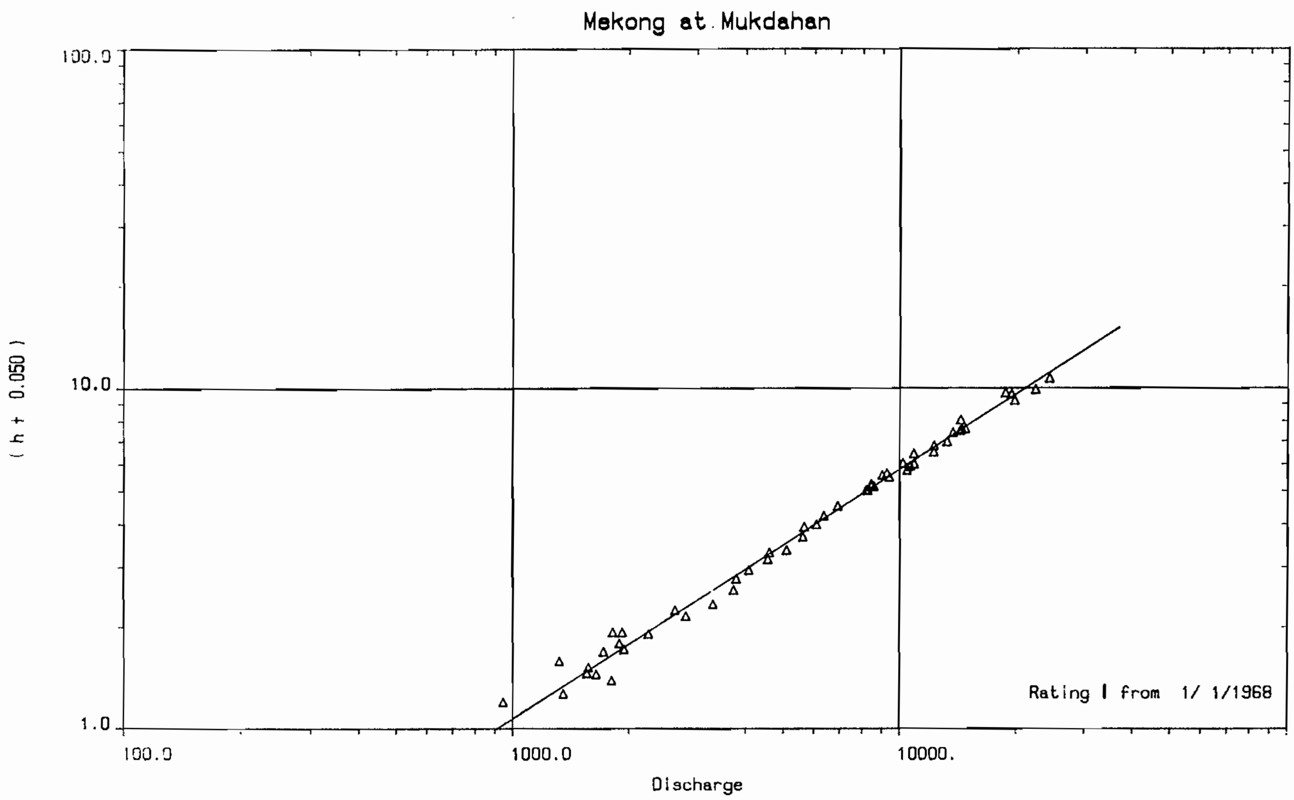


Figure C9.9.4i

Rating equations

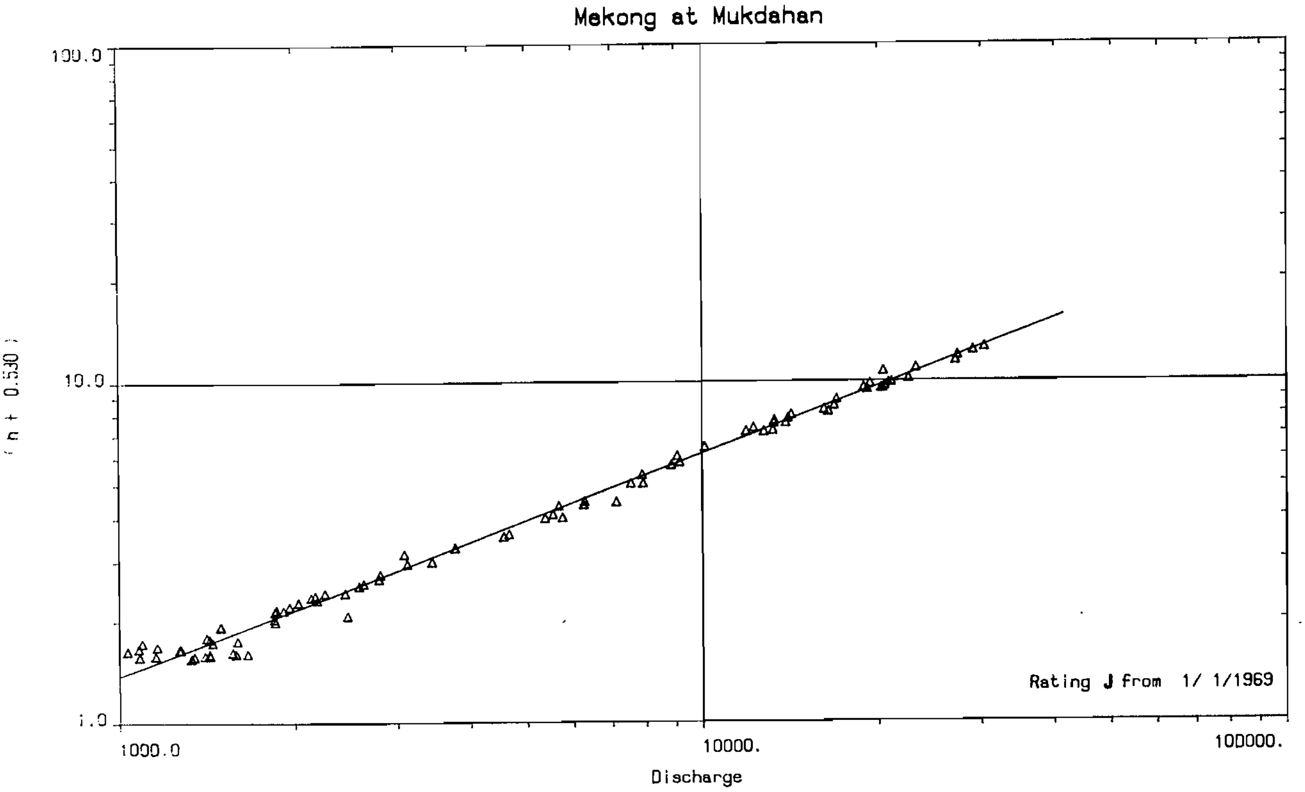


Figure C9.9.4j

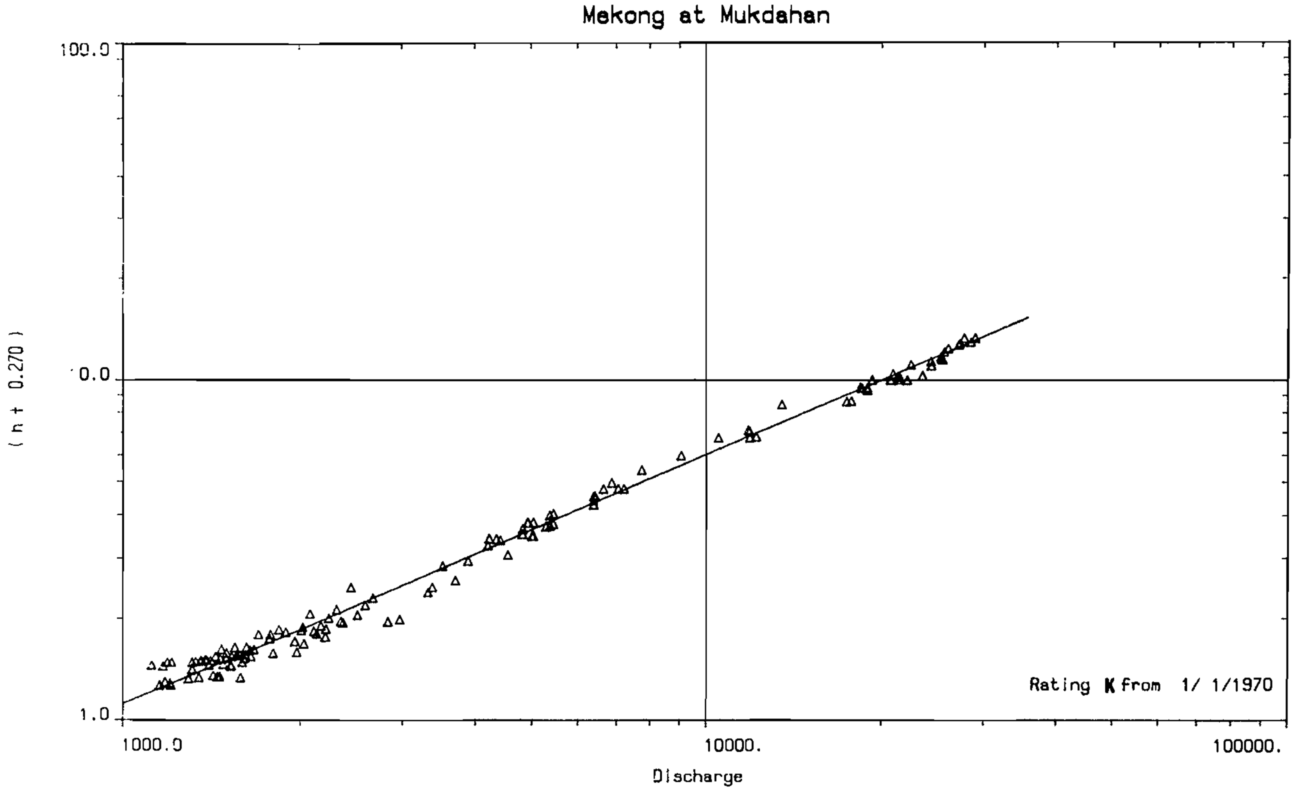


Figure C9.9.4k

Rating equations

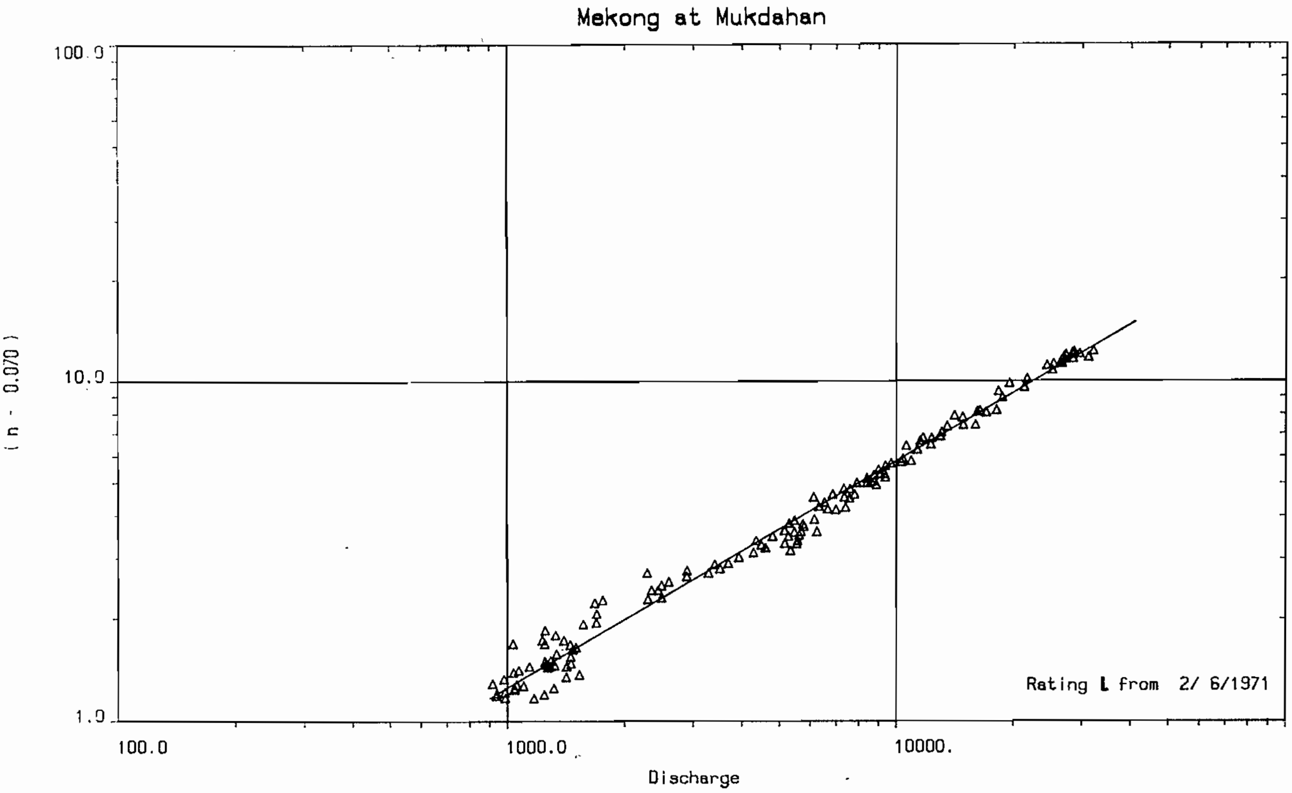


Figure C9.9.4l

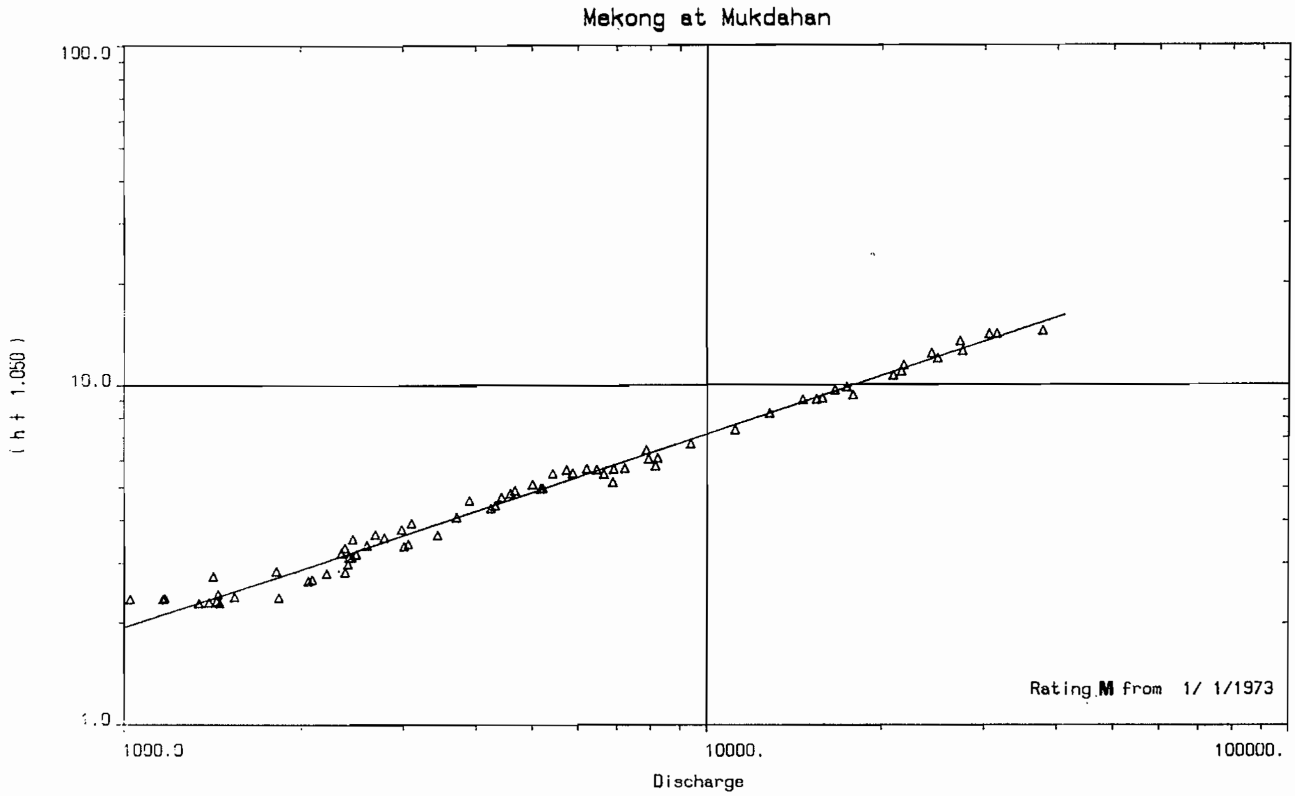


Figure C9.9.4m

Rating equations

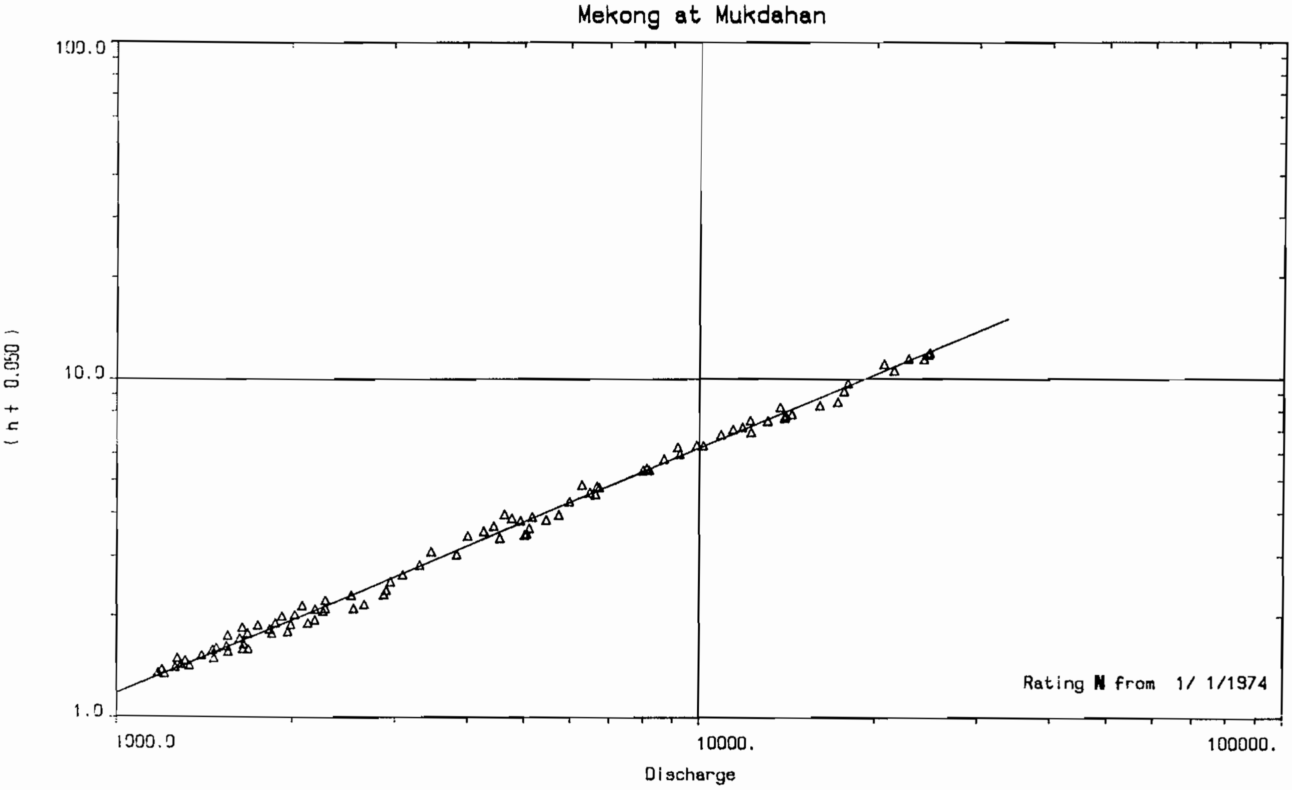


Figure C9.9.4n

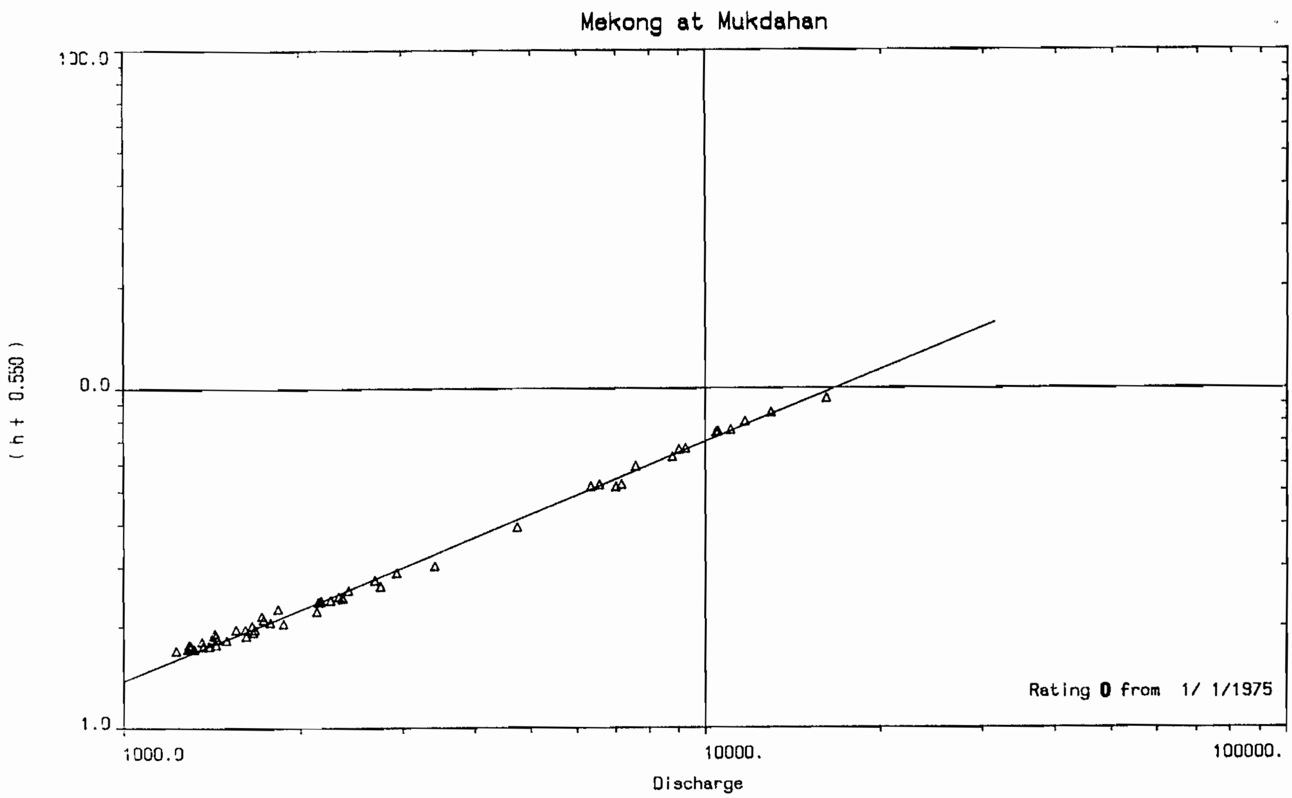


Figure C9.9.4o

Rating equations

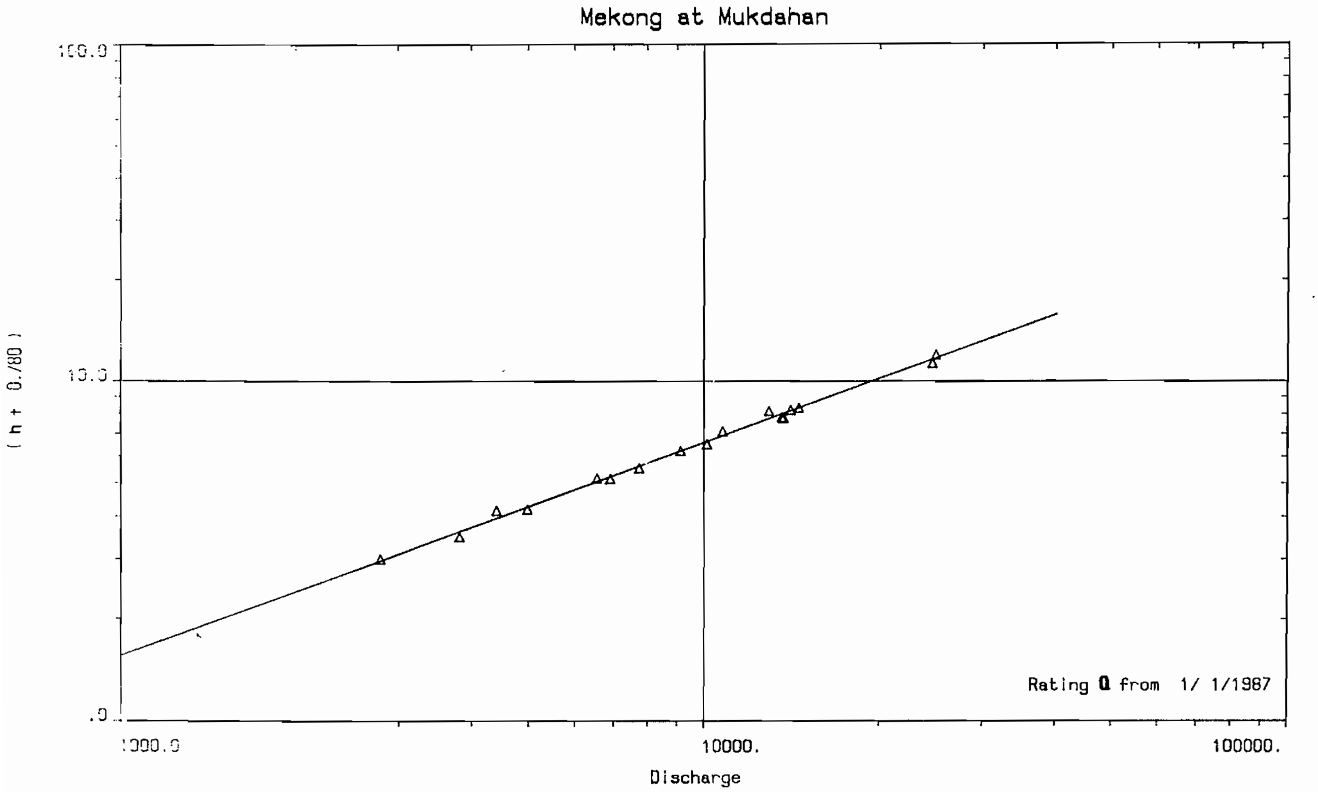


Figure C9.9.4q

River gaugings for station 13499 : Mekong at Mukdahan (1960-1971)

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
1	26 Aug 1960	B	13.320			33899.998	-0.12/B	<<-
2	28 Sep 1960	B	8.340			16899.999	-0.08/B	<-
3	12 Oct 1960	B	8.480			17299.999	-0.08/B	<-
4	22 Nov 1960	B	2.870			4150.000	0.05/B	->
5	25 Nov 1960	B	2.700			3680.000	0.04/B	->
6	28 Nov 1960	B	2.520			3600.000	0.03/B	->
7	30 Nov 1960	B	2.450			3490.000	0.03/B	->
8	12 Dec 1960	B	2.760			3980.000	0.04/B	->
9	21 Dec 1960	B	2.100			2940.000	0.02/B	-
10	9 Jan 1961	B	1.650			2340.000	-0.05/B	<-
11	25 Jan 1961	B	1.430			2000.000	-0.04/B	<-
12	3 Feb 1961	B	1.350			1810.000	0.00/B	-
13	8 Feb 1961	B	1.310			1750.000	0.00/B	-
14	17 Feb 1961	B	1.280			1710.000	0.00/B	-
15	24 Feb 1961	B	1.310			1750.000	0.00/B	-
16	3 Mar 1961	B	1.210			1580.000	0.02/B	-
17	8 Mar 1961	B	1.170			1530.000	0.01/B	-
18	15 Mar 1961	B	1.160			1510.000	0.02/B	-
19	21 Mar 1961	B	1.100			1430.000	0.01/B	-
20	27 Mar 1961	B	1.050			1360.000	0.01/B	-
21	7 Apr 1961	B	1.140			1510.000	-0.00/B	-
22	10 Apr 1961	B	1.160			1540.000	-0.00/B	-
23	20 Apr 1961	B	1.210			1640.000	-0.02/B	<-
24	27 Apr 1961	B	1.260			1710.000	-0.02/B	-
25	5 May 1961	B	1.300			1770.000	-0.02/B	<-
26	12 May 1961	B	1.440			1970.000	-0.01/B	-
27	18 May 1961	B	1.430			1910.000	0.02/B	-
28	25 May 1961	B	1.750			2370.000	0.03/B	->
29	2 Jun 1961	B	2.680			3790.000	0.08/B	->
30	16 Jun 1961	B	7.680			14599.999	0.05/B	->
31	21 Jun 1961	B	6.700			11900.000	0.05/B	->
32	30 Jun 1961	B	6.920			12500.001	0.05/B	->
33	3 Jul 1961	B	7.000			12700.000	0.05/B	->
34	13 Jul 1961	B	6.930			12500.001	0.06/B	->
35	17 Jul 1961	B	5.610			9210.001	0.02/B	-
36	26 Jul 1961	B	7.150			13199.999	0.02/B	-
37	27 Jul 1961	B	6.950			12600.001	0.04/B	->
38	31 Jul 1961	B	6.880			12400.001	0.04/B	->
39	2 Aug 1961	B	7.020			12800.000	0.04/B	->
40	7 Aug 1961	B	7.000			12700.000	0.05/B	->
41	9 Aug 1961	B	7.660			14599.999	0.03/B	->
42	19 Aug 1961	B	9.360			19799.999	-0.01/B	-
43	23 Aug 1961	B	11.110			25499.999	0.01/B	-
44	27 Aug 1961	B	11.160			25699.999	-0.00/B	-
45	29 Aug 1961	B	10.890			24799.999	-0.01/B	-
46	1 Sep 1961	B	11.160			25699.999	-0.00/B	-
47	6 Sep 1961	B	11.740			27599.999	0.03/B	->
48	10 Sep 1961	B	11.980			28400.000	0.04/B	->
49	12 Sep 1961	B	12.500			30199.998	0.06/B	->
50	16 Sep 1961	B	12.310			29499.998	0.07/B	->
51	21 Sep 1961	B	11.540			27000.001	0.00/B	-
52	27 Sep 1961	B	12.480			30099.999	0.07/B	->
53	3 Oct 1961	B	12.650			30700.001	0.07/B	->
54	6 Oct 1961	B	11.800			28000.000	-0.02/B	<-
55	12 Oct 1961	B	9.150			19499.999	-0.12/B	<<-
56	25 Oct 1961	B	7.330			14100.000	-0.12/B	<<-
57	31 Oct 1961	B	5.860			10200.001	-0.13/B	<<-
58	7 Nov 1961	B	4.920			7960.000	-0.06/B	<-
59	8 Nov 1961	B	4.760			7620.000	-0.03/B	<-
60	13 Nov 1961	B	3.990			6170.000	0.00/B	-

River gaugings for station 13499 : Mekong at Mukdahan (1960-1971)

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
61	21 Nov 1961	B	3.560			5420.000	-0.00/B	-
62	29 Nov 1961	B	3.040			4540.000	-0.01/B	-
63	1 Dec 1961	B	2.920			4330.000	-0.01/B	-
64	4 Dec 1961	B	2.790			4120.000	-0.01/B	-
65	14 Dec 1961	B	2.580			3790.000	-0.02/B	<-
66	15 Dec 1961	B	2.530			3710.000	-0.02/B	<-
67	19 Dec 1961	B	2.380			3470.000	-0.03/B	<-
68	22 Dec 1961	B	2.360			3440.000	-0.03/B	<-
69	26 Dec 1961	B	2.180			3160.000	-0.04/B	<-
70	4 Jan 1962	C	2.160	0.640	5453.13	3490.000	-0.20/C	<<-
71	11 Jan 1962	C	2.020	0.574	5261.32	3020.000	-0.07/C	<-
72	18 Jan 1962	C	1.860	0.537	5046.55	2710.000	-0.05/C	<-
73	27 Jan 1962	C	1.700	0.489	4969.33	2430.000	-0.05/C	<-
74	30 Jan 1962	C	1.680	0.475	4821.05	2290.000	0.01/C	-
75	6 Feb 1962	C	1.600	0.435	4643.68	2020.000	0.09/C	->
76	16 Feb 1962	C	1.530	0.421	4513.06	1900.000	0.09/C	->
77	21 Feb 1962	C	1.450	0.424	4481.13	1900.000	0.01/C	-
78	9 Mar 1962	C	1.340	0.390	4256.41	1660.000	0.03/C	->
79	14 Mar 1962	C	1.320	0.384	4218.75	1620.000	0.04/C	->
80	16 Mar 1962	C	1.300	0.378	4179.89	1580.000	0.04/C	->
81	21 Mar 1962	C	1.260	0.385	4285.71	1650.000	-0.04/C	<-
82	25 Mar 1962	C	1.200	0.353	3682.72	1300.000	0.10/C	->
83	27 Mar 1962	C	1.160	0.347	4034.58	1400.000	0.00/C	-
84	30 Mar 1962	C	1.120	0.341	3988.27	1360.000	-0.01/C	-
85	2 Apr 1962	C	1.100	0.343	4052.48	1390.000	-0.05/C	<-
86	10 Apr 1962	C	1.150	0.315	3873.02	1220.000	0.10/C	->
87	16 Apr 1962	C	1.080	0.324	3950.62	1280.000	-0.01/C	-
88	20 Apr 1962	C	1.150	0.374	4037.43	1510.000	-0.07/C	<-
89	23 Apr 1962	C	1.190	0.369	4119.24	1520.000	-0.04/C	<-
90	27 Apr 1962	C	1.210	0.381	4041.99	1540.000	-0.03/C	<-
91	2 May 1962	C	1.320	0.424	4150.94	1760.000	-0.04/C	<-
92	10 May 1962	C	1.550	0.448	4441.96	1990.000	0.05/C	->
93	14 May 1962	C	1.680	0.497	4808.85	2390.000	-0.05/C	<-
94	17 May 1962	C	1.750	0.486	4958.85	2410.000	0.01/C	-
95	23 May 1962	C	1.770	0.507	4990.14	2530.000	-0.04/C	<-
96	26 May 1962	C	1.870	0.522	5019.16	2620.000	0.01/C	-
97	28 May 1962	C	1.990	0.552	5199.28	2870.000	-0.01/C	-
98	29 May 1962	C	2.000	0.598	5050.17	3020.000	-0.09/C	<-
99	4 Jun 1962	C	2.220	0.605	5504.13	3330.000	-0.05/C	<-
100	7 Jun 1962	C	3.480	0.761	7017.08	5340.000	0.06/C	->
101	12 Jun 1962	C	4.060	1.000	7320.00	7320.000	-0.49/C	<<<<-
102	15 Jun 1962	C	4.290	0.882	7585.03	6690.000	0.10/C	->
103	18 Jun 1962	C	6.000	1.098	10655.74	11700.000	-0.39/C	<<<<-
104	23 Jun 1962	C	7.540	1.188	12205.39	14500.001	0.15/C	->>
105	25 Jun 1962	C	6.620	1.069	11412.53	12200.001	0.04/C	->
106	2 Jul 1962	C	6.550	1.086	11233.89	12200.001	-0.03/C	<-
107	6 Jul 1962	C	6.030	1.035	10628.02	11000.001	-0.10/C	<-
108	9 Jul 1962	C	6.150	1.036	10521.24	10900.001	0.05/C	->
109	13 Jul 1962	C	6.870	1.087	11131.55	12100.000	0.33/C	->>>>
110	17 Jul 1962	C	7.400	1.169	12574.85	14700.001	-0.06/C	<-
111	20 Jul 1962	C	7.800	1.185	12405.06	14700.001	0.34/C	->>>>
112	24 Jul 1962	C	7.700	1.206	12852.40	15500.000	-0.03/C	<-
113	31 Jul 1962	C	6.850	1.117	11369.74	12700.000	0.09/C	->
114	1 Aug 1962	C	6.780	1.115	11300.45	12600.001	0.06/C	->
115	8 Aug 1962	C	9.890	1.278	16118.94	20600.000	0.50/C	->>>>
116	13 Aug 1962	C	9.920	1.350	16814.82	22699.999	-0.12/C	<<-
117	16 Aug 1962	C	9.540	1.335	15955.06	21299.999	-0.07/C	<-
118	20 Aug 1962	C	9.370	1.343	15785.55	21199.999	-0.21/C	<<-
119	23 Aug 1962	C	9.530	1.363	15700.66	21400.000	-0.11/C	<-
120	27 Aug 1962	C	9.740	1.350	16740.74	22599.999	-0.27/C	<<<-

River gaugings for station 13499 : Mekong at Mukdahan (1960-1971)

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
121	30 Aug 1962	C	9.400	1.358	15758.47	21400.000	-0.24/C	<<<-
122	3 Sep 1962	C	9.030	1.309	15202.44	19900.000	-0.14/C	<<-
123	7 Sep 1962	C	9.950	1.375	16581.82	22800.000	-0.12/C	<<-
124	10 Sep 1962	C	9.020	1.296	15354.94	19900.000	-0.15/C	<<-
125	13 Sep 1962	C	8.010	1.186	13659.36	16200.001	0.04/C	->
126	18 Sep 1962	C	7.540	1.110	12792.79	14200.000	0.25/C	->>>
127	22 Sep 1962	C	7.800	1.136	13204.23	15000.000	0.24/C	->>>
128	24 Sep 1962	C	7.560	1.195	12803.35	15300.001	-0.11/C	<-
129	3 Oct 1962	C	7.790	1.152	13020.83	15000.000	0.23/C	->>>
130	8 Oct 1962	C	6.320	1.119	10902.59	12200.001	-0.26/C	<<<-
131	19 Oct 1962	C	5.340	0.979	9111.34	8920.000	0.01/C	-
132	25 Oct 1962	C	4.900	0.901	8523.86	7680.000	0.14/C	->>
133	1 Nov 1962	C	4.020	0.898	6982.18	6270.000	0.07/C	->
134	9 Nov 1962	C	3.310	0.848	5801.89	4920.000	0.13/C	->>
135	17 Nov 1962	C	2.990	0.825	5151.51	4250.000	0.20/C	->>
136	19 Nov 1962	C	2.830	0.868	5057.60	4390.000	-0.04/C	<-
137	27 Nov 1962	C	2.420	0.633	5529.23	3500.000	0.06/C	->
138	4 Dec 1962	C	2.230	0.719	4116.83	2960.000	0.18/C	->>
139	16 Dec 1962	C	2.020	0.582	5223.37	3040.000	-0.08/C	<-
140	20 Dec 1962	C	1.830	0.527	4876.66	2570.000	0.00/C	-
141	27 Dec 1962	C	1.740	0.532	4868.42	2590.000	-0.10/C	<-
142	2 Jan 1963	D	1.640	0.460	4717.39	2170.000	0.11/D	->
143	14 Jan 1963	D	1.480	0.470	4446.81	2090.000	-0.00/D	-
144	21 Jan 1963	D	1.400	0.470	4468.08	2100.000	-0.09/D	<-
145	28 Jan 1963	D	1.340	0.450	4311.11	1940.000	-0.05/D	<-
146	5 Feb 1963	D	1.270	0.420	4309.52	1810.000	-0.03/D	<-
147	13 Feb 1963	D	1.220	0.410	4195.12	1720.000	-0.03/D	<-
148	19 Feb 1963	D	1.150	0.380	3947.37	1500.000	0.04/D	->
149	25 Feb 1963	D	1.090	0.380	3789.47	1440.000	0.02/D	->
150	6 Mar 1963	D	1.050	0.350	3771.43	1320.000	0.06/D	->
151	12 Mar 1963	D	1.020	0.370	3594.59	1330.000	0.03/D	->
152	25 Mar 1963	D	1.000	0.350	3800.00	1330.000	0.01/D	-
153	29 Mar 1963	D	1.000	0.300	4566.67	1370.000	-0.02/D	<-
154	3 Apr 1963	D	0.960	0.330	3818.18	1260.000	0.01/D	-
155	12 Apr 1963	D	0.890	0.320	3687.50	1180.000	-0.01/D	-
156	18 Apr 1963	D	0.900	0.310	3903.23	1210.000	-0.02/D	-
157	23 Apr 1963	D	0.910	0.310	3645.16	1130.000	0.05/D	->
158	4 May 1963	D	0.860	0.330	3606.06	1190.000	-0.04/D	<-
159	9 May 1963	D	0.920	0.340	3588.24	1220.000	-0.00/D	-
160	17 May 1963	D	0.930	0.330	3727.27	1230.000	0.00/D	-
161	22 May 1963	D	1.080	0.390	3897.44	1520.000	-0.04/D	<-
162	20 Jun 1963	D	5.530	0.984	8689.02	8550.000	0.39/D	->>>>
163	27 Jun 1963	D	5.390	0.990	9141.41	9050.000	0.05/D	->
164	11 Jul 1963	D	7.440	1.212	12376.24	15000.000	-0.01/D	-
165	18 Jul 1963	?	7.080	1.603	4559.01	7308.100	2.46/D	->>>>
166	27 Jul 1963	D	10.350	1.450	17655.17	25600.001	-0.26/D	<<<-
167	26 Aug 1963	D	9.880	1.450	16275.86	23600.000	-0.18/D	<<-
168	5 Sep 1963	D	8.670	1.290	14387.60	18559.999	0.09/D	->
169	12 Sep 1963	D	10.640	1.530	16274.51	24899.999	0.22/D	->>>
170	19 Sep 1963	D	10.780	1.430	17762.24	25400.000	0.22/D	->>>
171	26 Sep 1963	D	9.100	1.370	14927.01	20450.000	-0.05/D	<-
172	4 Oct 1963	D	6.780	1.158	11636.44	13475.000	-0.16/D	<<-
173	8 Oct 1963	D	6.500	1.120	10357.14	11600.001	0.21/D	->>
174	19 Oct 1963	D	5.360	0.813	11488.31	9340.000	-0.09/D	<-
175	24 Oct 1963	D	4.800	0.941	7109.46	6690.000	0.54/D	->>>>
176	1 Nov 1963	D	4.260	0.983	7426.25	7300.000	-0.36/D	<<<<-
177	7 Nov 1963	D	6.130	1.073	11183.60	12000.000	-0.30/D	<<<-
178	15 Nov 1963	D	6.000	1.101	10172.57	11200.001	-0.14/D	<<-
179	18 Nov 1963	D	5.470	1.056	9090.91	9600.000	-0.08/D	<-
180	22 Nov 1963	D	4.930	0.960	8687.50	8340.001	-0.13/D	<<-

River gaugings for station 13499 : Mekong at Mukdahan (1960-1971)

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
181	25 Nov 1963	D	4.390	0.890	7898.88	7030.000	-0.07/D	<-
182	29 Nov 1963	D	3.820	0.833	6914.77	5760.000	0.11/D	->
183	6 Jan 1964	E	2.060	0.806	3870.97	3120.000	-0.14/E	<<-
184	14 Jan 1964	E	1.900	0.822	3710.46	3050.000	-0.25/E	<<<-
185	21 Jan 1964	E	1.750	0.746	3404.83	2540.000	-0.05/E	<-
186	27 Jan 1964	E	1.670	0.756	3280.42	2480.000	-0.09/E	<-
187	4 Feb 1964	E	1.560	0.468	4594.02	2150.000	0.02/E	->
188	10 Feb 1964	E	1.490	0.470	4574.47	2150.000	-0.05/E	<-
189	17 Feb 1964	E	1.430	0.440	4613.64	2030.000	-0.02/E	<-
190	24 Feb 1964	E	1.360	0.400	4375.00	1750.000	0.10/E	->
191	2 Mar 1964	E	1.290	0.354	5112.99	1810.000	-0.01/E	-
192	9 Mar 1964	E	1.260	0.394	4416.24	1740.000	0.00/E	-
193	19 Mar 1964	E	1.200	0.379	4248.02	1610.000	0.03/E	->
194	24 Mar 1964	E	1.170	0.372	4005.38	1490.000	0.08/E	->
195	10 Apr 1964	E	1.210	0.393	4351.14	1710.000	-0.03/E	<-
196	14 Apr 1964	E	1.160	0.386	4119.17	1590.000	0.01/E	-
197	28 Apr 1964	E	1.330	0.424	4410.38	1870.000	-0.01/E	-
198	11 May 1964	E	1.660	0.485	5278.35	2560.000	-0.15/E	<<-
199	19 May 1964	E	2.150	0.604	5165.56	3120.000	-0.05/E	<-
200	5 Jun 1964	E	3.400	0.918	5697.17	5230.000	-0.23/E	<<<-
201	16 Jun 1964	E	4.860	0.909	7887.79	7170.000	0.25/E	->>>
202	29 Jun 1964	E	5.320	1.038	9223.51	9574.000	-0.25/E	<<<-
203	4 Jul 1964	E	5.920	1.133	10414.83	11800.000	-0.48/E	<<<<-
204	6 Jul 1964	E	8.320	1.284	14408.10	18500.000	-0.29/E	<<<-
205	13 Jul 1964	E	9.350	1.394	16284.07	22699.999	-0.52/E	<<<<-
206	21 Jul 1964	E	7.600	1.188	12626.26	15000.000	0.10/E	->
207	28 Jul 1964	E	6.670	1.136	11443.66	13000.001	-0.15/E	<<-
208	4 Aug 1964	E	6.060	1.093	10247.03	11200.001	-0.12/E	<<-
209	14 Aug 1964	E	7.850	1.234	13452.19	16599.999	-0.17/E	<<-
210	21 Aug 1964	E	9.350	1.399	15868.48	22200.000	-0.37/E	<<<<-
211	27 Aug 1964	E	11.280	1.493	18888.15	28200.000	-0.11/E	<-
212	3 Sep 1964	E	10.470	1.381	17378.71	23999.999	0.23/E	->>>
213	9 Sep 1964	E	9.200	1.301	15295.93	19900.000	0.16/E	->>
214	19 Sep 1964	E	10.440	1.392	17456.90	24300.000	0.12/E	->
215	25 Sep 1964	E	10.660	1.458	17695.48	25799.998	-0.08/E	<-
216	5 Oct 1964	E	9.620	1.193	16789.61	20029.999	0.54/E	->>>>
217	9 Oct 1964	E	8.760	1.249	14387.51	17970.000	0.31/E	->>>
218	16 Oct 1964	E	8.100	1.203	13599.34	16360.001	0.16/E	->>
219	23 Oct 1964	E	6.430	1.081	10379.28	11220.000	0.24/E	->>>
220	28 Oct 1964	E	6.290	1.050	10323.81	10840.000	0.24/E	->>>
221	4 Nov 1964	E	4.970	0.983	8141.40	8003.000	0.02/E	-
222	10 Nov 1964	E	4.980	0.940	8300.00	7802.000	0.11/E	->
223	17 Nov 1964	E	3.760	0.846	6237.59	5277.000	0.09/E	->
224	24 Nov 1964	E	3.260	0.845	5691.12	4809.000	-0.09/E	<-
225	30 Nov 1964	E	3.040	0.860	4712.79	4053.000	0.21/E	->>
226	9 Dec 1964	E	2.980	0.891	4938.27	4400.000	-0.09/E	<-
227	14 Dec 1964	E	2.710	0.792	4234.85	3354.000	0.35/E	->>>>
228	21 Dec 1964	E	2.460	0.800	4187.50	3350.000	0.11/E	->
229	30 Dec 1964	E	2.180	0.774	3594.32	2782.000	0.21/E	->>
230	7 Jan 1965	F	2.060	0.779	3401.80	2650.000	0.15/F	->>
231	11 Jan 1965	F	1.980	0.792	3459.60	2740.000	0.02/F	-
232	22 Jan 1965	F	1.780	0.503	4910.54	2470.000	-0.01/F	-
233	26 Jan 1965	F	1.740	0.848	2806.60	2380.000	0.01/F	-
234	3 Feb 1965	F	1.630	0.440	4590.91	2020.000	0.14/F	->>
235	8 Feb 1965	F	1.530	0.479	4425.89	2120.000	-0.03/F	<-
236	15 Feb 1965	F	1.560	0.452	4690.27	2120.000	-0.00/F	-
237	25 Feb 1965	F	1.520	0.459	4422.66	2030.000	0.02/F	-
238	9 Mar 1965	F	1.390	0.420	4285.71	1800.000	0.05/F	->
239	23 Mar 1965	F	1.190	0.380	4078.95	1550.000	0.03/F	->
240	31 Mar 1965	F	1.140	0.383	3916.45	1500.000	0.02/F	-

River gaugings for station 13499 : Mekong at Mukdahan (1960-1971)

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
241	9 Apr 1965	F	1.180	0.373	4128.69	1540.000	0.03/F	->
242	16 Apr 1965	F	1.100	0.375	3733.33	1400.000	0.05/F	->
243	23 Apr 1965	F	1.180	0.403	4069.48	1640.000	-0.05/F	<-
244	28 Apr 1965	F	1.220	0.407	4348.89	1770.000	-0.10/F	<-
245	8 May 1965	F	1.070	0.380	4052.63	1540.000	-0.08/F	<-
246	13 May 1965	F	1.190	0.388	4149.48	1610.000	-0.01/F	-
247	29 May 1965	?	0.760	0.429	3356.64	1440.000	-0.30/F	<<<-
248	11 Jun 1965	F	5.010	0.709	10296.19	7300.000	0.66/F	->>>>
249	14 Jun 1965	F	5.800	1.100	10090.91	11100.001	-0.19/F	<<-
250	20 Jun 1965	?	5.890	1.200	12500.00	15000.000	-1.60/F	<<<<-
251	22 Jun 1965	F	8.580	1.260	13730.16	17299.999	0.26/F	->>>
252	28 Jun 1965	F	9.190	1.330	15263.16	20299.999	-0.16/F	<<-
253	2 Jul 1965	F	9.720	1.600	13750.00	21999.999	-0.20/F	<<-
254	7 Jul 1965	F	8.250	1.200	13583.33	16300.001	0.29/F	->>>
255	21 Jul 1965	F	6.490	1.500	7333.33	11000.001	0.54/F	->>>>
256	31 Jul 1965	F	9.280	1.500	14200.00	21299.999	-0.41/F	<<<<-
257	4 Aug 1965	F	9.540	1.810	11988.95	21699.999	-0.28/F	<<<-
258	13 Aug 1965	F	7.880	1.180	12542.37	14800.001	0.46/F	->>>>
259	17 Aug 1965	F	7.860	1.590	9622.64	15300.001	0.26/F	->>>
260	24 Aug 1965	F	9.600	1.340	15671.64	20999.999	0.01/F	-
261	31 Aug 1965	F	8.260	1.290	13875.97	17900.000	-0.27/F	<<<-
262	7 Sep 1965	F	9.450	1.370	15255.47	20900.000	-0.10/F	<-
263	13 Sep 1965	F	9.180	1.290	14806.20	19099.999	0.23/F	->>>
264	20 Sep 1965	F	7.890	1.230	13658.54	16799.999	-0.25/F	<<<-
265	11 Oct 1965	F	5.220	1.010	8950.50	9040.002	0.09/F	->
266	22 Oct 1965	F	4.580	0.890	9101.12	8100.000	-0.14/F	<<-
267	27 Oct 1965	F	4.030	0.984	7418.70	7300.000	-0.32/F	<<<<-
268	2 Nov 1965	F	7.500	1.230	11626.02	14300.000	0.27/F	->>>
269	8 Nov 1965	F	6.420	0.882	16213.15	14300.000	-0.81/F	<<<<-
270	15 Nov 1965	F	5.540	1.120	8928.57	10000.000	0.01/F	-
271	22 Nov 1965	F	4.070	0.935	7272.73	6800.000	-0.05/F	<-
272	2 Dec 1965	F	3.310	0.863	5805.33	5010.000	0.07/F	->
273	14 Dec 1965	F	2.670	0.800	5425.00	4340.000	-0.22/F	<<-
274	27 Dec 1965	F	3.310	0.914	6236.32	5700.000	-0.28/F	<<<-
275	17 Jan 1966	G	1.990	0.710	4098.59	2910.000	-0.08/G	<-
276	26 Jan 1966	G	1.810	0.560	5125.00	2870.000	-0.24/G	<<<-
277	8 Feb 1966	G	1.700	0.505	4871.29	2460.000	-0.06/G	<-
278	15 Feb 1966	G	1.540	0.496	4395.16	2180.000	-0.01/G	-
279	25 Feb 1966	G	1.440	0.386	4922.28	1900.000	0.11/G	->
280	4 Mar 1966	G	1.410	0.437	4782.61	2090.000	-0.07/G	<-
281	10 Mar 1966	G	1.330	0.503	4055.67	2040.000	-0.11/G	<-
282	17 Mar 1966	G	1.250	0.437	4027.46	1760.000	0.03/G	->
283	24 Mar 1966	G	1.220	0.429	3916.08	1680.000	0.07/G	->
284	19 May 1966	G	1.300	0.438	3995.43	1750.000	0.09/G	->
285	25 May 1966	G	2.480	0.616	6022.73	3710.000	-0.11/G	<-
286	8 Jun 1966	G	3.820	0.893	5811.87	5190.000	0.39/G	->>>>
287	13 Jun 1966	G	3.880	1.314	4939.12	6490.000	-0.22/G	<<-
288	18 Jun 1966	G	4.520	0.892	7825.11	6980.000	0.19/G	->>
289	28 Jun 1966	G	5.140	1.052	8288.97	8720.000	0.02/G	->
290	1 Jul 1966	G	8.280	1.288	14518.63	18700.000	-0.47/G	<<<<-
291	7 Jul 1966	G	8.270	1.055	16872.04	17800.000	-0.19/G	<<-
292	12 Jul 1966	G	7.840	1.186	13490.73	16000.001	-0.03/G	<-
293	19 Jul 1966	G	7.600	1.181	12447.08	14700.001	0.18/G	->>
294	27 Jul 1966	G	8.780	1.280	14921.87	19099.999	-0.09/G	<-
295	1 Aug 1966	G	11.120	1.432	18924.58	27099.999	-0.08/G	<-
296	15 Aug 1966	G	10.900	1.375	18618.18	25600.001	0.12/G	->
297	22 Aug 1966	G	11.320	1.483	19150.37	28400.000	-0.23/G	<<<-
298	26 Aug 1966	G	12.010	1.542	20038.91	30899.998	-0.19/G	<<-
299	6 Sep 1966	G	13.020	1.554	21106.82	32800.000	0.34/G	->>>>
300	7 Sep 1966	G	13.040	1.516	21635.88	32800.000	0.36/G	->>>>

River gaugings for station 13499 : Mekong at Mukdahan (1960-1971)

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
301	9 Sep 1966	G	13.500	1.617	22201.61	35899.999	0.06/G	->
302	14 Sep 1966	G	13.620	1.672	22368.42	37400.001	-0.18/G	<<-
303	20 Sep 1966	G	12.640	1.507	20703.39	31200.000	0.36/G	->>>>
304	29 Sep 1966	G	8.880	1.314	14611.87	19200.000	-0.02/G	<-
305	8 Oct 1966	G	6.800	1.184	10895.27	12900.000	0.02/G	->
306	12 Oct 1966	G	7.400	1.266	11611.37	14700.001	-0.02/G	<-
307	20 Oct 1966	G	5.580	1.099	9190.17	10100.001	-0.12/G	<-
308	25 Oct 1966	G	5.770	1.123	9439.00	10600.000	-0.13/G	<<-
309	27 Oct 1966	G	5.980	1.137	9762.53	11100.001	-0.12/G	<-
310	2 Nov 1966	G	5.200	1.082	8336.41	9020.000	-0.05/G	<-
311	7 Nov 1966	G	4.880	1.084	8228.78	8920.000	-0.32/G	<<<<-
312	12 Nov 1966	G	4.120	0.907	6571.11	5960.000	0.29/G	->>>
313	17 Nov 1966	G	3.860	0.947	6272.44	5940.000	0.04/G	->
314	28 Nov 1966	G	3.200	0.814	5356.27	4360.000	0.22/G	->>>
315	6 Dec 1966	G	3.000	0.846	5094.56	4310.000	0.05/G	->
316	12 Dec 1966	G	2.750	0.817	4749.08	3880.000	0.06/G	->
317	22 Dec 1966	G	2.520	0.838	4260.14	3570.000	0.02/G	-
318	29 Dec 1966	G	2.320	0.864	3726.85	3220.000	0.04/G	->
319	5 Jan 1967	H	2.100	0.821	3377.59	2773.000	-0.12/H	<<-
320	20 Jan 1967	H	1.890	0.762	3244.09	2472.000	-0.10/H	<-
321	24 Jan 1967	H	1.900	0.767	3298.57	2530.000	-0.13/H	<<-
322	1 Feb 1967	H	1.770	0.718	3193.59	2293.000	-0.07/H	<-
323	7 Feb 1967	H	1.660	0.698	3017.19	2106.000	-0.02/H	-
324	23 Feb 1967	H	1.510	0.380	4178.95	1588.000	0.32/H	->>>
325	2 Mar 1967	H	1.440	0.546	3932.23	2147.000	-0.27/H	<<<-
326	9 Mar 1967	H	1.380	0.460	4452.17	2048.000	-0.25/H	<<<-
327	16 Mar 1967	H	1.340	0.384	4187.50	1608.000	0.13/H	->>
328	21 Mar 1967	H	1.330	0.380	4165.79	1583.000	0.14/H	->>
329	11 Apr 1967	H	1.180	0.395	4025.32	1590.000	-0.02/H	-
330	18 Apr 1967	H	1.230	0.438	3367.58	1475.000	0.15/H	->>
331	3 May 1967	H	1.570	0.454	4755.51	2159.000	-0.16/H	<<-
332	9 May 1967	H	1.580	0.475	4387.37	2084.000	-0.08/H	<-
333	19 May 1967	H	1.960	0.462	5069.26	2342.000	0.08/H	->
334	26 May 1967	H	1.860	0.705	3568.79	2516.000	-0.16/H	<<-
335	2 Jun 1967	H	1.780	0.720	3279.17	2361.000	-0.12/H	<-
336	14 Jun 1967	H	4.650	0.849	8015.31	6805.000	0.07/H	->
337	22 Jun 1967	H	3.740	0.869	6957.42	6046.000	-0.47/H	<<<<-
338	29 Jun 1967	H	3.320	0.770	5575.32	4293.000	0.08/H	->
339	29 Jun 1967	H	3.320	0.770	5575.32	4293.000	0.08/H	->
340	29 Jun 1967	H	3.320	0.771	5577.17	4300.000	0.07/H	->
341	5 Jul 1967	H	4.700	0.880	8222.73	7236.000	-0.09/H	<-
342	5 Jul 1967	H	4.700	0.907	7782.80	7059.000	-0.00/H	-
343	12 Jul 1967	H	5.190	0.912	8926.54	8141.000	-0.00/H	-
344	12 Jul 1967	H	5.190	0.908	8918.50	8098.000	0.02/H	-
345	19 Jul 1967	H	5.920	0.908	9937.23	9023.001	0.36/H	->>>>
346	19 Jul 1967	H	5.920	0.972	9947.53	9669.001	0.10/H	->
347	26 Jul 1967	H	6.500	1.072	10973.88	11764.000	-0.12/H	<-
348	26 Jul 1967	H	6.500	1.125	10968.89	12340.001	-0.32/H	<<<-
349	1 Aug 1967	H	8.380	1.200	13881.67	16658.000	0.16/H	->>
350	8 Aug 1967	H	6.680	1.010	11120.79	11232.000	0.26/H	->>>
351	16 Aug 1967	H	6.300	1.080	10821.30	11687.000	-0.29/H	<<<-
352	23 Aug 1967	H	9.400	1.350	16716.30	22566.999	-0.45/H	<<<<-
353	29 Aug 1967	H	9.520	1.370	16168.61	22150.999	-0.22/H	<<<-
354	6 Sep 1967	H	7.400	1.145	12490.83	14302.000	-0.08/H	<-
355	13 Sep 1967	H	8.380	1.255	14002.39	17573.000	-0.11/H	<-
356	20 Sep 1967	H	9.520	1.253	15727.85	19707.000	0.43/H	->>>>
357	27 Sep 1967	H	10.500	1.374	17676.13	24287.000	0.22/H	->>
358	2 Oct 1967	H	10.200	1.357	16764.19	22748.999	0.30/H	->>>
359	18 Oct 1967	H	5.900	1.116	9832.44	10973.000	-0.43/H	<<<<-
360	26 Oct 1967	H	5.100	0.919	8683.35	7980.000	-0.02/H	-

River gaugings for station 13499 : Mekong at Mukdahan (1960-1971)

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
361	2 Nov 1967	H	3.740	0.874	6355.83	5555.000	-0.22/H	<<-
362	9 Nov 1967	H	3.420	0.713	5503.51	3924.000	0.40/H	->>>>
363	15 Nov 1967	H	3.160	0.816	5087.01	4151.000	0.00/H	-
364	23 Nov 1967	H	3.000	0.788	5189.09	4089.000	-0.12/H	<-
365	30 Nov 1967	H	3.380	0.823	4900.36	4033.000	0.30/H	->>>
366	7 Dec 1967	H	2.880	0.768	5102.86	3919.000	-0.13/H	<<-
367	13 Dec 1967	H	2.560	0.650	4246.15	2760.000	0.35/H	->>>>
368	20 Dec 1967	H	2.240	0.772	3375.65	2606.000	0.15/H	->>
369	28 Dec 1967	H	2.160	0.625	3760.00	2350.000	0.27/H	->>>
370	5 Jan 1968	I	1.880	0.621	3094.45	1921.653	0.20/I	->>
371	11 Jan 1968	I	1.740	0.674	2802.71	1889.024	0.08/I	->
372	17 Jan 1968	I	1.670	0.686	2836.11	1945.569	-0.02/I	<-
373	22 Jan 1968	I	1.640	0.612	2809.46	1719.391	0.10/I	->
374	2 Feb 1968	I	1.880	0.629	2884.81	1814.547	0.27/I	->>>
375	5 Feb 1968	I	1.340	0.662	2728.28	1806.123	-0.26/I	<<<-
376	8 Feb 1968	I	1.540	0.519	2549.42	1323.151	0.28/I	->>>
377	12 Feb 1968	I	1.470	0.598	2627.59	1571.299	0.03/I	->
378	19 Feb 1968	I	1.400	0.687	2395.56	1645.752	-0.09/I	<-
379	27 Feb 1968	I	1.410	0.601	2592.84	1558.295	-0.02/I	<-
380	5 Mar 1968	I	1.340	0.662	2728.28	1806.123	-0.26/I	<<<-
381	1 Apr 1968	I	1.220	0.418	3240.07	1354.351	-0.07/I	<-
382	16 Apr 1968	I	1.150	0.306	3093.87	946.725	0.17/I	->>
383	9 May 1968	?	2.860	0.448	5127.36	2297.057	0.94/I	->>>>
384	15 May 1968	?	2.520	0.395	4275.18	1688.696	1.00/I	->>>>
385	20 May 1968	?	2.420	0.406	4556.90	1850.103	0.79/I	->>>>
386	27 May 1968	?	2.260	0.376	3667.05	1378.809	0.96/I	->>>>
387	3 Jun 1968	I	1.860	0.683	3294.47	2250.121	-0.03/I	<-
388	10 Jun 1968	I	2.720	0.761	4974.01	3785.221	-0.07/I	<-
389	17 Jun 1968	I	3.880	0.863	6541.79	5645.564	0.12/I	->>
390	24 Jun 1968	I	5.100	1.006	8522.34	8573.476	-0.02/I	<-
391	1 Jul 1968	?	4.830	0.548	8237.26	4514.018	1.65/I	->>>>
392	8 Jul 1968	I	7.530	1.187	12194.45	14474.810	-0.02/I	-
393	15 Jul 1968	I	5.990	1.043	9766.82	10186.791	0.17/I	->>
394	19 Jul 1968	I	5.960	1.104	9876.15	10903.270	-0.16/I	<<-
395	22 Jul 1968	I	5.860	1.075	9906.73	10649.740	-0.16/I	<<-
396	2 Aug 1968	I	5.520	1.000	9009.21	9009.209	0.20/I	->>
397	5 Aug 1968	I	5.440	1.021	9215.69	9409.225	-0.05/I	<-
398	9 Aug 1968	I	6.460	1.089	11241.96	12242.491	-0.21/I	<<-
399	13 Aug 1968	I	9.870	1.402	15978.53	22401.900	-0.55/I	<<<<-
400	19 Aug 1968	I	10.640	1.432	16999.58	24343.399	-0.44/I	<<<<-
401	26 Aug 1968	I	9.160	1.330	14862.93	19767.698	-0.34/I	<<<<-
402	30 Aug 1968	I	7.540	1.220	12124.33	14791.680	-0.13/I	<<-
403	2 Sep 1968	I	7.460	1.198	11935.48	14298.701	-0.02/I	<-
404	9 Sep 1968	I	9.540	1.280	15159.97	19404.760	0.17/I	->>
405	13 Sep 1968	I	9.640	1.246	15033.31	18731.500	0.51/I	->>>>
406	23 Sep 1968	I	8.020	1.127	12745.08	14363.710	0.51/I	->>>>
407	27 Sep 1968	I	7.360	1.154	11891.56	13722.860	0.10/I	->
408	30 Sep 1968	I	6.920	1.190	11145.40	13263.031	-0.16/I	<<-
409	4 Oct 1968	I	6.740	1.143	10715.36	12247.661	0.07/I	->
410	7 Oct 1968	I	6.390	1.071	10149.84	10870.482	0.28/I	->>>
411	14 Oct 1968	I	5.710	1.112	9390.28	10441.990	-0.22/I	<<-
412	21 Oct 1968	I	5.140	1.006	8408.10	8458.545	0.07/I	->
413	25 Oct 1968	I	5.590	0.998	9272.09	9253.544	0.17/I	->>
414	28 Oct 1968	I	4.990	1.002	8161.60	8177.924	0.04/I	->
415	1 Nov 1968	I	4.180	0.918	6923.64	6355.899	0.08/I	->
416	4 Nov 1968	I	4.970	0.982	8410.34	8258.951	-0.01/I	-
417	8 Nov 1968	I	5.200	0.996	8457.92	8424.093	0.14/I	->>
418	11 Nov 1968	I	4.470	1.118	6175.75	6904.491	0.11/I	->
419	15 Nov 1968	I	3.940	0.947	6417.71	6077.568	-0.03/I	<-
420	18 Nov 1968	I	3.620	0.891	6296.06	5609.791	-0.12/I	<<-

River gaugings for station 13499 : Mekong at Mukdahan (1960-1971)

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
421	22 Nov 1968	I	3.310	0.905	5622.69	5088.534	-0.17/I	<<-
422	25 Nov 1968	I	3.260	0.824	5577.53	4595.882	0.04/I	->
423	29 Nov 1968	I	3.110	0.842	5411.08	4556.130	-0.09/I	<-
424	2 Dec 1968	I	2.890	0.888	4591.67	4077.407	-0.06/I	<-
425	9 Dec 1968	I	2.520	0.872	4269.74	3723.216	-0.24/I	<<<-
426	16 Dec 1968	I	2.280	0.890	3702.92	3295.598	-0.24/I	<<<-
427	19 Dec 1968	I	2.190	0.702	3758.49	2638.459	0.06/I	->
428	23 Dec 1968	I	2.100	0.764	3682.71	2813.587	-0.13/I	<<-
429	3 Jan 1969	J	1.860	0.725	2993.16	2170.043	0.11/J	->
430	10 Jan 1969	J	1.750	0.715	2837.56	2028.853	0.09/J	->
431	14 Jan 1969	J	1.690	0.710	2758.72	1958.692	0.08/J	->
432	20 Jan 1969	J	1.640	0.669	2779.76	1859.663	0.10/J	->
433	23 Jan 1969	J	1.630	0.712	2686.64	1912.890	0.06/J	->
434	27 Jan 1969	J	1.610	0.696	2656.63	1849.018	0.08/J	->
435	3 Feb 1969	J	1.510	0.709	2601.11	1844.188	-0.01/J	-
436	7 Feb 1969	J	1.470	0.724	2557.77	1851.824	-0.06/J	<-
437	14 Feb 1969	J	1.410	0.393	3797.24	1492.317	0.15/J	->>
438	17 Feb 1969	J	1.400	0.392	3800.65	1489.854	0.14/J	->>
439	28 Feb 1969	J	1.270	0.388	3636.73	1411.052	0.07/J	->
440	3 Mar 1969	J	1.250	0.446	3199.29	1426.885	0.04/J	->
441	7 Mar 1969	J	1.230	0.450	3544.30	1594.937	-0.11/J	<-
442	10 Mar 1969	J	1.210	0.396	3649.59	1445.239	-0.01/J	-
443	13 Mar 1969	J	1.200	0.322	3398.42	1094.291	0.27/J	->>>
444	17 Mar 1969	J	1.160	0.348	3336.00	1160.927	0.17/J	->>
445	21 Mar 1969	J	1.140	0.318	3396.27	1080.014	0.22/J	->>
446	24 Mar 1969	J	1.130	0.371	3417.50	1267.893	0.05/J	->
447	28 Mar 1969	J	1.130	0.372	3427.80	1275.142	0.04/J	->
448	2 Apr 1969	J	1.110	0.313	3299.99	1032.898	0.23/J	->>>
449	7 Apr 1969	J	1.060	0.381	3029.70	1154.314	0.07/J	->
450	11 Apr 1969	J	1.050	0.335	3233.86	1083.343	0.13/J	->>
451	24 Apr 1969	J	1.080	0.433	3296.48	1427.374	-0.13/J	<<-
452	28 Apr 1969	J	1.060	0.450	3113.44	1401.047	-0.13/J	<<-
453	2 May 1969	J	1.050	0.408	3294.81	1344.282	-0.09/J	<-
454	9 May 1969	J	1.080	0.485	3269.65	1585.782	-0.25/J	<<<-
455	16 May 1969	J	1.080	0.481	3447.92	1658.451	-0.31/J	<<<-
456	19 May 1969	J	1.030	0.407	3265.85	1329.202	-0.10/J	<-
457	23 May 1969	J	1.060	0.466	3070.26	1430.742	-0.15/J	<<-
458	26 May 1969	J	1.100	0.458	3416.72	1564.857	-0.22/J	<<-
459	29 May 1969	J	1.550	0.590	4174.78	2463.120	-0.40/J	<<<<-
460	2 Jun 1969	J	1.900	0.783	3118.46	2441.756	-0.04/J	<-
461	6 Jun 1969	J	3.000	0.906	5043.95	4569.817	-0.18/J	<<-
462	9 Jun 1969	J	4.500	1.109	7132.93	7910.418	-0.26/J	<<<-
463	13 Jun 1969	J	5.270	1.078	8480.21	9141.669	-0.01/J	-
464	16 Jun 1969	J	5.160	1.068	8279.52	8842.523	-0.00/J	-
465	20 Jun 1969	J	7.620	1.352	12159.48	16439.609	-0.36/J	<<<<-
466	23 Jun 1969	J	7.730	1.269	12737.08	16163.350	-0.16/J	<<-
467	27 Jun 1969	J	7.030	1.221	11389.04	13906.019	-0.08/J	<-
468	30 Jun 1969	J	6.600	1.158	11029.50	12772.160	-0.10/J	<-
469	4 Jul 1969	J	6.650	1.173	11263.47	13212.050	-0.21/J	<<-
470	7 Jul 1969	J	7.150	1.207	11011.34	13290.691	0.26/J	->>>
471	11 Jul 1969	J	7.940	1.292	13026.35	16830.050	-0.17/J	<<-
472	14 Jul 1969	J	9.020	1.392	14543.66	20244.769	-0.20/J	<<-
473	19 Jul 1969	J	8.940	1.351	14181.13	19158.710	0.07/J	->
474	19 Jul 1969	J	7.260	1.222	11484.84	14034.481	0.11/J	->
475	21 Jul 1969	J	9.060	1.342	14087.69	18905.679	0.27/J	->>>
476	23 Jul 1969	J	9.010	1.427	14267.95	20360.368	-0.24/J	<<<-
477	29 Jul 1969	J	9.660	1.441	15653.37	22556.509	-0.27/J	<<<-
478	1 Aug 1969	J	10.180	1.215	16811.93	20426.490	0.91/J	->>>>
479	4 Aug 1969	J	9.160	1.357	15134.50	20537.519	-0.15/J	<<-
480	7 Aug 1969	J	9.410	1.420	14864.37	21107.409	-0.08/J	<-

River gaugings for station 13499 : Mekong at Mukdahan (1960-1971)

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
481	15 Aug 1969	J	12.020	1.598	19011.23	30379.948	-0.14/J	<<-
482	18 Aug 1969	J	11.760	1.550	18765.61	29086.700	-0.05/J	<-
483	22 Aug 1969	J	11.360	1.546	17692.72	27352.949	0.04/J	->
484	25 Aug 1969	J	10.960	1.528	17771.12	27154.269	-0.31/J	<<<-
485	29 Aug 1969	J	10.400	1.456	15956.98	23233.360	0.27/J	->>>
486	1 Sep 1969	J	9.320	1.376	14077.71	19370.929	0.38/J	->>>>
487	5 Sep 1969	J	9.390	1.388	15021.50	20849.840	-0.02/J	-
488	8 Sep 1969	J	8.300	1.285	13214.41	16980.519	0.14/J	->>
489	12 Sep 1969	J	7.000	1.221	10863.74	13264.630	0.12/J	->>
490	15 Sep 1969	J	6.620	1.167	10194.25	11896.691	0.25/J	->>>
491	22 Sep 1969	J	7.440	1.198	11863.62	14212.621	0.22/J	->>>
492	26 Sep 1969	J	6.800	1.175	10431.41	12256.910	0.29/J	->>>
493	30 Sep 1969	J	5.900	1.137	8879.60	10096.100	0.23/J	->>>
494	6 Oct 1969	J	5.520	1.081	8375.73	9054.169	0.27/J	->>>
495	10 Oct 1969	J	4.800	1.052	7492.41	7882.011	0.05/J	->
496	13 Oct 1969	J	4.500	1.073	7026.02	7538.918	-0.10/J	<-
497	17 Oct 1969	J	3.920	1.129	6307.79	7121.492	-0.49/J	<<<<-
498	20 Oct 1969	J	3.800	0.954	5950.11	5676.401	0.06/J	->
499	24 Oct 1969	J	3.940	1.007	6239.82	6283.500	-0.09/J	<-
500	27 Oct 1969	J	3.840	1.032	6067.50	6261.656	-0.18/J	<<-
501	31 Oct 1969	J	3.480	1.027	5602.83	5754.101	-0.29/J	<<<-
502	3 Nov 1969	J	3.460	0.970	5538.23	5372.086	-0.13/J	<<-
503	7 Nov 1969	J	3.560	0.996	5568.80	5546.526	-0.11/J	<-
504	17 Nov 1969	J	3.060	0.952	4899.76	4664.573	-0.17/J	<<-
505	21 Nov 1969	J	2.750	0.841	4484.77	3771.694	0.01/J	-
506	24 Nov 1969	J	2.620	0.778	3965.42	3085.095	0.28/J	->>>
507	28 Nov 1969	J	2.460	0.859	4010.47	3444.997	-0.09/J	<-
508	1 Dec 1969	J	2.420	0.810	3855.24	3122.745	0.06/J	->
509	5 Dec 1969	J	2.220	0.797	3521.79	2806.864	0.05/J	->
510	8 Dec 1969	J	2.140	0.805	3472.14	2795.069	-0.02/J	<-
511	12 Dec 1969	J	2.060	0.780	3369.73	2628.392	0.00/J	-
512	15 Dec 1969	J	2.020	0.776	3327.81	2582.378	-0.01/J	-
513	19 Dec 1969	J	1.900	0.727	3101.71	2254.942	0.09/J	->
514	22 Dec 1969	J	1.830	0.764	2794.71	2135.156	0.10/J	->
515	26 Dec 1969	J	1.790	0.572	3824.72	2187.737	0.02/J	->

River gaugings for station 13402 : Mekong at Mukdahan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
1	2 Jan 1970	K	1.720	0.714	4156.67	2967.860	-0.49/K	<<<<-
2	5 Jan 1970	K	1.690	0.690	4104.82	2832.328	-0.44/K	<<<<-
3	9 Jan 1970	K	1.600	0.553	4003.84	2214.121	-0.13/K	<<-
4	12 Jan 1970	K	1.570	0.534	3951.24	2109.963	-0.09/K	<-
5	16 Jan 1970	K	1.540	0.568	3755.83	2133.312	-0.14/K	<<-
6	19 Jan 1970	K	1.500	0.600	3683.34	2210.006	-0.23/K	<<<-
7	23 Jan 1970	K	1.480	0.482	3679.47	1773.506	0.05/K	->
8	26 Jan 1970	K	1.450	0.539	3630.77	1956.984	-0.11/K	<-
9	30 Jan 1970	K	1.420	0.569	3568.34	2030.386	-0.19/K	<<-
10	2 Feb 1970	K	1.380	0.470	3450.72	1621.837	0.05/K	->
11	6 Feb 1970	K	1.350	0.482	3413.30	1645.211	0.01/K	-
12	9 Feb 1970	K	1.320	0.540	3332.13	1799.348	-0.13/K	<<-
13	13 Feb 1970	K	1.280	0.440	3265.80	1436.950	0.09/K	->
14	16 Feb 1970	K	1.260	0.453	3231.26	1463.759	0.05/K	->
15	20 Feb 1970	K	1.230	0.420	3224.41	1354.254	0.10/K	->
16	23 Feb 1970	K	1.220	0.496	3214.50	1594.390	-0.09/K	<-
17	27 Feb 1970	K	1.190	0.434	3226.13	1400.142	0.03/K	->
18	2 Mar 1970	K	1.150	0.419	3128.86	1310.992	0.05/K	->
19	13 Mar 1970	K	1.090	0.454	3134.28	1422.961	-0.09/K	<-
20	16 Mar 1970	K	1.070	0.430	3132.63	1347.029	-0.05/K	<-
21	20 Mar 1970	K	1.030	0.398	2963.70	1179.552	0.04/K	->
22	23 Mar 1970	K	1.020	0.402	2989.52	1201.786	0.01/K	-
23	27 Mar 1970	K	1.000	0.382	3023.16	1154.847	0.02/K	->
24	30 Mar 1970	K	1.000	0.400	3017.88	1207.151	-0.02/K	-
25	3 Apr 1970	K	1.080	0.448	3230.03	1447.052	-0.12/K	<-
26	6 Apr 1970	K	1.080	0.449	3252.51	1460.379	-0.13/K	<<-
27	10 Apr 1970	K	1.060	0.401	3223.60	1292.662	-0.02/K	<-
28	13 Apr 1970	K	1.070	0.476	3326.81	1583.562	-0.23/K	<<<-
29	17 Apr 1970	K	1.300	0.446	3619.41	1614.255	-0.02/K	<-
30	20 Apr 1970	K	1.330	0.546	3612.64	1972.503	-0.24/K	<<<-
31	24 Apr 1970	K	1.190	0.475	3209.70	1524.606	-0.07/K	<-
32	1 May 1970	K	1.180	0.465	3280.25	1525.317	-0.08/K	<-
33	4 May 1970	K	1.220	0.389	3371.69	1311.589	0.12/K	->>
34	9 May 1970	K	1.290	0.442	3534.89	1562.421	0.01/K	-
35	11 May 1970	K	1.280	0.491	3359.82	1649.670	-0.07/K	<-
36	18 May 1970	K	1.800	0.512	4060.79	2079.125	0.16/K	->>
37	22 May 1970	K	2.200	0.677	3612.75	2445.829	0.32/K	->>>
38	25 May 1970	K	3.220	0.940	5358.77	5037.245	-0.16/K	<<-
39	29 May 1970	K	4.510	1.003	7026.34	7047.424	0.11/K	->
40	1 Jun 1970	K	4.260	0.924	6964.90	6435.571	0.16/K	->>
41	4 Jun 1970	K	3.720	0.931	5773.31	5374.948	0.16/K	->>
42	8 Jun 1970	K	3.460	0.942	5707.66	5376.618	-0.10/K	<-
43	12 Jun 1970	K	3.540	0.894	5630.35	5033.535	0.16/K	->>
44	15 Jun 1970	K	4.020	0.963	6638.43	6392.809	-0.06/K	<-
45	18 Jun 1970	K	4.500	1.011	7129.43	7207.854	0.03/K	->
46	22 Jun 1970	K	6.520	1.143	10682.77	12210.410	-0.18/K	<<-
47	26 Jun 1970	K	6.840	1.098	10768.15	11823.431	0.30/K	->>>
48	29 Jun 1970	K	8.380	1.296	13693.06	17746.211	-0.51/K	<<<<-
49	3 Jul 1970	K	10.020	1.438	16355.63	23519.399	-0.96/K	<<<<-
50	6 Jul 1970	K	9.920	1.428	15050.41	21491.980	-0.35/K	<<<<-
51	10 Jul 1970	K	9.950	1.415	15050.64	21296.660	-0.25/K	<<<-
52	13 Jul 1970	K	9.060	1.326	14270.60	18922.810	-0.27/K	<<<-
53	17 Jul 1970	K	8.360	1.298	13433.39	17436.538	-0.41/K	<<<<-
54	20 Jul 1970	K	9.200	1.318	14042.06	18507.429	0.02/K	->
55	24 Jul 1970	K	9.720	1.402	15793.94	22143.109	-0.78/K	<<<<-
56	27 Jul 1970	K	9.760	1.373	15642.61	21477.301	-0.50/K	<<<<-
57	31 Jul 1970	K	9.740	1.364	15202.85	20736.679	-0.26/K	<<<-
58	3 Aug 1970	K	9.740	1.284	15001.91	19262.449	0.28/K	->>>
59	7 Aug 1970	K	10.740	1.444	16878.77	24372.948	-0.54/K	<<<<-
60	10 Aug 1970	K	11.200	1.469	17344.94	25479.722	-0.46/K	<<<<-

River gaugings for station 13402 : Mekong at Mukdahan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
61	17 Aug 1970	K	11.430	1.474	17163.58	25299.119	-0.17/K	<<-
62	21 Aug 1970	K	12.540	1.450	18826.30	27298.140	0.26/K	->>>
63	24 Aug 1970	K	13.050	1.427	20317.31	28992.801	0.21/K	->>
64	28 Aug 1970	K	13.020	1.398	19855.80	27758.401	0.59/K	->>>>
65	31 Aug 1970	K	12.670	1.511	18858.82	28495.669	-0.01/K	-
66	5 Sep 1970	K	12.450	1.449	18758.71	27181.369	0.21/K	->>
67	7 Sep 1970	K	12.120	1.417	18384.25	26050.481	0.26/K	->>>
68	11 Sep 1970	K	11.840	1.430	17928.89	25638.309	0.12/K	->>
69	14 Sep 1970	K	11.300	1.458	17378.21	25337.430	-0.31/K	<<<-
70	18 Sep 1970	K	11.060	1.446	16814.13	24313.230	-0.20/K	<<-
71	21 Sep 1970	K	10.820	1.407	15987.44	22494.329	0.20/K	->>
72	25 Sep 1970	K	10.160	1.356	15445.47	20944.051	0.09/K	->
73	29 Sep 1970	K	9.240	1.324	13888.26	18388.061	0.11/K	->
74	1 Oct 1970	K	9.220	1.362	13876.65	18899.999	-0.10/K	<-
75	5 Oct 1970	K	8.180	1.082	12476.89	13500.002	0.95/K	->>>>
76	10 Oct 1970	K	6.780	1.104	10778.98	11900.000	0.21/K	->>
77	12 Oct 1970	K	6.480	1.132	10512.37	11900.000	-0.09/K	<-
78	16 Oct 1970	K	6.480	1.058	9924.39	10500.000	0.51/K	->>>>
79	19 Oct 1970	K	5.710	1.061	8539.11	9060.000	0.37/K	->>>>
80	22 Oct 1970	K	5.150	0.989	7826.09	7740.000	0.42/K	->>>>
81	26 Oct 1970	K	4.700	0.954	7201.26	6870.000	0.39/K	->>>>
82	29 Oct 1970	K	4.500	0.941	7066.95	6650.000	0.30/K	->>>
83	2 Nov 1970	K	4.280	0.973	6577.60	6400.000	0.20/K	->>
84	3 Nov 1970	K	4.140	0.980	6520.41	6390.000	0.07/K	->
85	6 Nov 1970	K	3.760	0.923	5904.66	5450.000	0.16/K	->>
86	9 Nov 1970	K	3.540	0.892	5526.91	4930.000	0.22/K	->>
87	13 Nov 1970	K	3.540	0.897	5484.95	4920.000	0.22/K	->>>
88	16 Nov 1970	K	3.380	0.907	5325.25	4830.000	0.11/K	->
89	20 Nov 1970	K	3.120	0.873	5063.00	4420.000	0.07/K	->
90	23 Nov 1970	K	3.150	0.852	5105.63	4350.000	0.14/K	->>
91	27 Nov 1970	K	3.160	0.834	5071.94	4230.000	0.22/K	->>
92	30 Nov 1970	K	3.000	0.834	5047.96	4210.000	0.07/K	->
93	7 Dec 1970	K	2.680	0.891	4365.88	3890.000	-0.07/K	<-
94	11 Dec 1970	K	2.580	0.830	4240.96	3520.000	0.04/K	->
95	16 Dec 1970	K	3.260	0.809	5970.33	4830.000	-0.01/K	-
96	19 Dec 1970	K	3.220	0.809	6192.83	5010.000	-0.15/K	<<-
97	23 Dec 1970	K	3.500	0.818	6662.59	5450.000	-0.10/K	<-
98	26 Dec 1970	K	3.440	0.825	6412.12	5290.000	-0.07/K	<-
99	30 Dec 1970	K	2.800	0.788	5786.80	4560.000	-0.33/K	<<<<-
100	6 Jan 1971	K	2.320	0.720	5138.89	3700.000	-0.32/K	<<<<-
101	9 Jan 1971	K	2.200	0.721	4687.93	3380.000	-0.26/K	<<<-
102	12 Jan 1971	K	2.120	0.730	4547.95	3320.000	-0.30/K	<<<-
103	15 Jan 1971	K	2.030	0.592	4510.14	2670.000	0.00/K	-
104	20 Jan 1971	K	1.920	0.573	4520.07	2590.000	-0.06/K	<-
105	23 Jan 1971	K	1.860	0.562	4110.32	2310.000	0.06/K	->
106	27 Jan 1971	K	1.780	0.589	4261.46	2510.000	-0.15/K	<<-
107	30 Jan 1971	K	1.740	0.556	4028.78	2240.000	-0.01/K	-
108	3 Feb 1971	K	1.700	0.583	4030.87	2350.000	-0.12/K	<<-
109	6 Feb 1971	K	1.680	0.595	3983.19	2370.000	-0.16/K	<<-
110	10 Feb 1971	K	1.640	0.561	3868.09	2170.000	-0.06/K	<-
111	13 Feb 1971	K	1.620	0.527	3833.02	2020.000	0.02/K	-
112	17 Feb 1971	K	1.580	0.544	3694.85	2010.000	-0.02/K	-
113	20 Feb 1971	K	1.560	0.507	3727.81	1890.000	0.05/K	->
114	24 Feb 1971	K	1.530	0.474	3755.27	1780.000	0.09/K	->
115	27 Feb 1971	K	1.530	0.454	3744.49	1700.000	0.15/K	->>
116	13 Mar 1971	K	1.360	0.464	3599.14	1670.000	-0.00/K	-
117	17 Mar 1971	K	1.300	0.465	3354.84	1560.000	0.02/K	-
118	20 Mar 1971	K	1.280	0.449	3407.57	1530.000	0.02/K	->
119	24 Mar 1971	K	1.250	0.410	3365.85	1380.000	0.10/K	->
120	27 Mar 1971	K	1.240	0.415	3349.40	1390.000	0.08/K	->

River gaugings for station 13402 : Mekong at Mukdahan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
121	31 Mar 1971	K	1.300	0.457	3457.33	1580.000	0.00/K	-
122	3 Apr 1971	K	1.260	0.456	3530.70	1610.000	-0.06/K	<-
123	7 Apr 1971	K	1.240	0.391	3478.26	1360.000	0.11/K	->
124	10 Apr 1971	K	1.220	0.352	3380.68	1190.000	0.22/K	->>
125	14 Apr 1971	K	1.190	0.340	3294.12	1120.000	0.24/K	->>>
126	21 Apr 1971	K	1.180	0.357	3277.31	1170.000	0.19/K	->>
127	24 Apr 1971	K	1.200	0.442	3348.42	1480.000	-0.02/K	<-
128	26 Apr 1971	K	1.230	0.392	3392.86	1330.000	0.12/K	->
129	1 May 1971	K	1.320	0.412	3640.78	1500.000	0.08/K	->
130	5 May 1971	K	1.260	0.417	3597.12	1500.000	0.02/K	->
131	9 May 1971	K	1.220	0.363	3333.33	1210.000	0.20/K	->>
132	12 May 1971	K	1.240	0.402	3507.46	1410.000	0.07/K	->
133	15 May 1971	K	1.360	0.369	3983.74	1470.000	0.14/K	->>
134	19 May 1971	K	1.380	0.402	3855.72	1550.000	0.11/K	->
135	22 May 1971	K	1.590	0.369	4986.45	1840.000	0.11/K	->
136	2 Jun 1971	L	2.500	0.547	4460.69	2440.000	0.16/L	->>
137	5 Jun 1971	L	3.700	0.795	6477.99	5150.000	-0.11/L	<-
138	9 Jun 1971	L	4.880	0.938	7803.84	7320.000	0.08/L	->
139	12 Jun 1971	L	5.080	0.925	8551.35	7910.000	0.03/L	->
140	16 Jun 1971	L	3.660	0.842	6484.56	5460.000	-0.30/L	<<<-
141	19 Jun 1971	L	3.360	0.762	5892.39	4490.000	-0.12/L	<<-
142	23 Jun 1971	L	4.580	0.983	7700.92	7570.000	-0.32/L	<<<<-
143	26 Jun 1971	L	5.140	1.015	8650.25	8780.000	-0.27/L	<<<-
144	28 Jun 1971	L	5.860	1.044	9865.90	10300.000	-0.15/L	<<-
145	3 Jul 1971	L	6.880	1.108	11101.08	12300.001	0.13/L	->>
146	7 Jul 1971	L	6.960	1.156	11245.67	13000.001	-0.04/L	<-
147	9 Jul 1971	L	8.280	1.323	13681.03	18099.999	-0.43/L	<<<<-
148	25 Aug 1971	L	12.360	1.614	19888.48	32100.000	-0.38/L	<<<<-
149	28 Aug 1971	L	12.120	1.566	18901.66	29600.000	0.05/L	->
150	1 Sep 1971	L	11.700	1.524	17716.54	27000.001	0.34/L	->>>>
151	4 Sep 1971	L	11.720	1.595	17868.34	28499.999	-0.05/L	<-
152	8 Sep 1971	L	11.840	1.724	18097.45	31200.000	-0.66/L	<<<<-
153	11 Sep 1971	L	11.530	1.562	16965.43	26499.998	0.31/L	->>>
154	16 Sep 1971	L	10.240	1.391	15600.29	21699.999	0.41/L	->>>>
155	20 Sep 1971	L	9.410	1.352	13535.50	18299.999	0.63/L	->>>>
156	27 Sep 1971	L	7.900	1.246	11878.01	14800.001	0.27/L	->>>
157	1 Oct 1971	L	7.440	1.204	11212.63	13500.002	0.26/L	->>>
158	4 Oct 1971	L	8.000	1.211	11643.27	14100.000	0.61/L	->>>>
159	9 Oct 1971	L	6.890	1.166	10034.31	11700.000	0.36/L	->>>>
160	11 Oct 1971	L	6.530	1.088	9742.65	10600.000	0.41/L	->>>>
161	30 Oct 1971	L	5.080	1.008	8333.33	8400.000	-0.17/L	<<-
162	3 Nov 1971	L	4.260	0.931	7153.60	6660.000	-0.25/L	<<<-
163	6 Nov 1971	L	4.700	0.861	7955.87	6850.000	0.11/L	->
164	10 Nov 1971	L	4.460	0.949	6880.93	6530.000	0.01/L	-
165	13 Nov 1971	L	3.880	0.889	5950.51	5290.000	0.00/L	-
166	17 Nov 1971	L	3.560	0.864	5555.55	4800.000	-0.08/L	<-
167	20 Nov 1971	L	3.460	0.819	5323.57	4360.000	0.04/L	->
168	27 Nov 1971	L	3.100	0.780	5038.46	3930.000	-0.09/L	<-
169	29 Nov 1971	L	2.960	0.760	4486.84	3410.000	0.05/L	->
170	3 Dec 1971	L	2.800	0.781	4212.55	3290.000	-0.04/L	<-
171	6 Dec 1971	L	2.740	0.662	4365.56	2890.000	0.13/L	->>
172	10 Dec 1971	L	2.580	0.618	4029.13	2490.000	0.21/L	->>
173	15 Dec 1971	L	2.500	0.605	3884.30	2350.000	0.21/L	->>
174	18 Dec 1971	L	2.380	0.633	3933.65	2490.000	0.01/L	-
175	23 Dec 1971	L	2.300	0.445	3775.28	1680.000	0.46/L	->>>>
176	25 Dec 1971	L	2.360	0.588	3911.56	2300.000	0.11/L	->
177	4 Jan 1972	L	2.340	0.484	3638.43	1761.000	0.44/L	->>>>
178	8 Jan 1972	L	2.140	0.479	3546.97	1699.000	0.28/L	->>>
179	12 Jan 1972	L	2.020	0.482	3516.60	1695.000	0.17/L	->>
180	15 Jan 1972	L	2.000	0.439	3578.59	1571.000	0.24/L	->>>

River gaugings for station 13402 : Mekong at Mukdahan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
181	19 Jan 1972	L	1.920	0.378	3306.88	1250.000	0.39/L	->>>>
182	22 Jan 1972	L	1.860	0.436	3050.46	1330.000	0.27/L	->>>
183	26 Jan 1972	L	1.800	0.394	3121.83	1230.000	0.29/L	->>>
184	29 Jan 1972	L	1.760	0.366	2825.14	1034.000	0.41/L	->>>>
185	3 Feb 1972	L	1.700	0.375	3930.67	1474.000	0.01/L	-
186	9 Feb 1972	L	1.650	0.364	3675.82	1338.000	0.06/L	->
187	16 Feb 1972	L	1.580	0.344	3755.81	1292.000	0.02/L	->
188	19 Feb 1972	L	1.540	0.337	3727.00	1256.000	0.01/L	-
189	23 Feb 1972	L	1.570	0.343	3644.31	1250.000	0.04/L	->
190	26 Feb 1972	L	1.520	0.311	3665.59	1140.000	0.08/L	->
191	1 Mar 1972	L	1.480	0.302	3543.05	1070.000	0.10/L	->
192	4 Mar 1972	L	1.460	0.288	3600.69	1037.000	0.11/L	->
193	8 Mar 1972	L	1.400	0.284	3450.70	980.000	0.09/L	->
194	11 Mar 1972	L	1.360	0.274	3339.42	915.000	0.11/L	->
195	15 Mar 1972	L	1.350	0.302	3500.00	1057.000	-0.02/L	<-
196	18 Mar 1972	L	1.340	0.296	3719.59	1101.000	-0.07/L	<-
197	22 Mar 1972	L	1.320	0.282	3695.04	1042.000	-0.04/L	<-
198	25 Mar 1972	L	1.310	0.281	3715.30	1044.000	-0.05/L	<-
199	29 Mar 1972	L	1.290	0.280	3521.43	986.000	-0.02/L	<-
200	1 Apr 1972	L	1.260	0.268	3496.27	937.000	-0.01/L	-
201	6 Apr 1972	L	1.240	0.283	3491.17	988.000	-0.07/L	<-
202	8 Apr 1972	L	1.280	0.269	3494.42	940.000	0.01/L	-
203	10 Apr 1972	L	1.320	0.390	3374.36	1316.000	-0.26/L	<<<-
204	15 Apr 1972	L	1.440	0.393	3898.22	1532.000	-0.30/L	<<<-
205	20 Apr 1972	L	1.520	0.364	3903.85	1421.000	-0.13/L	<<-
206	22 Apr 1972	L	1.520	0.341	3780.06	1289.000	-0.04/L	<-
207	27 Apr 1972	L	1.420	0.385	3677.92	1416.000	-0.23/L	<<<-
208	2 May 1972	L	1.240	0.336	3485.12	1171.000	-0.22/L	<<<-
209	6 May 1972	L	1.270	0.355	3501.41	1243.000	-0.25/L	<<<-
210	11 May 1972	L	1.620	0.372	3913.98	1456.000	-0.06/L	<-
211	13 May 1972	L	1.720	0.380	3955.26	1503.000	0.00/L	-
212	18 May 1972	L	1.530	0.360	3672.22	1322.000	-0.05/L	<-
213	20 May 1972	L	1.510	0.348	3652.30	1271.000	-0.03/L	<-
214	22 May 1972	L	1.550	0.384	3796.87	1458.000	-0.13/L	<<-
215	27 May 1972	L	1.750	0.332	4370.48	1451.000	0.07/L	->
216	1 Jun 1972	L	1.760	0.318	3921.38	1247.000	0.24/L	->>>
217	4 Jun 1972	L	1.800	0.329	4243.16	1396.000	0.16/L	->>
218	8 Jun 1972	L	2.800	0.421	5432.30	2287.000	0.55/L	->>>>
219	10 Jun 1972	L	3.300	0.812	5672.41	4606.000	-0.24/L	<<<-
220	15 Jun 1972	L	4.620	0.863	7093.86	6122.000	0.35/L	->>>>
221	17 Jun 1972	L	3.950	0.853	6398.59	5458.000	-0.01/L	-
222	22 Jun 1972	L	4.340	0.889	7106.86	6318.000	-0.02/L	-
223	24 Jun 1972	L	3.860	0.900	6375.56	5738.000	-0.23/L	<<<-
224	29 Jun 1972	L	3.200	0.781	5494.24	4291.000	-0.18/L	<<-
225	1 Jul 1972	L	5.020	1.094	8122.49	8886.001	-0.43/L	<<<<-
226	6 Jul 1972	L	5.700	1.029	9105.93	9370.000	0.06/L	->
227	8 Jul 1972	L	5.400	1.012	9009.88	9118.000	-0.14/L	<<-
228	13 Jul 1972	L	4.880	0.904	8402.65	7596.000	-0.04/L	<-
229	15 Jul 1972	L	5.250	0.956	8785.57	8399.000	-0.00/L	-
230	20 Jul 1972	L	6.760	1.074	10724.39	11518.001	0.29/L	->>>
231	22 Jul 1972	L	7.510	1.278	12518.78	15999.001	-0.52/L	<<<<-
232	27 Jul 1972	L	8.240	1.276	12844.04	16389.000	0.08/L	->
233	29 Jul 1972	L	8.200	1.261	12790.64	16129.001	0.12/L	->>
234	3 Aug 1972	L	9.030	1.291	14512.01	18735.000	0.11/L	->
235	10 Aug 1972	L	12.060	1.412	19306.66	27261.000	0.63/L	->>>>
236	12 Aug 1972	L	12.240	1.450	19548.97	28345.999	0.51/L	->>>>
237	17 Aug 1972	L	12.270	1.473	19467.75	28676.000	0.45/L	->>>>
238	20 Aug 1972	L	11.870	1.420	18984.51	26958.000	0.53/L	->>>>
239	24 Aug 1972	L	11.320	1.446	17531.81	25350.999	0.43/L	->>>>
240	26 Aug 1972	L	11.350	1.480	18047.30	26710.000	0.08/L	->

River gaugings for station 13402 : Mekong at Mukdahan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
241	31 Aug 1972	L	11.200	1.461	16688.57	24381.999	0.59/L	->>>>
242	2 Sep 1972	L	10.860	1.513	16642.43	25180.000	0.02/L	-
243	7 Sep 1972	L	9.940	1.322	14757.94	19509.999	0.78/L	->>>>
244	10 Sep 1972	L	9.680	1.321	16153.67	21338.999	-0.04/L	<-
245	14 Sep 1972	L	8.160	1.279	13301.80	17012.999	-0.20/L	<<-
246	16 Sep 1972	L	7.500	1.235	12046.15	14877.000	-0.16/L	<<-
247	21 Sep 1972	L	6.360	1.084	10431.73	11308.000	-0.03/L	<-
248	23 Sep 1972	L	5.980	1.034	10056.09	10398.000	-0.06/L	<-
249	28 Sep 1972	L	5.400	1.136	8201.58	9317.001	-0.22/L	<<<-
250	30 Sep 1972	L	5.280	1.124	8343.42	9378.001	-0.37/L	<<<<-
251	5 Oct 1972	L	6.580	1.077	11384.40	12261.001	-0.16/L	<<-
252	7 Oct 1972	L	7.160	1.131	11559.68	13074.001	0.13/L	->>
253	12 Oct 1972	L	5.900	1.104	9884.06	10912.001	-0.34/L	<<<<-
254	14 Oct 1972	L	5.550	1.007	8937.44	9000.000	0.05/L	->
255	19 Oct 1972	L	5.800	1.030	9404.86	9687.001	0.03/L	->
256	26 Oct 1972	L	5.360	1.021	8578.84	8759.000	-0.04/L	<-
257	28 Oct 1972	L	5.140	1.027	8374.88	8601.000	-0.19/L	<<-
258	2 Nov 1972	L	4.620	0.946	7762.16	7343.000	-0.19/L	<<-
259	4 Nov 1972	L	4.310	1.020	7248.04	7393.000	-0.52/L	<<<<-
260	9 Nov 1972	L	3.590	0.998	5632.26	5621.000	-0.44/L	<<<<-
261	11 Nov 1972	L	3.460	1.005	5538.31	5566.000	-0.55/L	<<<<-
262	16 Nov 1972	L	3.980	0.900	6825.56	6143.000	-0.30/L	<<<-
263	18 Nov 1972	L	4.700	1.011	7717.11	7802.000	-0.30/L	<<<-
264	23 Nov 1972	L	3.670	1.079	5785.91	6243.000	-0.65/L	<<<<-
265	25 Nov 1972	L	3.390	1.041	5315.08	5533.000	-0.60/L	<<<<-
266	30 Nov 1972	L	3.240	1.026	5201.75	5337.000	-0.66/L	<<<<-
267	2 Dec 1972	L	3.560	0.884	5964.93	5273.000	-0.31/L	<<<-
268	7 Dec 1972	L	3.680	0.940	6042.55	5680.000	-0.38/L	<<<<-
269	9 Dec 1972	L	4.240	0.999	6986.99	6980.000	-0.41/L	<<<<-
270	14 Dec 1972	L	3.800	0.921	6284.47	5788.000	-0.31/L	<<<-
271	16 Dec 1972	L	3.400	0.864	5964.12	5153.000	-0.41/L	<<<<-
272	20 Dec 1972	L	2.980	0.769	4803.64	3694.000	-0.09/L	<-
273	22 Dec 1972	L	2.880	0.755	4660.93	3519.000	-0.09/L	<-
274	27 Dec 1972	L	2.840	0.628	4609.87	2895.000	0.22/L	->>>
275	29 Dec 1972	L	2.640	0.642	4051.40	2601.000	0.20/L	->>
276	3 Jan 1973	M	2.340	0.704	3688.78	2596.900	0.05/M	->
277	5 Jan 1973	M	2.280	0.666	3571.47	2378.600	0.15/M	->>
278	8 Jan 1973	M	2.160	0.629	3726.87	2344.200	0.06/M	->
279	12 Jan 1973	M	2.080	0.633	3817.22	2416.300	-0.07/M	<-
280	7 Mar 1973	M	1.320	0.303	3874.26	1173.900	0.24/M	->>>
281	9 Mar 1973	M	1.300	0.268	3820.52	1023.900	0.38/M	->>>>
282	14 Mar 1973	M	1.300	0.302	3855.96	1164.500	0.23/M	->>>
283	17 Mar 1973	M	1.380	0.354	4080.79	1444.600	0.04/M	->
284	21 Mar 1973	M	1.800	0.409	4433.99	1813.500	0.13/M	->>
285	5 Apr 1973	M	1.330	0.413	4435.11	1831.700	-0.36/M	<<<<-
286	7 Apr 1973	M	1.690	0.356	3982.58	1417.800	0.37/M	->>>>
287	11 Apr 1973	M	1.270	0.372	3858.87	1435.500	-0.06/M	<-
288	19 Apr 1973	M	1.240	0.365	3672.60	1340.500	-0.00/M	-
289	21 Apr 1973	M	1.240	0.375	3877.60	1454.100	-0.11/M	<-
290	25 Apr 1973	M	1.250	0.370	3769.46	1394.700	-0.04/M	<-
291	28 Apr 1973	M	1.340	0.388	3969.85	1540.300	-0.09/M	<-
292	2 May 1973	M	1.620	0.462	4452.38	2057.000	-0.25/M	<<<-
293	5 May 1973	M	1.750	0.491	4510.18	2214.500	-0.25/M	<<<-
294	9 May 1973	M	1.780	0.485	4909.69	2381.200	-0.35/M	<<<<-
295	12 May 1973	M	1.640	0.457	4570.90	2088.900	-0.26/M	<<<-
296	16 May 1973	M	1.940	0.498	4834.34	2407.500	-0.21/M	<<-
297	19 May 1973	M	2.320	0.562	5349.82	3006.600	-0.26/M	<<<-
298	23 May 1973	M	2.140	0.490	5074.29	2486.400	-0.07/M	<-
299	26 May 1973	M	2.080	0.505	4848.12	2448.300	-0.10/M	<-
300	30 May 1973	M	2.370	0.557	5495.87	3061.200	-0.25/M	<<<-

River gaugings for station 13402 : Mekong at Mukdahan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
301	2 Jun 1973	M	2.580	0.606	5669.64	3435.800	-0.28/M	<<<-
302	6 Jun 1973	M	2.520	0.493	5640.77	2780.900	0.10/M	->
303	9 Jun 1973	M	3.380	0.679	6360.68	4318.900	-0.03/M	<-
304	13 Jun 1973	M	4.630	0.788	7886.68	6214.700	0.20/M	->>
305	16 Jun 1973	M	4.580	0.756	7585.45	5734.600	0.39/M	->>>>
306	20 Jun 1973	M	5.400	0.872	9013.99	7860.200	0.18/M	->>
307	23 Jun 1973	M	5.050	0.890	9238.88	8222.600	-0.33/M	<<<<-
308	27 Jun 1973	M	4.640	0.879	8209.21	7215.900	-0.28/M	<<<-
309	30 Jun 1973	M	4.430	0.885	7511.07	6647.300	-0.22/M	<<-
310	4 Jul 1973	M	4.140	0.888	7757.21	6888.400	-0.62/M	<<<<-
311	7 Jul 1973	M	4.740	0.908	8978.75	8152.700	-0.61/M	<<<<-
312	11 Jul 1973	?	8.250	1.114	1438.78	1602.800	6.76/M	->>>>
313	14 Jul 1973	M	8.290	1.147	15553.53	17839.899	-0.64/M	<<<<-
314	21 Jul 1973	M	8.810	1.172	14833.79	17385.199	0.02/M	->
315	26 Jul 1973	M	8.080	1.165	13548.84	15784.402	-0.18/M	<<-
316	28 Jul 1973	M	8.030	1.141	13526.47	15433.701	-0.12/M	<-
317	1 Sep 1973	M	11.520	1.405	19573.10	27500.200	-0.20/M	<<-
318	4 Sep 1973	M	13.040	1.448	21093.99	30544.099	0.54/M	->>>>
319	8 Sep 1973	M	13.380	1.604	23569.02	37804.698	-0.87/M	<<<<-
320	11 Sep 1973	M	13.080	1.428	22059.10	31500.399	0.34/M	->>>>
321	14 Sep 1973	M	12.370	1.321	20626.34	27247.399	0.72/M	->>>>
322	18 Sep 1973	M	11.320	1.299	18723.32	24321.599	0.46/M	->>>>
323	22 Sep 1973	M	10.900	1.370	18194.89	24927.000	-0.13/M	<<-
324	25 Sep 1973	M	10.360	1.287	16930.15	21789.099	0.22/M	->>>
325	29 Sep 1973	M	9.880	1.329	16259.14	21608.400	-0.20/M	<<-
326	2 Oct 1973	M	9.610	1.279	16349.88	20911.499	-0.27/M	<<<-
327	6 Oct 1973	M	8.610	1.176	14118.96	16603.900	0.07/M	->
328	9 Oct 1973	M	8.000	1.095	13342.56	14610.101	0.14/M	->>
329	13 Oct 1973	M	7.200	1.081	11840.98	12800.100	-0.02/M	-
330	16 Oct 1973	M	6.340	1.068	10452.06	11162.801	-0.26/M	<<<-
331	20 Oct 1973	M	5.670	1.006	9314.32	9370.203	-0.20/M	<<-
332	23 Oct 1973	M	5.020	0.947	8374.55	7930.700	-0.23/M	<<<-
333	27 Oct 1973	M	4.600	0.866	7462.59	6462.600	0.04/M	->
334	30 Oct 1973	M	4.620	0.879	7867.12	6915.200	-0.16/M	<<-
335	3 Nov 1973	M	4.460	0.834	7046.40	5876.700	0.20/M	->>
336	7 Nov 1973	M	4.440	0.975	5568.41	5429.200	0.41/M	->>>>
337	10 Nov 1973	M	3.930	0.879	5934.58	5216.500	0.02/M	-
338	13 Nov 1973	M	3.640	0.773	5725.23	4425.600	0.17/M	->>
339	17 Nov 1973	M	3.920	0.806	6418.11	5173.000	0.03/M	->
340	24 Nov 1973	M	3.760	0.786	5834.73	4586.100	0.20/M	->>
341	27 Nov 1973	M	3.540	0.738	5279.00	3895.900	0.39/M	->>>>
342	1 Dec 1973	M	4.060	0.805	6221.86	5008.600	0.26/M	->>>
343	4 Dec 1973	M	3.860	0.743	6287.48	4671.600	0.25/M	->>>
344	8 Dec 1973	M	3.300	0.781	5436.49	4245.900	-0.06/M	<-
345	11 Dec 1973	M	3.040	0.735	5039.32	3703.900	0.00/M	-
346	14 Dec 1973	M	2.880	0.647	4788.41	3098.100	0.24/M	->>>
347	18 Dec 1973	M	2.720	0.649	4590.45	2979.200	0.16/M	->>
348	21 Dec 1973	M	2.600	0.677	3964.99	2684.300	0.25/M	->>>
349	25 Dec 1973	M	2.480	0.655	3746.26	2453.800	0.30/M	->>>
350	1 Jan 1974	N	2.260	0.662	3817.52	2527.200	0.00/N	-
351	4 Jan 1974	N	2.180	0.607	3761.45	2283.200	0.09/N	->
352	8 Jan 1974	N	2.100	0.576	3616.84	2083.300	0.14/N	->>
353	11 Jan 1974	N	2.050	0.464	4723.71	2191.800	0.02/N	-
354	15 Jan 1974	N	1.970	0.462	4375.76	2021.600	0.06/N	->
355	18 Jan 1974	N	1.950	0.442	4350.90	1923.100	0.11/N	->
356	22 Jan 1974	N	1.860	0.435	4303.45	1872.000	0.05/N	->
357	25 Jan 1974	N	1.830	0.409	4271.64	1747.100	0.11/N	->
358	29 Jan 1974	N	1.800	0.399	4118.80	1643.400	0.16/N	->>
359	1 Feb 1974	N	1.780	0.418	4381.58	1831.500	0.00/N	-
360	5 Feb 1974	N	1.730	0.394	4262.18	1679.300	0.06/N	->

River gaugings for station 13402 : Mekong at Mukdahan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
361	8 Feb 1974	N	1.700	0.374	4152.14	1552.900	0.13/N	->>
362	15 Feb 1974	N	1.580	0.367	4209.26	1544.800	0.01/N	-
363	19 Feb 1974	N	1.560	0.352	4215.62	1483.900	0.04/N	->
364	21 Feb 1974	N	1.540	0.355	4119.16	1462.300	0.04/N	->
365	1 Mar 1974	N	1.480	0.357	3922.41	1400.300	0.03/N	->
366	5 Mar 1974	N	1.430	0.334	3927.55	1311.800	0.04/N	->
367	12 Mar 1974	N	1.360	0.341	3696.19	1260.400	0.02/N	-
368	15 Mar 1974	N	1.340	0.325	3683.69	1197.200	0.05/N	->
369	19 Mar 1974	N	1.310	0.319	3692.48	1177.900	0.03/N	->
370	22 Mar 1974	N	1.300	0.328	3690.24	1210.400	-0.00/N	-
371	3 Apr 1974	N	1.390	0.343	3761.81	1290.300	0.02/N	->
372	9 Apr 1974	N	1.380	0.359	3720.06	1335.500	-0.02/N	<-
373	12 Apr 1974	N	1.450	0.365	4026.03	1469.500	-0.06/N	<-
374	15 Apr 1974	N	1.600	0.391	4226.34	1652.500	-0.05/N	<-
375	18 Apr 1974	N	1.670	0.387	4202.58	1626.400	0.04/N	->
376	23 Apr 1974	N	1.550	0.413	3987.17	1646.700	-0.09/N	<-
377	26 Apr 1974	N	1.520	0.384	4051.04	1555.600	-0.05/N	<-
378	30 Apr 1974	N	1.450	0.318	3997.80	1271.300	0.10/N	->
379	3 May 1974	N	1.550	0.405	4155.80	1683.100	-0.12/N	<-
380	6 May 1974	N	1.860	0.460	4626.30	2128.100	-0.13/N	<<-
381	10 May 1974	N	2.060	0.465	4909.68	2283.000	-0.03/N	<-
382	14 May 1974	N	1.840	0.439	4530.98	1989.100	-0.05/N	<-
383	17 May 1974	N	1.730	0.411	4492.94	1846.600	-0.06/N	<-
384	21 May 1974	N	1.750	0.434	4531.34	1966.600	-0.12/N	<<-
385	24 May 1974	N	1.900	0.450	4861.78	2187.800	-0.13/N	<<-
386	28 May 1974	N	2.020	0.450	5031.11	2264.000	-0.06/N	<-
387	4 Jun 1974	?	3.020	0.500	5297.40	2648.700	0.68/N	->>>>
388	7 Jun 1974	N	3.050	0.571	6074.08	3468.300	0.20/N	->>
389	11 Jun 1974	N	3.390	0.629	6372.50	4008.300	0.22/N	->>
390	14 Jun 1974	N	3.500	0.637	6699.37	4267.500	0.18/N	->>
391	18 Jun 1974	N	6.220	0.920	9967.94	9170.501	0.40/N	->>>>
392	21 Jun 1974	N	5.370	0.911	8897.15	8105.300	0.05/N	->
393	25 Jun 1974	N	4.750	0.831	8017.21	6662.300	0.14/N	->>
394	27 Jun 1974	N	4.560	0.847	7645.45	6475.700	0.05/N	->
395	3 Jul 1974	N	3.820	0.697	6842.32	4769.100	0.21/N	->>
396	5 Jul 1974	N	3.860	0.743	6955.32	5167.800	0.04/N	->
397	9 Jul 1974	N	6.290	1.027	9890.55	10157.600	0.02/N	->
398	12 Jul 1974	N	5.730	0.966	8992.86	8687.100	0.14/N	->>
399	16 Jul 1974	N	5.320	0.937	8743.54	8192.701	-0.04/N	<-
400	19 Jul 1974	N	4.800	0.809	7765.64	6282.400	0.39/N	->>>>
401	23 Jul 1974	N	6.900	1.123	10925.38	12269.201	-0.30/N	<<<-
402	26 Jul 1974	N	8.500	1.333	12919.58	17221.800	-0.71/N	<<<<-
403	30 Jul 1974	N	7.800	1.155	12449.09	14378.701	-0.28/N	<<<-
404	2 Aug 1974	N	7.460	1.110	11789.28	13086.101	-0.08/N	<-
405	6 Aug 1974	N	7.730	1.155	12138.79	14020.301	-0.20/N	<<-
406	9 Aug 1974	N	7.610	1.179	11853.44	13975.200	-0.30/N	<<<-
407	13 Aug 1974	N	8.290	1.204	13324.25	16042.402	-0.46/N	<<<<-
408	27 Aug 1974	N	11.020	1.453	14204.61	20639.300	0.51/N	->>>>
409	30 Aug 1974	N	11.420	1.580	14393.99	22742.499	0.14/N	->>
410	3 Sep 1974	N	11.880	1.604	15423.32	24739.000	-0.11/N	<-
411	6 Sep 1974	N	11.740	1.607	15304.98	24595.099	-0.20/N	<<-
412	10 Sep 1974	N	11.380	1.587	15235.92	24179.400	-0.41/N	<<<<-
413	13 Sep 1974	N	10.540	1.535	13995.51	21483.099	-0.28/N	<<<-
414	17 Sep 1974	N	9.640	1.427	12562.79	17927.099	0.15/N	->>
415	20 Sep 1974	N	9.140	1.455	12125.29	17642.301	-0.24/N	<<<-
416	24 Sep 1974	N	8.190	1.292	10629.88	13733.801	0.38/N	->>>>
417	27 Sep 1974	N	7.480	1.229	9940.52	12216.901	0.31/N	->>>
418	30 Sep 1974	N	7.150	1.257	9434.61	11859.301	0.13/N	->>
419	4 Oct 1974	N	7.040	1.223	9327.88	11408.001	0.22/N	->>
420	8 Oct 1974	N	6.790	1.198	9086.48	10885.600	0.20/N	->>

River gaugings for station 13402 : Mekong at Mukdahan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
421	11 Oct 1974	N	6.300	1.182	8368.70	9891.800	0.15/N	->>
422	15 Oct 1974	N	5.940	1.168	7917.81	9248.000	0.09/N	->
423	18 Oct 1974	N	5.310	1.164	6869.33	7995.900	0.05/N	->
424	22 Oct 1974	N	4.720	1.086	6190.05	6722.400	0.08/N	->
425	25 Oct 1974	N	4.280	1.031	5797.67	5977.400	0.03/N	->
426	29 Oct 1974	N	3.920	0.849	5460.54	4636.000	0.39/N	->>>>
427	1 Nov 1974	N	3.760	0.957	5157.47	4935.700	0.06/N	->
428	4 Nov 1974	N	3.620	0.907	4900.99	4445.200	0.20/N	->>
429	7 Nov 1974	N	3.780	0.807	6769.76	5463.200	-0.20/N	<<-
430	11 Nov 1974	N	4.500	0.868	7638.82	6630.500	-0.09/N	<-
431	14 Nov 1974	N	3.910	0.827	6937.61	5737.400	-0.22/N	<<-
432	18 Nov 1974	N	3.420	0.787	6377.89	5019.400	-0.32/N	<<<<-
433	21 Nov 1974	N	3.440	0.800	6324.00	5059.200	-0.32/N	<<<<-
434	25 Nov 1974	N	3.570	0.787	6490.09	5107.700	-0.22/N	<<<-
435	28 Nov 1974	N	3.340	0.737	6175.98	4551.700	-0.14/N	<<-
436	2 Dec 1974	N	2.990	0.682	5627.13	3837.700	-0.08/N	<-
437	5 Dec 1974	N	2.780	0.621	5335.43	3313.300	0.02/N	->
438	9 Dec 1974	N	2.600	0.599	5173.96	3099.200	-0.03/N	<-
439	12 Dec 1974	N	2.480	0.600	4916.67	2950.000	-0.05/N	<-
440	16 Dec 1974	N	2.340	0.596	4870.80	2903.000	-0.16/N	<<-
441	17 Dec 1974	N	2.270	0.600	4789.83	2873.900	-0.21/N	<<-
442	23 Dec 1974	N	2.120	0.569	4675.04	2660.100	-0.23/N	<<<-
443	26 Dec 1974	N	2.060	0.551	4627.59	2549.800	-0.21/N	<<-
444	6 Jan 1975	O	1.860	0.502	4491.22	2254.590	-0.04/O	<-
445	9 Jan 1975	O	1.850	0.484	4481.78	2169.180	0.01/O	-
446	13 Jan 1975	O	1.830	0.487	4411.44	2148.370	0.01/O	-
447	16 Jan 1975	O	1.830	0.494	4377.45	2162.460	0.00/O	-
448	20 Jan 1975	O	1.910	0.520	4539.94	2360.770	-0.07/O	<-
449	23 Jan 1975	O	2.340	0.598	4899.51	2929.910	-0.06/O	<-
450	27 Jan 1975	O	2.090	0.577	4763.41	2748.490	-0.18/O	<<-
451	30 Jan 1975	O	1.920	0.509	4576.95	2329.670	-0.04/O	<-
452	6 Feb 1975	O	1.720	0.428	4277.45	1830.750	0.15/O	->>
453	10 Feb 1975	O	1.610	0.481	3570.19	1717.260	0.14/O	->>
454	13 Feb 1975	O	1.560	0.423	4089.29	1729.770	0.08/O	->
455	17 Feb 1975	O	1.520	0.446	3980.99	1775.520	-0.00/O	-
456	20 Feb 1975	O	1.470	0.413	4001.40	1652.580	0.05/O	->
457	24 Feb 1975	O	1.420	0.403	3856.10	1554.010	0.08/O	->
458	27 Feb 1975	O	1.420	0.432	3870.09	1671.880	-0.02/O	-
459	10 Mar 1975	O	1.370	0.371	3855.36	1430.340	0.14/O	->>
460	13 Mar 1975	O	1.330	0.370	3876.46	1434.290	0.10/O	->
461	17 Mar 1975	O	1.280	0.389	3848.30	1496.990	-0.01/O	-
462	20 Mar 1975	O	1.260	0.374	3635.45	1359.660	0.09/O	->
463	24 Mar 1975	O	1.220	0.368	3508.97	1291.300	0.11/O	->
464	27 Mar 1975	O	1.210	0.375	3466.96	1300.110	0.09/O	->
465	31 Mar 1975	O	1.170	0.376	3415.19	1284.110	0.07/O	->
466	4 Apr 1975	O	1.200	0.382	3662.12	1398.930	-0.00/O	-
467	10 Apr 1975	O	1.150	0.347	3540.35	1228.500	0.10/O	->
468	14 Apr 1975	O	1.200	0.378	3608.89	1364.160	0.03/O	->
469	17 Apr 1975	O	1.220	0.392	3666.86	1437.410	-0.02/O	-
470	21 Apr 1975	O	1.170	0.371	3556.44	1319.440	0.04/O	->
471	24 Apr 1975	O	1.190	0.373	3486.30	1300.390	0.07/O	->
472	28 Apr 1975	O	1.330	0.413	3912.88	1616.020	-0.06/O	<-
473	1 May 1975	O	1.380	0.415	4002.31	1660.960	-0.05/O	<-
474	5 May 1975	O	1.420	0.420	3834.21	1610.370	0.03/O	->
475	8 May 1975	O	1.290	0.380	3715.82	1412.010	0.08/O	->
476	12 May 1975	O	1.290	0.384	3762.76	1444.900	0.05/O	->
477	15 May 1975	O	1.500	0.462	4049.26	1870.760	-0.10/O	<-
478	19 May 1975	O	1.680	0.492	4339.65	2135.110	-0.13/O	<<-
479	22 May 1975	O	1.880	0.515	4596.27	2367.080	-0.11/O	<-
480	26 May 1975	O	2.020	0.515	4698.78	2419.870	-0.01/O	-

River gaugings for station 13402 : Mekong at Mukdahan

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
481	29 May 1975	O	2.200	0.525	5118.78	2687.360	-0.02/O	<-
482	2 Jun 1975	O	2.480	0.633	5389.43	3411.510	-0.25/O	<<<-
483	5 Jun 1975	O	3.380	0.730	6491.71	4738.950	-0.20/O	<<-
484	9 Jun 1975	O	4.610	0.856	8180.96	7002.900	-0.27/O	<<<-
485	12 Jun 1975	O	4.690	0.866	8267.93	7160.030	-0.27/O	<<<-
486	16 Jun 1975	O	4.620	0.821	7723.53	6341.020	0.11/O	->
487	19 Jun 1975	O	4.680	0.811	8090.80	6561.640	0.04/O	->
488	23 Jun 1975	O	6.920	1.111	9463.55	10514.000	0.25/O	->>>
489	26 Jun 1975	O	6.990	1.152	9593.39	11051.590	0.06/O	->
490	30 Jun 1975	O	6.880	1.153	9055.37	10440.840	0.25/O	->>>
491	3 Jul 1975	O	6.100	1.149	8038.75	9236.520	0.06/O	->
492	7 Jul 1975	O	5.360	1.002	7551.60	7566.700	0.18/O	->>
493	10 Jul 1975	O	5.740	1.106	7928.87	8769.330	-0.07/O	<-
494	14 Jul 1975	O	6.060	1.100	8186.61	9005.270	0.13/O	->>
495	17 Jul 1975	O	7.430	1.180	9921.71	11707.620	0.19/O	->>
496	21 Jul 1975	O	7.920	1.248	10394.83	12972.751	0.10/O	->
497	24 Jul 1975	O	8.780	1.372	11766.74	16143.970	-0.43/O	<<<<-
498	14 Jul 1987	Q	4.380	0.981	7043.83	6910.000	-0.08/Q	<-
499	21 Jul 1987	Q	5.740	1.060	9559.43	10133.000	-0.14/Q	<<-
500	28 Jul 1987	Q	4.760	1.004	7717.13	7748.000	-0.09/Q	<-
501	4 Aug 1987	Q	7.040	1.165	11693.56	13623.000	-0.20/Q	<<-
502	11 Aug 1987	?	5.680	0.797	9037.64	7203.000	1.08/Q	->>>>
503	18 Aug 1987	Q	7.560	1.241	11730.86	14558.000	-0.02/Q	-
504	25 Aug 1987	Q	11.180	1.380	18115.94	25000.000	0.23/Q	->>>
505	1 Sep 1987	Q	10.530	1.491	16531.19	24648.000	-0.32/Q	<<<-
506	8 Sep 1987	?	8.950	1.068	14431.65	15413.001	1.07/Q	->>>>
507	18 Sep 1987	Q	7.380	1.135	11394.71	12933.000	0.40/Q	->>>>
508	22 Sep 1987	Q	7.000	1.220	11242.62	13716.001	-0.27/Q	<<<-
509	2 Oct 1987	Q	7.440	1.162	12128.23	14093.001	0.03/Q	->
510	13 Oct 1987	Q	6.340	1.087	9917.20	10780.000	0.20/Q	->>
511	20 Oct 1987	Q	5.450	1.052	8678.71	9130.001	-0.01/Q	-
512	27 Oct 1987	Q	4.400	0.963	6812.05	6560.000	0.11/Q	->
513	10 Nov 1987	Q	3.390	0.836	5285.89	4419.000	0.21/Q	->>
514	24 Nov 1987	Q	3.420	0.885	5632.77	4985.000	-0.07/Q	<-
515	8 Dec 1987	Q	2.700	0.851	4488.84	3820.000	-0.13/Q	<<-
516	23 Dec 1987	Q	2.220	0.752	3710.11	2790.000	0.03/Q	->

C.9.10 Station 13801 - Khong Chiam

Figure C9.10.1 shows the number of gaugings per year from 1960 to 1987. Figure C9.10.2 shows the spread of gaugings obtained at this station and the average rating curve. There is constant shifting of the rating at this station which affects the rating over the whole range of stages. The problem is greatest, in terms of percentage error in flow, at low stages.

The seven rating equations fitted to river gaugings from this station are shown in Figure C9.10.3.

Figures C9.10.4a to C9.10.4i show the individual ratings fitted. In many cases these plots show a high degree of rating instability at low flows, even within individual years. Note the few medium and flood gaugings available for rating D (Figure C9.10.4d). The final form of rating D is discussed below.

Gauging History - 013801 Khong Chiam

Year	Gauging numbers	Number of gaugings	Rating letter	Shifts (Y=yes)	Fitting method	
1965	1 - 6	6				
1966	7 - 123	117	A	Y	3	*
1967	124 - 236	113	B	Y	1	
1968		0	C		3	
1969	237 - 300	64	D	Y	3,9	*
1970#		0	E		3	
1972	301 - 383	83	F	Y	4	*
1973	384 - 476	93	G	Y	1	
1974	477 - 563	87	H	Y	1	
1975	564 - 601	38	I	Y	1	
1976#		0	J		3	
	Total =	601				

= and subsequent years

Dubious gaugings (HYDATA flag ?) - None
Rare flood gaugings (HYDATA flag +) - None

Observed stage range 1.02 metres to 17.77 metres
Gauged stage range 1.04 metres to 15.58 metres

See Section C.9.1 for description of the table

* Notes on special fitting :

Rating A . A weighted fitting technique (3) was used to give a better fit at high flows obtained.

Rating D . Only a few medium flow gaugings available for this rating because gauging stopped in June 1969. A weighted fit was used to get a better fit to the few flood gaugings. In order to get a realistic upper part to the rating, the upper part of rating B was used above 5 metres with the parameter "c" calculated to give intersection of the two curves at 5 metres.

Rating F . There were indications of a loop rating during this period. In order to obtain a rating which was consistent with other ratings the exponent "b" was fixed the mean of the exponents of earlier, non modified, ratings A and B. The mean exponent was 1.95.

Rating equations - 13801 Mekong at Khong Chiam

Rating Letter	Rating Date	Parameters (a, c, b)	Maximum Stage
A	from 1 Jan 1965	$Q = 38.038\ (h + 4.550)^{2.348}$	20.00 m
B	from 1 Jan 1967	$Q = 515.357\ (h + 0.880)^{1.545}$	20.00 m
C	from 1 Jan 1968	$Q = 68.976\ (h + 3.760)^{2.181}$	20.00 m
D	from 1 Jan 1969	$Q = 110.711\ (h + 2.360)^{2.173}$ $Q = 515.357\ (h + 1.120)^{1.545}$	5.00 m 20.00 m
E	from 1 Jan 1970	$Q = 68.976\ (h + 3.760)^{2.181}$	20.00 m
F	from 1 Jan 1972	$Q = 120.000\ (h + 3.550)^{1.950}$	20.00 m
G	from 1 Jan 1973	$Q = 568.424\ (h + 0.960)^{1.515}$	20.00 m
H	from 1 Jan 1974	$Q = 153.600\ (h + 2.300)^{1.971}$	20.00 m
I	from 1 Jan 1975	$Q = 942.293\ (h + 0.070)^{1.321}$	20.00 m
J	from 1 Jan 1976	$Q = 68.976\ (h + 3.760)^{2.181}$	20.00 m

Ratings C,E and J are the average rating

Number of gaugings per year

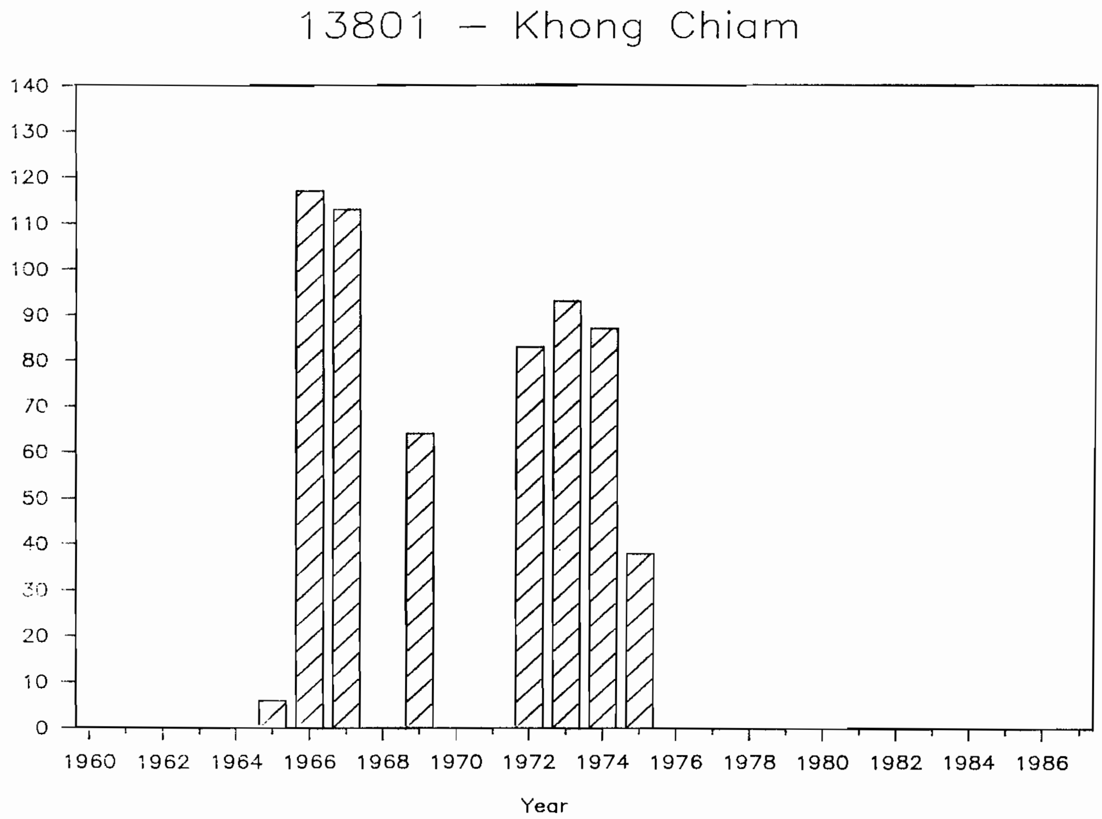


Figure C9.10.1

Rating equations

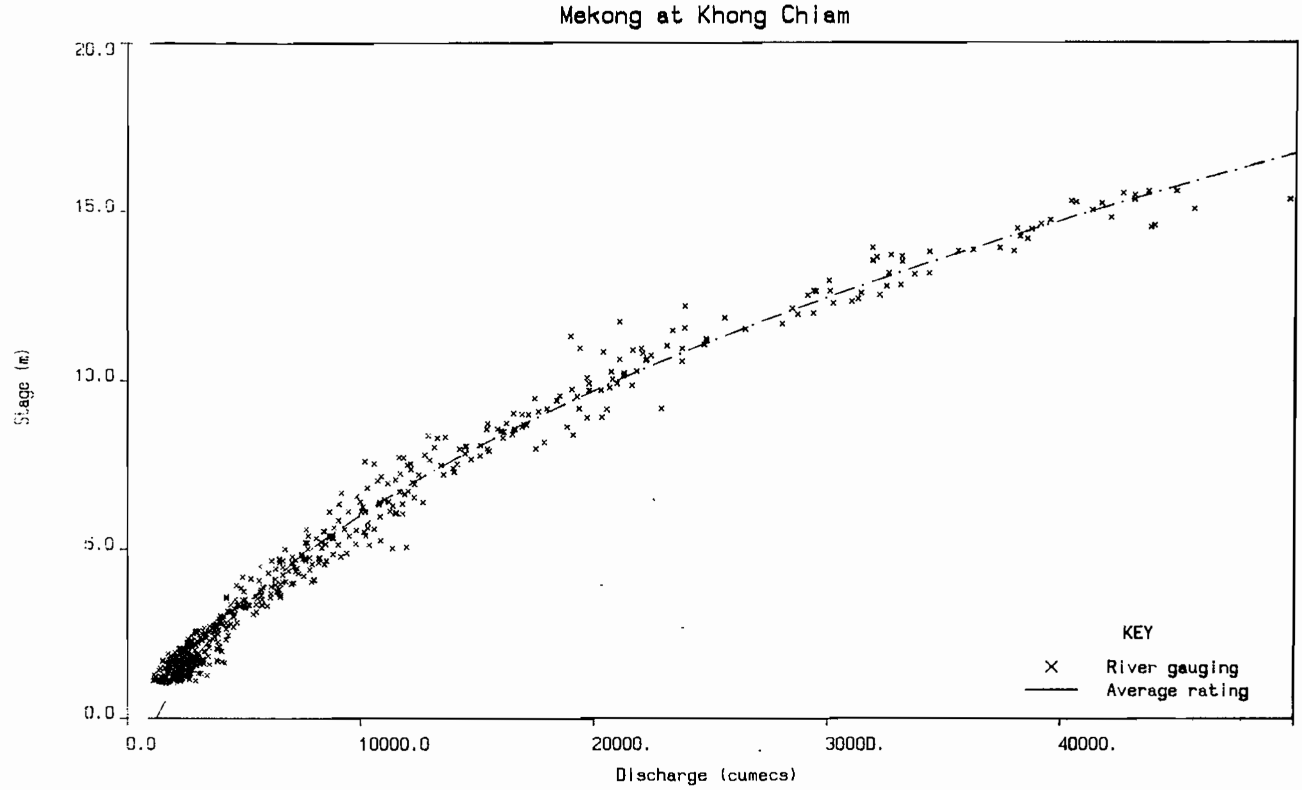


Figure C9.10.2

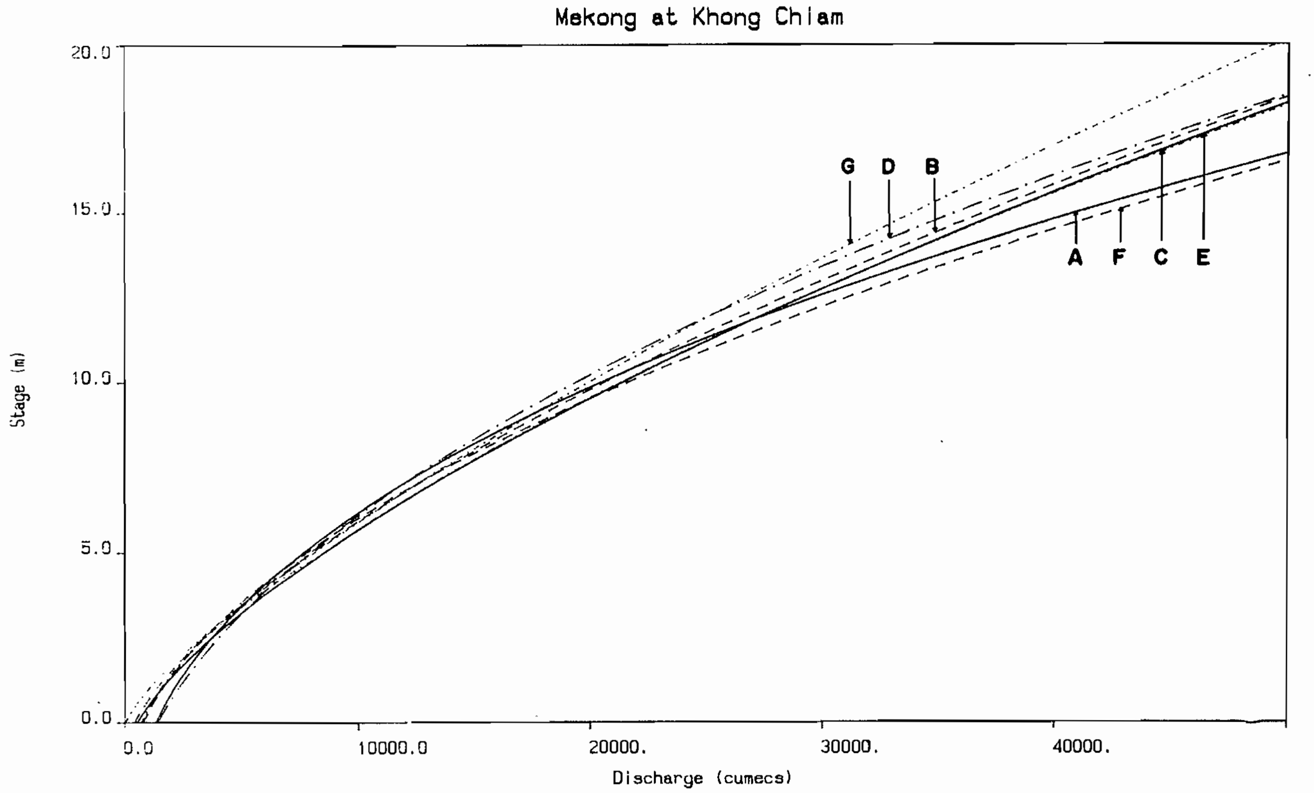


Figure C9.10.3

Rating equations

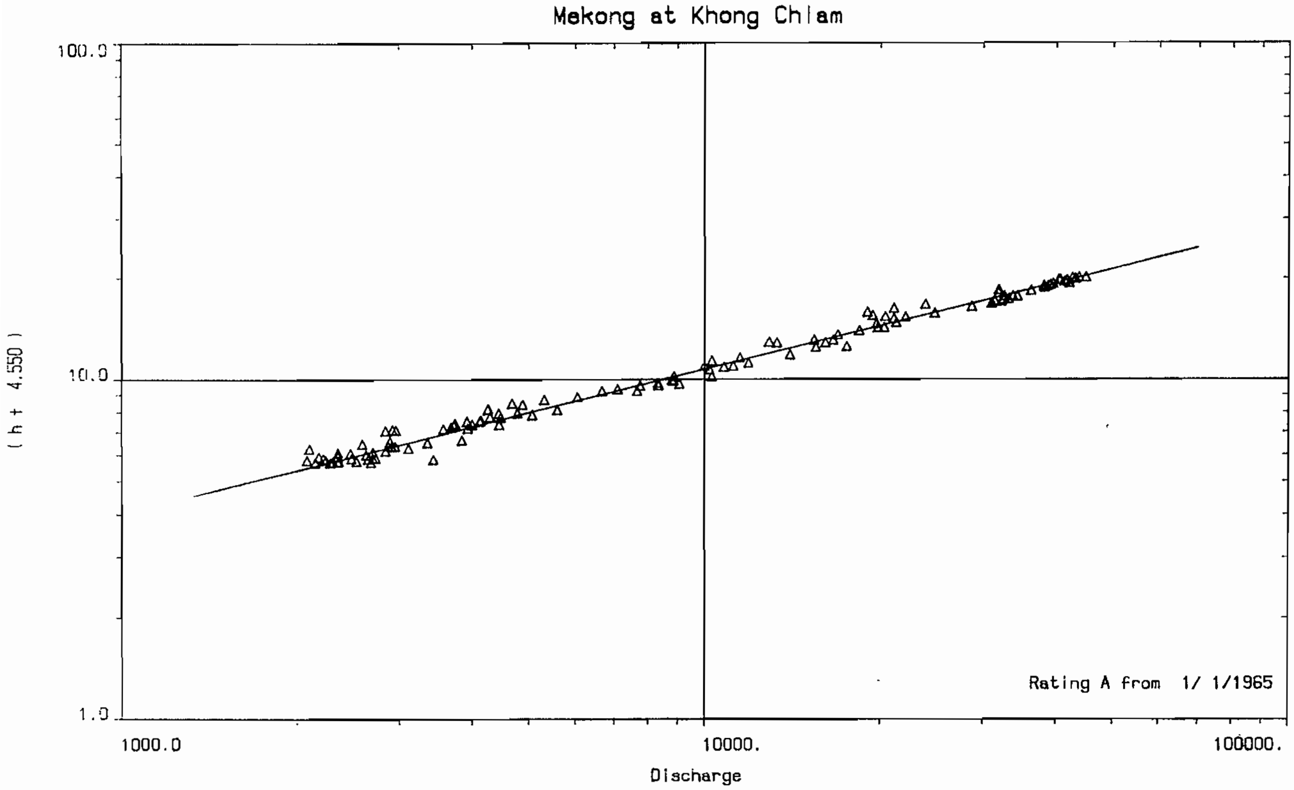


Figure C9.10.4a

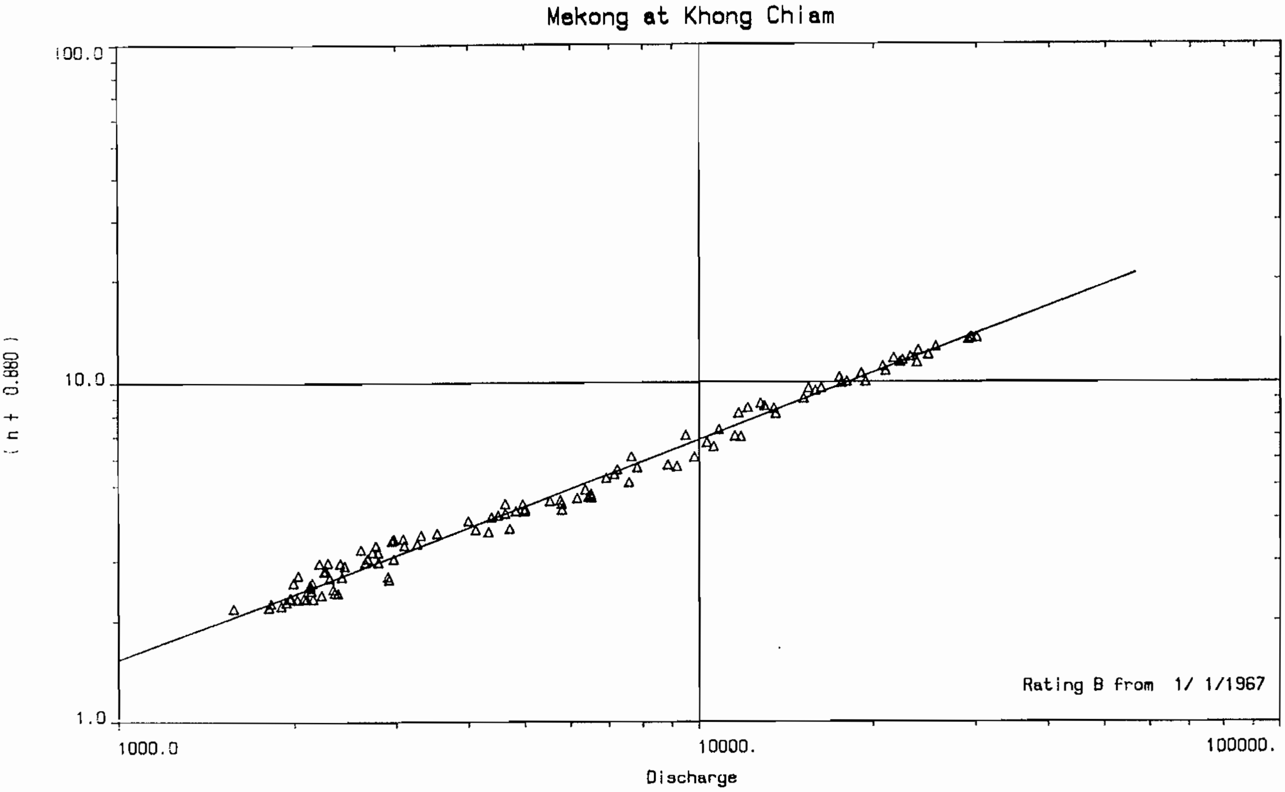


Figure C9.10.4b

Rating equations

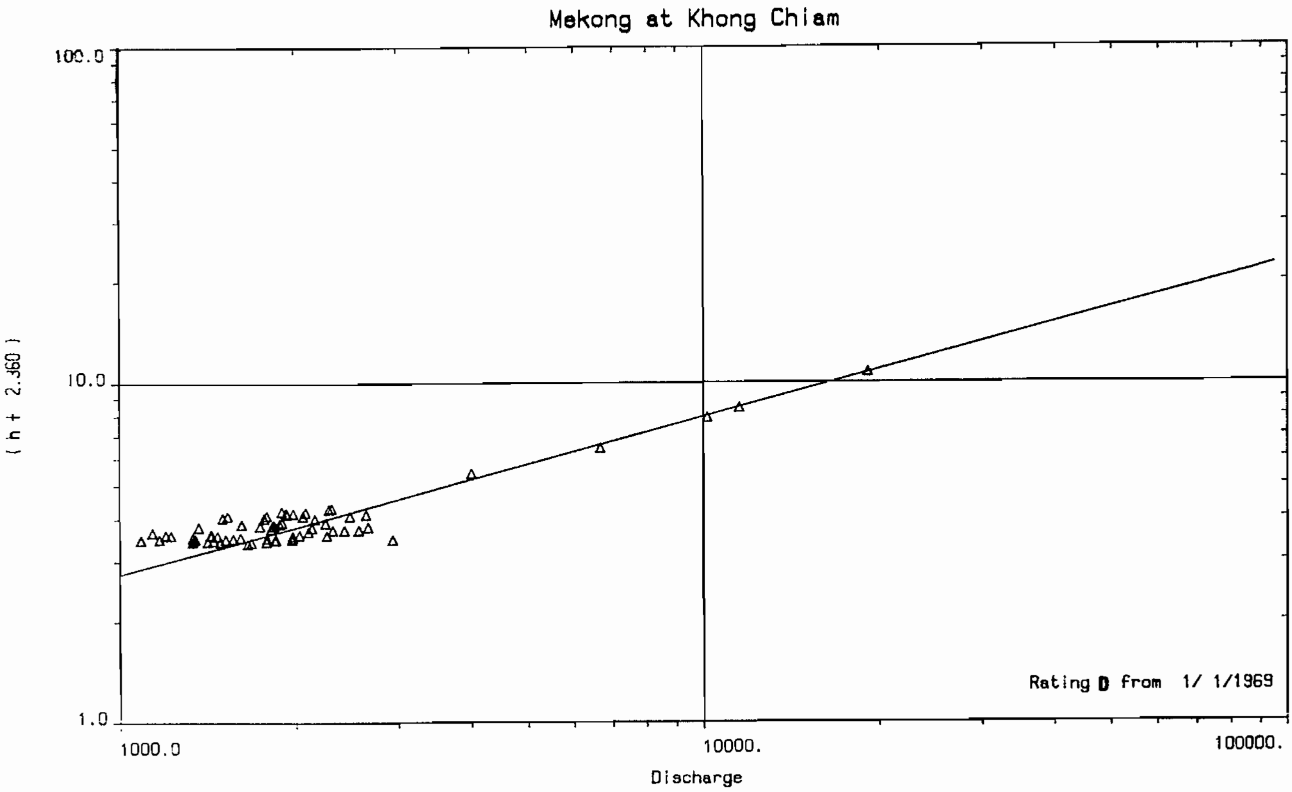


Figure C9.10.4d

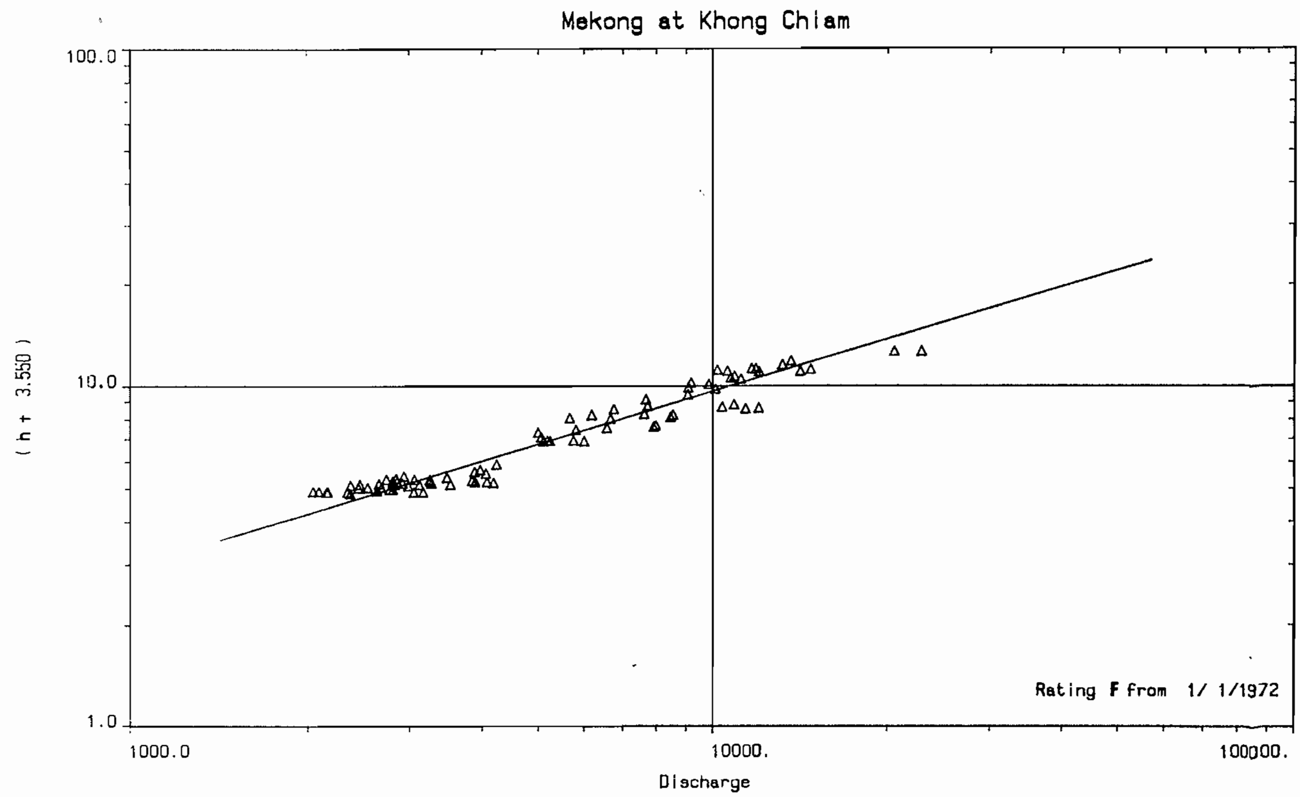


Figure C9.10.4f

Rating equations

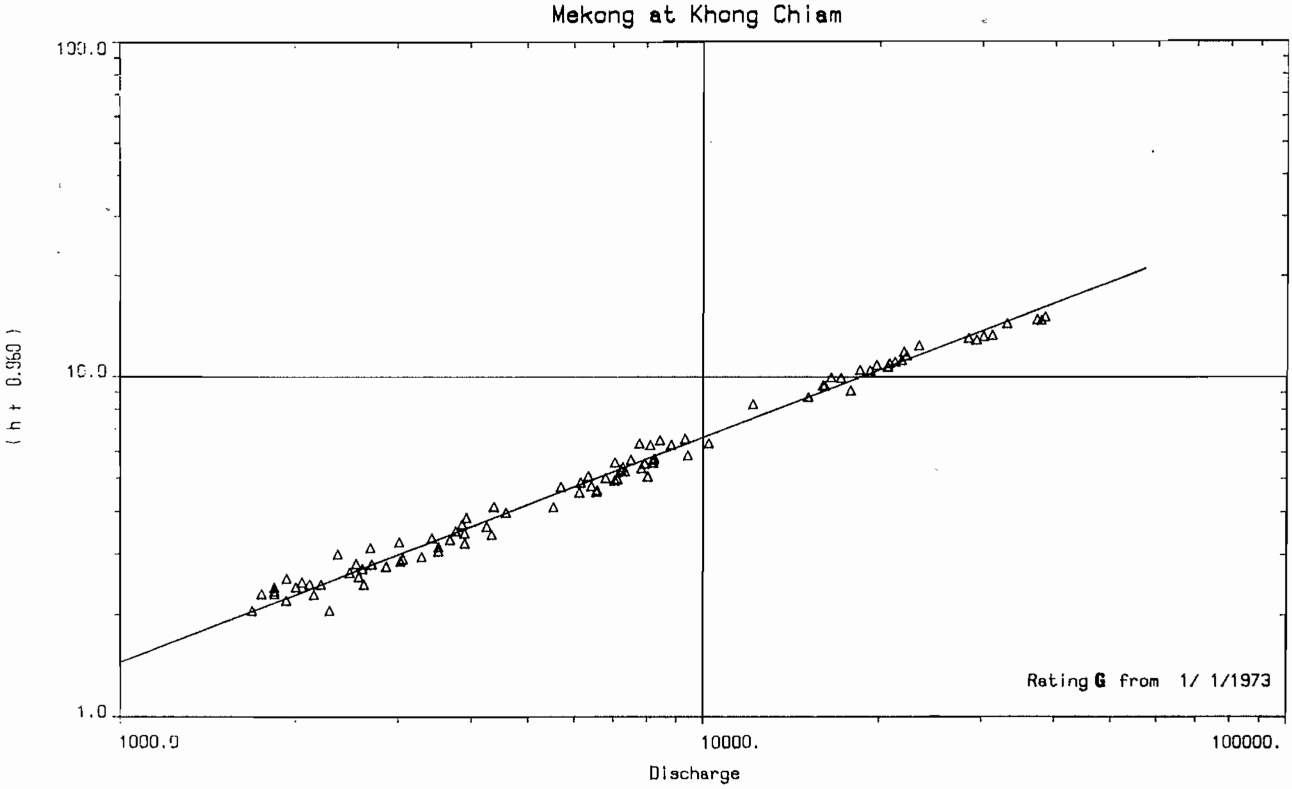


Figure C9.10.4g

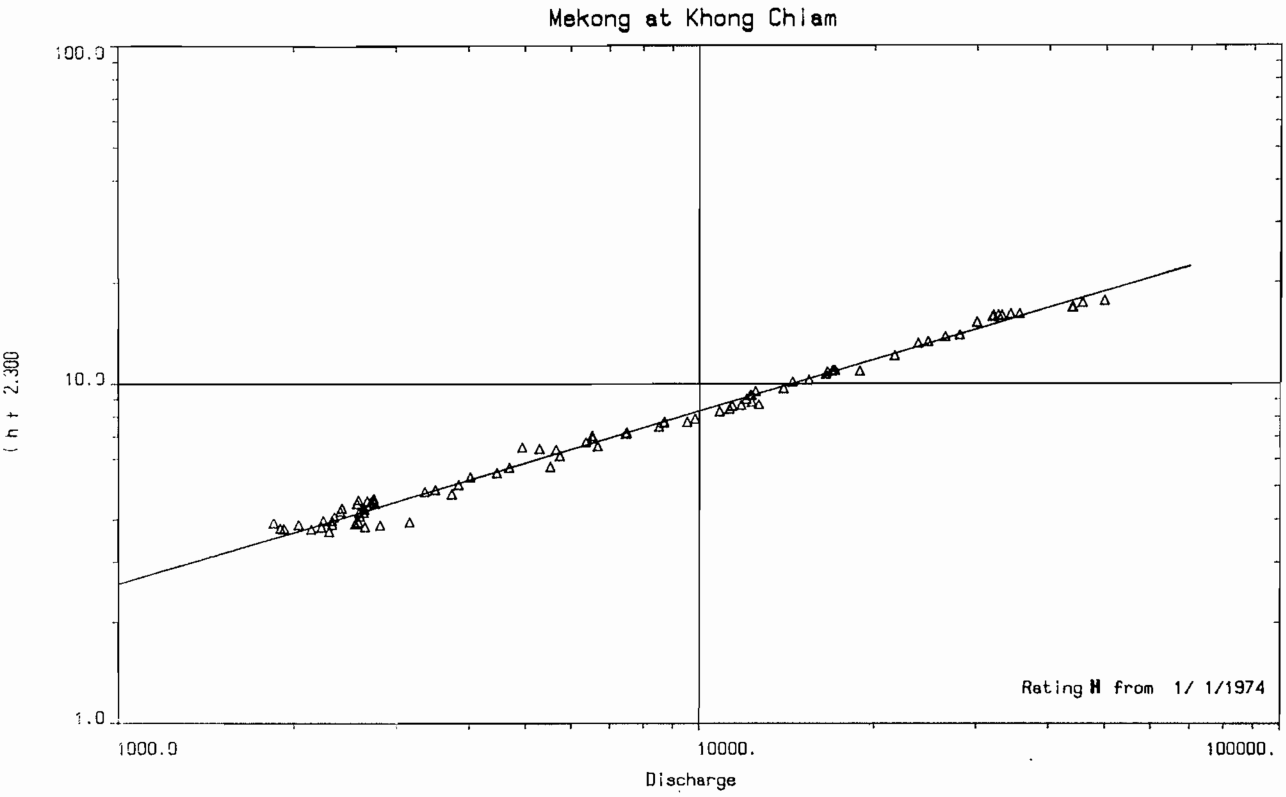


Figure C9.10.4h

Rating equations

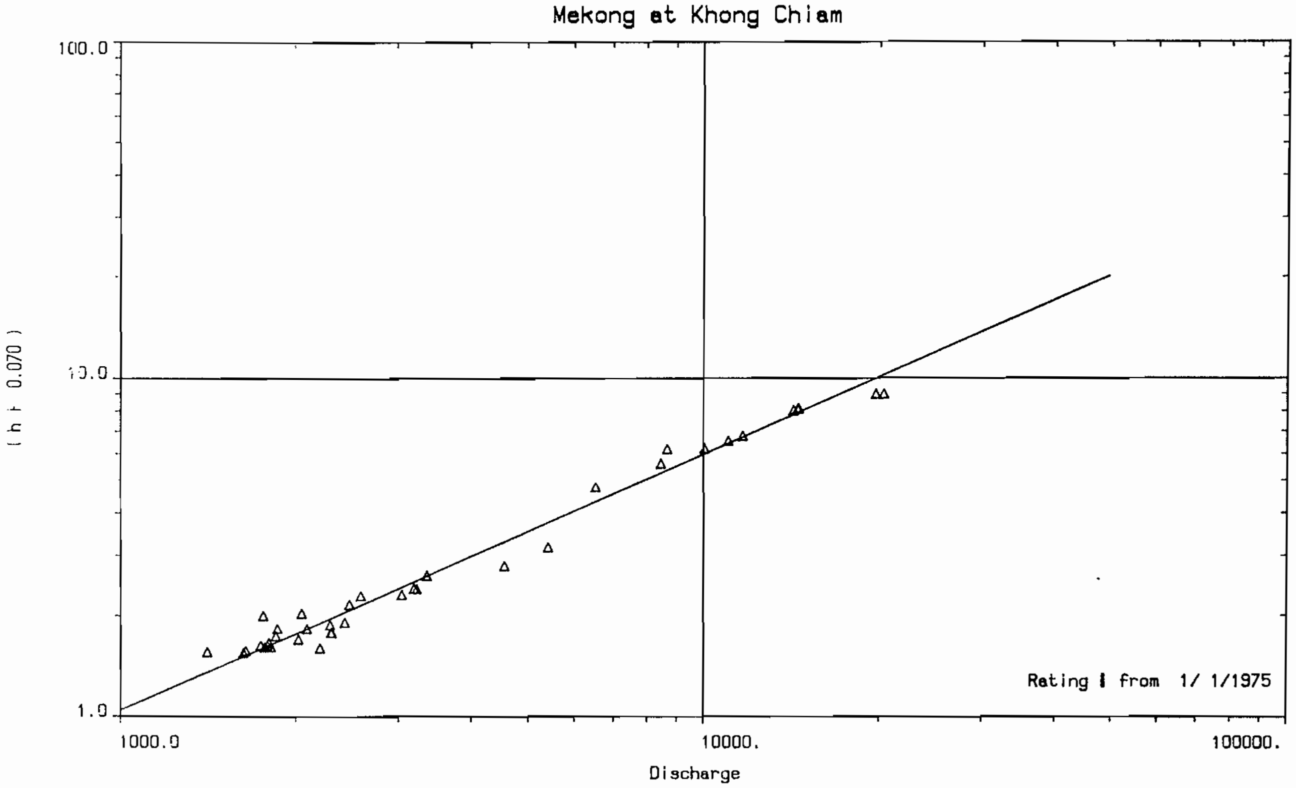


Figure C9.10.4i

River gaugings for station 13801 : Mekong at Khong Chiam

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
1	11 Nov 1965	A	7.290	1.320	10606.06	14000.001	-0.54/A	<<<<-
2	15 Dec 1965	A	2.980	0.432	9074.07	3920.000	0.33/A	->>>>
3	18 Dec 1965	A	2.820	0.511	8708.41	4450.000	-0.23/A	<<<-
4	24 Dec 1965	A	2.820	0.409	9779.95	4000.000	0.11/A	->
5	28 Dec 1965	A	3.300	0.499	10160.32	5070.000	-0.19/A	<<-
6	31 Dec 1965	A	3.570	0.601	9301.17	5590.000	-0.26/A	<<<-
7	19 Jan 1966	A	2.080	0.431	8909.51	3840.000	-0.51/A	<<<<-
8	21 Jan 1966	A	2.030	0.335	8626.86	2890.000	0.26/A	->>>
9	23 Jan 1966	A	1.980	0.380	8815.79	3350.000	-0.21/A	<<-
10	25 Jan 1966	A	1.920	0.302	8576.16	2590.000	0.43/A	->>>>
11	3 Feb 1966	A	1.820	0.335	8686.57	2910.000	0.03/A	->
12	17 Feb 1966	A	1.620	0.370	7675.68	2840.000	-0.11/A	<-
13	19 Feb 1966	A	1.580	0.297	9090.91	2700.000	-0.01/A	-
14	21 Feb 1966	A	1.550	0.273	8608.06	2350.000	0.31/A	->>>
15	24 Feb 1966	A	1.520	0.281	8790.04	2470.000	0.15/A	->>
16	7 Mar 1966	A	1.460	0.294	8945.58	2630.000	-0.07/A	<-
17	13 Mar 1966	A	1.390	0.278	8453.24	2350.000	0.15/A	->>
18	15 Mar 1966	A	1.330	0.290	9413.79	2730.000	-0.29/A	<<<-
19	17 Mar 1966	A	1.310	0.285	8701.75	2480.000	-0.07/A	<-
20	19 Mar 1966	A	1.330	0.307	8794.79	2700.000	-0.26/A	<<<-
21	21 Mar 1966	A	1.290	0.312	8493.59	2650.000	-0.26/A	<<<-
22	26 Mar 1966	A	1.280	0.394	8705.58	3430.000	-0.97/A	<<<<-
23	29 Mar 1966	A	1.200	0.273	9267.40	2530.000	-0.23/A	<<<-
24	1 Apr 1966	A	1.150	0.216	9953.70	2150.000	0.12/A	->>
25	4 Apr 1966	A	1.160	0.285	9403.51	2680.000	-0.41/A	<<<<-
26	7 Apr 1966	A	1.180	0.248	9274.19	2300.000	-0.01/A	-
27	9 Apr 1966	A	1.170	0.245	9591.84	2350.000	-0.07/A	<-
28	14 Apr 1966	A	1.150	0.236	9661.02	2280.000	-0.02/A	-
29	17 Apr 1966	A	1.200	0.273	8644.69	2360.000	-0.05/A	<-
30	20 Apr 1966	A	1.240	0.274	8175.18	2240.000	0.12/A	->
31	28 Apr 1966	A	1.310	0.244	9098.36	2220.000	0.21/A	->>
32	1 May 1966	A	1.240	0.231	9004.33	2080.000	0.29/A	->>>
33	5 May 1966	A	1.380	0.237	9198.31	2180.000	0.32/A	->>>>
34	8 May 1966	A	1.710	0.316	6645.57	2100.000	0.74/A	->>>>
35	10 May 1966	A	2.640	0.388	10128.86	3930.000	-0.02/A	-
36	13 May 1966	A	1.840	0.291	9862.54	2870.000	0.08/A	->
37	17 May 1966	A	1.740	0.310	10032.26	3110.000	-0.24/A	<<<-
38	20 May 1966	A	1.820	0.304	9703.95	2950.000	-0.01/A	-
39	23 May 1966	A	3.180	0.426	10516.43	4480.000	0.11/A	->
40	26 May 1966	A	3.950	0.447	10469.80	4680.000	0.73/A	->>>>
41	1 Jun 1966	A	4.160	0.494	10748.99	5310.000	0.51/A	->>>>
42	5 Jun 1966	A	4.800	0.646	10975.23	7090.000	0.08/A	->
43	9 Jun 1966	A	5.030	0.676	11464.50	7750.000	-0.05/A	<-
44	12 Jun 1966	A	5.060	0.734	11362.40	8340.001	-0.32/A	<<<<-
45	15 Jun 1966	A	4.690	0.687	11149.93	7660.000	-0.34/A	<<<<-
46	19 Jun 1966	A	5.350	0.741	11943.32	8850.001	-0.29/A	<<<-
47	22 Jun 1966	A	5.150	0.794	11410.58	9060.000	-0.59/A	<<<<-
48	25 Jun 1966	A	5.650	0.870	11839.08	10300.000	-0.67/A	<<<<-
49	14 Jul 1966	A	7.980	1.297	13492.67	17499.999	-1.09/A	<<<<-
50	18 Jul 1966	A	7.910	1.155	13419.91	15500.000	-0.47/A	<<<<-
51	20 Jul 1966	A	8.300	1.182	13620.98	16100.001	-0.29/A	<<<-
52	21 Jul 1966	A	8.540	1.237	13419.56	16599.999	-0.23/A	<<<-
53	23 Jul 1966	A	9.700	1.451	13990.35	20299.999	-0.26/A	<<<-
54	24 Jul 1966	A	10.200	1.514	14068.69	21299.999	-0.06/A	<-
55	25 Jul 1966	A	10.780	1.519	14549.04	22100.000	0.29/A	->>>
56	26 Jul 1966	A	10.820	1.396	14613.18	20399.999	0.83/A	->>>>
57	29 Jul 1966	A	10.060	1.383	14244.40	19699.999	0.29/A	->>>
58	1 Aug 1966	A	9.400	1.321	13928.84	18400.000	0.04/A	->
59	2 Aug 1966	A	9.000	1.238	13651.05	16899.999	0.13/A	->>
60	4 Aug 1966	A	9.700	1.412	14022.66	19799.999	-0.10/A	<-

River gaugings for station 13801 : Mekong at Khong Chiam

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
61	5 Aug 1966	A	10.600	1.459	14461.96	21099.999	0.40/A	->>>>
62	6 Aug 1966	A	11.200	1.678	14779.50	24799.999	-0.05/A	<-
63	7 Aug 1966	A	11.920	1.894	15153.11	28700.000	-0.34/A	<<<<-
64	8 Aug 1966	A	12.310	2.020	15346.54	31000.000	-0.51/A	<<<<-
65	9 Aug 1966	A	12.800	2.121	15605.85	33100.000	-0.52/A	<<<<-
66	10 Aug 1966	A	12.750	2.149	15123.31	32499.998	-0.43/A	<<<<-
67	14 Aug 1966	A	12.560	2.027	15490.87	31400.001	-0.36/A	<<<<-
68	19 Aug 1966	A	12.500	2.084	15451.05	32199.999	-0.61/A	<<<<-
69	24 Aug 1966	A	13.140	2.209	15527.39	34299.999	-0.45/A	<<<<-
70	25 Aug 1966	A	13.160	2.105	15486.94	32600.000	-0.04/A	<-
71	27 Aug 1966	A	13.120	2.176	15487.13	33700.001	-0.33/A	<<<<-
72	31 Aug 1966	A	13.840	2.274	15919.09	36199.998	-0.17/A	<<-
73	2 Sep 1966	A	14.240	2.368	16131.76	38199.999	-0.20/A	<<-
74	3 Sep 1966	A	14.460	2.408	16071.43	38699.999	-0.09/A	<-
75	5 Sep 1966	A	14.610	2.403	16271.33	39100.000	-0.02/A	<-
76	7 Sep 1966	A	14.480	2.340	16282.05	38100.001	0.06/A	->
77	8 Sep 1966	A	14.800	2.557	16464.61	42100.000	-0.44/A	<<<<-
78	9 Sep 1966	A	15.250	2.433	16687.22	40599.998	0.31/A	->>>
79	10 Sep 1966	A	15.580	2.549	17143.98	43700.000	0.02/A	-
80	11 Sep 1966	A	15.460	2.522	17089.61	43099.999	0.02/A	-
81	12 Sep 1966	A	15.280	2.374	17017.69	40400.001	0.38/A	->>>>
82	13 Sep 1966	A	15.220	2.400	17375.00	41699.999	0.06/A	->
83	14 Sep 1966	A	15.330	2.528	17049.05	43099.999	-0.11/A	<-
84	16 Sep 1966	A	15.520	2.478	17191.28	42599.999	0.18/A	->>
85	17 Sep 1966	A	15.580	2.607	17222.86	44900.000	-0.21/A	<<-
86	20 Sep 1966	A	15.020	2.433	16974.93	41299.998	-0.06/A	<-
87	21 Sep 1966	A	14.720	2.358	16751.49	39500.001	0.01/A	-
88	23 Sep 1966	A	13.900	1.952	16342.21	31900.000	0.86/A	->>>>
89	24 Sep 1966	A	13.520	1.979	16119.25	31900.000	0.48/A	->>>>
90	27 Sep 1966	A	12.160	1.549	15429.31	23899.999	1.16/A	->>>>
91	28 Sep 1966	A	11.710	1.385	15234.66	21099.999	1.51/A	->>>>
92	29 Sep 1966	A	11.290	1.269	14972.42	18999.999	1.74/A	->>>>
93	30 Sep 1966	A	10.930	1.312	14786.59	19400.000	1.25/A	->>>>
94	7 Oct 1966	A	8.370	0.965	13367.88	12900.000	0.96/A	->>>>
95	9 Oct 1966	A	8.300	0.991	13420.79	13300.000	0.73/A	->>>>
96	12 Oct 1966	A	8.560	1.143	13473.32	15400.001	0.21/A	->>
97	19 Oct 1966	A	7.060	0.916	12554.58	11500.000	0.22/A	->>>
98	22 Oct 1966	A	6.420	0.826	12106.54	10000.000	0.24/A	->>>
99	24 Oct 1966	A	6.340	0.902	11973.39	10800.000	-0.20/A	<<-
100	26 Oct 1966	A	6.640	0.950	12526.32	11900.000	-0.37/A	<<<<-
101	28 Oct 1966	A	6.820	0.834	12350.12	10300.000	0.50/A	->>>>
102	30 Oct 1966	A	6.420	0.925	12108.11	11200.001	-0.29/A	<<<-
103	31 Oct 1966	A	6.140	0.847	12042.50	10200.001	-0.13/A	<<-
104	3 Nov 1966	A	5.660	0.761	11655.72	8870.000	0.01/A	-
105	5 Nov 1966	A	5.420	0.763	11533.42	8800.001	-0.19/A	<<-
106	8 Nov 1966	A	5.230	0.728	11428.57	8320.000	-0.14/A	<<-
107	12 Nov 1966	A	4.680	0.603	11061.36	6670.000	0.20/A	->>
108	16 Nov 1966	A	4.320	0.555	10900.90	6050.000	0.21/A	->>
109	24 Nov 1966	A	3.880	0.461	10585.68	4880.000	0.52/A	->>>>
110	28 Nov 1966	A	3.630	0.380	11210.53	4260.000	0.72/A	->>>>
111	30 Nov 1966	A	3.580	0.376	11303.19	4250.000	0.68/A	->>>>
112	1 Dec 1966	A	3.400	0.421	11353.92	4780.000	0.11/A	->
113	7 Dec 1966	A	3.390	0.398	11155.78	4440.000	0.35/A	->>>>
114	10 Dec 1966	A	3.200	0.389	11028.28	4290.000	0.27/A	->>>
115	13 Dec 1966	A	3.040	0.378	10952.38	4140.000	0.22/A	->>
116	16 Dec 1966	A	2.970	0.378	10899.47	4120.000	0.16/A	->>
117	19 Dec 1966	A	2.870	0.347	10778.10	3740.000	0.36/A	->>>>
118	21 Dec 1966	A	2.780	0.346	10751.45	3720.000	0.29/A	->>>
119	23 Dec 1966	A	2.700	0.345	10666.67	3680.000	0.24/A	->>>
120	25 Dec 1966	A	2.620	0.336	10625.00	3570.000	0.25/A	->>>

River gaugings for station 13801 : Mekong at Khong Chiam

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
121	27 Dec 1966	A	2.580	0.275	10618.18	2920.000	0.78/A	->>>>
122	29 Dec 1966	A	2.550	0.279	10609.32	2960.000	0.71/A	->>>>
123	31 Dec 1966	A	2.530	0.268	10597.01	2840.000	0.80/A	->>>>
124	3 Jan 1967	B	2.460	0.263	10509.51	2764.000	0.37/B	->>>>
125	5 Jan 1967	B	2.370	0.254	10248.03	2603.000	0.40/B	->>>>
126	8 Jan 1967	B	2.310	0.266	10244.36	2725.000	0.25/B	->>>
127	19 Jan 1967	B	2.100	0.281	9935.94	2792.000	-0.01/B	-
128	21 Jan 1967	B	2.100	0.267	9917.60	2648.000	0.10/B	->
129	23 Jan 1967	B	2.080	0.226	9756.64	2205.000	0.40/B	->>>>
130	27 Jan 1967	B	2.090	0.234	9752.14	2282.000	0.35/B	->>>>
131	30 Jan 1967	B	2.080	0.262	9145.04	2396.000	0.26/B	->>>
132	2 Feb 1967	B	1.940	0.230	9839.13	2263.000	0.21/B	->>
133	5 Feb 1967	B	1.850	0.280	7242.86	2028.000	0.30/B	->>>
134	8 Feb 1967	B	1.820	0.248	9729.84	2413.000	-0.02/B	-
135	13 Feb 1967	B	1.720	0.206	9665.05	1991.000	0.20/B	->>
136	19 Feb 1967	B	1.680	0.220	9668.18	2127.000	0.06/B	->
137	22 Feb 1967	B	1.670	0.220	9663.64	2126.000	0.05/B	->
138	25 Feb 1967	B	1.630	0.220	9654.55	2124.000	0.01/B	-
139	28 Feb 1967	B	1.580	0.224	9553.57	2140.000	-0.05/B	<-
140	2 Mar 1967	B	1.550	0.222	10563.06	2345.000	-0.24/B	<<<-
141	5 Mar 1967	B	1.540	0.226	10508.85	2375.000	-0.27/B	<<<-
142	9 Mar 1967	B	1.450	0.206	10446.60	2152.000	-0.19/B	<<-
143	12 Mar 1967	B	1.450	0.201	10432.84	2097.000	-0.15/B	<<-
144	15 Mar 1967	B	1.460	0.199	10427.14	2075.000	-0.12/B	<<-
145	21 Mar 1967	B	1.440	0.194	10417.53	2021.000	-0.10/B	<-
146	24 Mar 1967	B	1.460	0.188	10436.17	1962.000	-0.04/B	<-
147	28 Mar 1967	B	1.460	0.189	10428.57	1971.000	-0.04/B	<-
148	4 Apr 1967	B	1.340	0.192	9880.21	1897.000	-0.10/B	<-
149	14 Apr 1967	B	1.300	0.160	9837.50	1574.000	0.12/B	->>
150	16 Apr 1967	B	1.320	0.183	9868.85	1806.000	-0.05/B	<-
151	19 Apr 1967	B	1.400	0.195	9928.20	1936.000	-0.08/B	<-
152	22 Apr 1967	B	1.380	0.184	9896.74	1821.000	-0.00/B	-
153	26 Apr 1967	B	1.510	0.223	9982.06	2226.000	-0.19/B	<<-
154	29 Apr 1967	B	1.610	0.232	10051.72	2332.000	-0.17/B	<<-
155	5 May 1967	B	1.780	0.288	10118.05	2914.000	-0.41/B	<<<<-
156	8 May 1967	B	1.720	0.213	10065.73	2144.000	0.08/B	->
157	11 May 1967	B	1.800	0.227	10118.94	2297.000	0.05/B	->
158	16 May 1967	B	1.830	0.282	10280.14	2899.000	-0.35/B	<<<<-
159	20 May 1967	B	2.180	0.256	10445.31	2674.000	0.16/B	->>
160	23 May 1967	B	2.300	0.265	10524.53	2789.000	0.20/B	->>
161	26 May 1967	B	2.170	0.290	10227.59	2966.000	-0.05/B	<-
162	29 May 1967	B	2.030	0.241	10120.33	2439.000	0.17/B	->>
163	2 Jun 1967	B	1.920	0.220	10209.09	2246.000	0.21/B	->>
164	9 Jun 1967	B	5.180	0.790	12416.46	9809.001	-0.67/B	<<<<-
165	12 Jun 1967	B	6.070	0.894	13208.05	11808.000	-0.64/B	<<<<-
166	16 Jun 1967	B	4.870	0.730	12100.00	8833.001	-0.54/B	<<<<-
167	19 Jun 1967	B	4.810	0.770	11894.81	9159.001	-0.75/B	<<<<-
168	22 Jun 1967	B	4.230	0.650	11638.46	7565.000	-0.58/B	<<<<-
169	25 Jun 1967	B	3.760	0.550	11692.73	6431.000	-0.48/B	<<<<-
170	29 Jun 1967	B	3.540	0.430	10751.16	4623.000	0.28/B	->>>
171	2 Jul 1967	B	3.730	0.603	10802.65	6514.000	-0.56/B	<<<<-
172	6 Jul 1967	B	4.700	0.641	11254.29	7214.000	0.06/B	->
173	9 Jul 1967	B	4.510	0.640	11146.88	7134.000	-0.09/B	<-
174	23 Jul 1967	B	5.810	0.870	11850.57	10310.001	-0.26/B	<<<-
175	25 Jul 1967	B	5.620	0.910	11637.36	10590.001	-0.57/B	<<<<-
176	2 Aug 1967	B	9.160	1.630	11886.50	19374.999	-0.42/B	<<<<-
177	7 Aug 1967	B	7.650	1.160	11168.97	12956.000	0.47/B	->>>>
178	9 Aug 1967	B	7.220	1.230	11023.58	13559.000	-0.20/B	<<-
179	12 Aug 1967	B	7.540	1.090	11131.19	12133.000	0.69/B	->>>>
180	14 Aug 1967	B	6.100	1.070	10777.57	11532.001	-0.50/B	<<<<-

River gaugings for station 13801 : Mekong at Khong Chiam

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
181	16 Aug 1967	B	6.410	1.000	10817.00	10817.001	0.12/B	->
182	18 Aug 1967	B	7.490	1.180	11402.54	13455.000	0.11/B	->
183	21 Aug 1967	B	9.900	1.660	12645.18	20991.000	-0.24/B	<<<-
184	25 Aug 1967	B	10.540	1.870	12706.95	23761.999	-0.52/B	<<<<-
185	27 Aug 1967	B	10.720	1.740	12900.57	22447.000	0.09/B	->
186	29 Aug 1967	B	11.150	1.880	13214.89	24843.999	-0.26/B	<<<-
187	4 Sep 1967	B	9.080	1.460	12059.59	17607.000	0.13/B	->>
188	6 Sep 1967	B	8.560	1.340	11840.30	15866.000	0.25/B	->>>
189	8 Sep 1967	B	8.080	1.310	11555.72	15138.001	0.04/B	->
190	10 Sep 1967	B	8.730	1.370	11857.66	16245.001	0.28/B	->>>
191	12 Sep 1967	B	9.160	1.490	12065.77	17978.000	0.07/B	->
192	14 Sep 1967	B	9.730	1.550	12287.74	19045.999	0.27/B	->>>
193	16 Sep 1967	B	11.000	1.790	12925.70	23137.000	0.15/B	->>
194	18 Sep 1967	B	10.880	1.680	12892.86	21660.000	0.52/B	->>>>
195	20 Sep 1967	B	11.520	1.810	13191.16	23875.999	0.43/B	->>>>
196	22 Sep 1967	B	11.820	1.920	13326.04	25586.000	0.18/B	->>
197	24 Sep 1967	B	12.600	2.140	13774.77	29477.998	-0.24/B	<<<-
198	26 Sep 1967	B	12.620	2.180	13802.29	30088.999	-0.41/B	<<<<-
199	28 Sep 1967	B	12.620	2.130	13786.38	29365.000	-0.19/B	<<-
200	30 Sep 1967	B	12.480	2.260	12887.17	29124.999	-0.26/B	<<<-
201	6 Oct 1967	B	10.580	1.750	12698.86	22223.000	0.03/B	->
202	7 Oct 1967	B	10.240	1.660	12495.18	20742.000	0.19/B	->>
203	12 Oct 1967	B	9.460	1.440	12118.05	17450.000	0.57/B	->>>>
204	14 Oct 1967	B	8.720	1.310	11787.02	15441.000	0.57/B	->>>>
205	17 Oct 1967	B	7.800	1.130	11291.15	12759.001	0.70/B	->>>>
206	19 Oct 1967	B	7.250	1.060	11040.57	11703.000	0.58/B	->>>>
207	26 Oct 1967	B	6.140	0.901	10526.08	9484.000	0.43/B	->>>>
208	30 Oct 1967	B	5.210	0.749	10196.26	7637.000	0.36/B	->>>>
209	1 Nov 1967	B	4.770	0.701	11155.49	7820.000	-0.16/B	<<-
210	3 Nov 1967	B	4.380	0.629	10980.92	6907.000	-0.11/B	<-
211	8 Nov 1967	B	3.980	0.589	10784.38	6352.000	-0.22/B	<<<-
212	10 Nov 1967	B	3.840	0.606	10722.77	6498.000	-0.44/B	<<<<-
213	13 Nov 1967	B	3.630	0.520	10615.38	5520.000	-0.13/B	<<-
214	15 Nov 1967	B	3.550	0.546	10595.24	5785.000	-0.35/B	<<<<-
215	17 Nov 1967	B	3.530	0.468	10585.47	4954.000	0.08/B	->
216	20 Nov 1967	B	3.330	0.476	10481.09	4989.000	-0.14/B	<<-
217	22 Nov 1967	B	3.210	0.431	10429.23	4495.000	0.03/B	->
218	25 Nov 1967	B	3.390	0.476	10504.20	5000.000	-0.08/B	<-
219	28 Nov 1967	B	3.720	0.577	10663.78	6153.000	-0.38/B	<<<<-
220	30 Nov 1967	B	3.660	0.541	10639.56	5756.000	-0.23/B	<<<-
221	4 Dec 1967	B	3.370	0.554	10454.87	5792.000	-0.54/B	<<<<-
222	6 Dec 1967	B	3.330	0.462	10435.07	4821.000	-0.04/B	<-
223	7 Dec 1967	B	3.260	0.446	10367.71	4624.000	0.00/B	-
224	8 Dec 1967	B	3.160	0.424	10318.40	4375.000	0.05/B	->
225	9 Dec 1967	B	3.060	0.388	10286.08	3991.000	0.18/B	->>
226	12 Dec 1967	B	2.860	0.462	10186.15	4706.000	-0.45/B	<<<<-
227	13 Dec 1967	B	2.830	0.404	10170.79	4109.000	-0.12/B	<<-
228	14 Dec 1967	B	2.780	0.427	10131.15	4326.000	-0.30/B	<<<-
229	15 Dec 1967	B	2.750	0.348	10137.93	3528.000	0.16/B	->>
230	16 Dec 1967	B	2.700	0.328	10088.41	3309.000	0.25/B	->>>
231	18 Dec 1967	B	2.620	0.307	10035.83	3081.000	0.32/B	->>>
232	19 Dec 1967	B	2.610	0.296	10030.41	2969.000	0.38/B	->>>>
233	21 Dec 1967	B	2.590	0.295	10006.78	2952.000	0.38/B	->>>>
234	22 Dec 1967	B	2.570	0.296	9945.95	2944.000	0.36/B	->>>>
235	26 Dec 1967	B	2.500	0.327	9969.42	3260.000	0.08/B	->
236	29 Dec 1967	B	2.470	0.311	9951.77	3095.000	0.16/B	->>
237	6 Jan 1969	D	1.940	0.245	9412.91	2306.163	0.26/D	->>>
238	7 Jan 1969	D	1.920	0.244	9350.40	2281.497	0.26/D	->>>
239	10 Jan 1969	D	1.860	0.200	9461.10	1892.220	0.53/D	->>>>
240	13 Jan 1969	D	1.830	0.225	9244.41	2079.992	0.33/D	->>>>

River gaugings for station 13801 : Mekong at Khong Chiam

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
241	14 Jan 1969	D	1.810	0.205	9378.96	1922.687	0.45/D	->>>>
242	16 Jan 1969	D	1.800	0.208	9519.67	1980.092	0.39/D	->>>>
243	17 Jan 1969	D	1.780	0.207	9335.81	1932.513	0.41/D	->>>>
244	20 Jan 1969	D	1.740	0.195	9144.55	1783.187	0.51/D	->>>>
245	21 Jan 1969	D	1.730	0.219	9394.42	2057.378	0.25/D	->>>
246	23 Jan 1969	D	1.730	0.164	9329.48	1530.034	0.74/D	->>>>
247	24 Jan 1969	D	1.720	0.259	9574.33	2479.752	-0.10/D	<-
248	27 Jan 1969	D	1.680	0.164	9148.10	1500.288	0.72/D	->>>>
249	28 Jan 1969	D	1.670	0.196	9002.85	1764.559	0.45/D	->>>>
250	31 Jan 1969	D	1.650	0.232	9296.57	2156.805	0.09/D	->
251	4 Feb 1969	D	1.560	0.209	9063.67	1894.306	0.23/D	->>>
252	5 Feb 1969	D	1.540	0.245	9185.68	2250.491	-0.10/D	<-
253	6 Feb 1969	D	1.520	0.200	9379.55	1875.911	0.20/D	->>
254	7 Feb 1969	D	1.510	0.168	9610.83	1614.619	0.44/D	->>>>
255	10 Feb 1969	D	1.480	0.200	9182.92	1836.585	0.20/D	->>
256	13 Feb 1969	D	1.460	0.183	9492.42	1737.112	0.27/D	->>>
257	14 Feb 1969	D	1.460	0.195	9358.49	1824.905	0.19/D	->>
258	17 Feb 1969	D	1.430	0.146	9350.05	1365.107	0.61/D	->>>>
259	18 Feb 1969	D	1.430	0.297	8965.66	2662.800	-0.53/D	<<<<-
260	20 Feb 1969	D	1.420	0.230	9277.36	2133.792	-0.12/D	<<-
261	21 Feb 1969	D	1.400	0.195	9302.60	1814.007	0.14/D	->>
262	24 Feb 1969	D	1.360	0.261	9291.13	2424.985	-0.42/D	<<<<-
263	25 Feb 1969	D	1.360	0.276	9296.86	2565.933	-0.53/D	<<<<-
264	27 Feb 1969	D	1.320	0.225	9349.34	2103.602	-0.20/D	<<-
265	28 Feb 1969	D	1.300	0.127	8956.84	1137.519	0.74/D	->>>>
266	6 Mar 1969	D	1.240	0.132	9084.39	1199.140	0.61/D	->>>>
267	7 Mar 1969	D	1.240	0.226	8977.58	2028.932	-0.21/D	<<-
268	11 Mar 1969	D	1.230	0.260	8703.79	2262.985	-0.42/D	<<<<-
269	12 Mar 1969	D	1.230	0.141	8684.78	1224.554	0.57/D	->>>>
270	14 Mar 1969	D	1.240	0.157	9114.46	1430.971	0.35/D	->>>>
271	17 Mar 1969	D	1.180	0.151	8834.18	1333.961	0.40/D	->>>>
272	20 Mar 1969	D	1.150	0.173	9038.87	1563.724	0.13/D	->>
273	21 Mar 1969	D	1.140	0.132	8859.07	1169.397	0.54/D	->>>>
274	24 Mar 1969	D	1.140	0.170	8932.70	1518.559	0.16/D	->>
275	25 Mar 1969	D	1.140	0.148	9107.99	1347.982	0.34/D	->>>>
276	27 Mar 1969	D	1.140	0.224	8800.12	1971.228	-0.26/D	<<<-
277	29 Mar 1969	D	1.130	0.205	9030.20	1851.191	-0.17/D	<<-
278	1 Apr 1969	D	1.120	0.127	8565.44	1087.811	0.62/D	->>>>
279	2 Apr 1969	D	1.110	0.159	9101.50	1447.139	0.21/D	->>
280	7 Apr 1969	D	1.090	0.161	8783.21	1414.097	0.22/D	->>>
281	9 Apr 1969	D	1.080	0.149	8956.07	1334.454	0.30/D	->>>
282	17 Apr 1969	D	1.040	0.190	8717.14	1656.256	-0.07/D	<-
283	21 Apr 1969	D	1.060	0.185	9084.90	1680.707	-0.08/D	<-
284	22 Apr 1969	D	1.080	0.165	9012.01	1486.981	0.14/D	->>
285	29 Apr 1969	D	1.120	0.201	9162.25	1841.613	-0.17/D	<<-
286	2 May 1969	D	1.080	0.194	9188.25	1782.521	-0.15/D	<<-
287	5 May 1969	D	1.160	0.194	9207.56	1786.267	-0.08/D	<-
288	6 May 1969	D	1.180	0.176	9148.68	1610.168	0.11/D	->
289	8 May 1969	D	1.240	0.164	8763.25	1437.173	0.35/D	->>>>
290	10 May 1969	D	1.220	0.214	9228.97	1975.000	-0.19/D	<<-
291	13 May 1969	D	1.220	0.166	8857.50	1470.345	0.29/D	->>>
292	15 May 1969	D	1.160	0.223	8867.14	1977.372	-0.25/D	<<<-
293	21 May 1969	D	1.120	0.322	9113.11	2934.421	-1.04/D	<<<<-
294	28 May 1969	D	1.360	0.252	9190.71	2316.058	-0.33/D	<<<<-
295	30 May 1969	D	1.760	0.289	9140.45	2641.591	-0.19/D	<<-
296	7 Jun 1969	D	3.060	0.409	9787.98	4003.283	0.21/D	->>
297	9 Jun 1969	D	4.060	0.635	10486.05	6658.643	-0.17/D	<<-
298	13 Jun 1969	D	5.530	0.901	11269.61	10153.923	-0.23/D	<<<-
299	19 Jun 1969	D	6.070	0.996	11553.63	11507.414	-0.28/D	<<<-
300	21 Jun 1969	D	8.380	1.514	12624.95	19114.173	-0.87/D	<<<<-

River gaugings for station 13801 : Mekong at Khong Chiam

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
301	4 Jan 1972	F	2.350	0.377	11236.07	4236.000	-0.32/F	<<<-
302	11 Jan 1972	F	2.130	0.355	11177.46	3968.000	-0.33/F	<<<<-
303	17 Jan 1972	F	2.060	0.354	10966.10	3882.000	-0.34/F	<<<<-
304	20 Jan 1972	F	2.000	0.372	10908.60	4058.000	-0.53/F	<<<<-
305	25 Jan 1972	F	1.900	0.271	10830.26	2935.000	0.30/F	->>>
306	27 Jan 1972	F	1.850	0.331	10507.55	3478.000	-0.22/F	<<<-
307	31 Jan 1972	F	1.820	0.272	10463.23	2846.000	0.30/F	->>>
308	3 Feb 1972	F	1.780	0.319	10188.09	3250.000	-0.10/F	<-
309	5 Feb 1972	F	1.720	0.320	10175.00	3256.000	-0.16/F	<<-
310	10 Feb 1972	F	1.720	0.278	10089.93	2805.000	0.24/F	->>>
311	12 Feb 1972	F	1.690	0.386	10077.72	3890.000	-0.71/F	<<<<-
312	17 Feb 1972	F	1.650	0.293	9962.46	2919.000	0.06/F	->
313	19 Feb 1972	F	1.630	0.267	9940.08	2654.000	0.29/F	->>>
314	22 Feb 1972	F	1.610	0.249	9883.53	2461.000	0.45/F	->>>>
315	25 Feb 1972	F	1.640	0.328	9984.76	3275.000	-0.26/F	<<<-
316	28 Feb 1972	F	1.560	0.300	9940.00	2982.000	-0.08/F	<-
317	2 Mar 1972	F	1.490	0.248	9870.97	2448.000	0.35/F	->>>>
318	6 Mar 1972	F	1.430	0.290	9682.76	2808.000	-0.06/F	<-
319	10 Mar 1972	F	1.390	0.273	9655.68	2636.000	0.06/F	->
320	13 Mar 1972	F	1.360	0.220	9809.09	2158.000	0.51/F	->>>>
321	16 Mar 1972	F	1.380	0.208	9822.12	2043.000	0.65/F	->>>>
322	20 Mar 1972	F	1.380	0.213	9816.90	2091.000	0.60/F	->>>>
323	23 Mar 1972	F	1.350	0.240	9758.33	2342.000	0.31/F	->>>
324	27 Mar 1972	F	1.340	0.326	9714.72	3167.000	-0.47/F	<<<<-
325	30 Mar 1972	F	1.340	0.310	9838.71	3050.000	-0.37/F	<<<<-
326	13 Apr 1972	F	1.360	0.219	9894.98	2167.000	0.50/F	->>>>
327	17 Apr 1972	F	1.510	0.269	9962.82	2680.000	0.14/F	->>
328	20 Apr 1972	F	1.580	0.238	9970.59	2373.000	0.51/F	->>>>
329	24 Apr 1972	F	1.600	0.355	9932.39	3526.000	-0.51/F	<<<<-
330	26 Apr 1972	F	1.600	0.285	9933.33	2831.000	0.09/F	->
331	28 Apr 1972	F	1.500	0.259	9803.09	2539.000	0.27/F	->>>
332	3 May 1972	F	1.300	0.240	9870.83	2369.000	0.23/F	->>>
333	10 May 1972	F	1.440	0.277	10003.61	2771.000	-0.01/F	-
334	13 May 1972	F	1.700	0.283	10084.81	2854.000	0.17/F	->>
335	16 May 1972	F	1.740	0.380	10107.90	3841.000	-0.62/F	<<<<-
336	18 May 1972	F	1.660	0.416	10057.69	4184.000	-0.97/F	<<<<-
337	22 May 1972	F	1.600	0.313	9968.05	3120.000	-0.17/F	<<-
338	24 May 1972	F	1.690	0.405	10059.26	4074.000	-0.86/F	<<<<-
339	29 May 1972	F	1.790	0.304	10059.21	3058.000	0.08/F	->
340	31 May 1972	F	1.790	0.271	10095.94	2736.000	0.37/F	->>>>
341	5 Jun 1972	F	3.360	0.446	11443.95	5104.000	0.07/F	->
342	9 Jun 1972	F	4.520	0.527	10760.91	5671.000	0.85/F	->>>>
343	12 Jun 1972	F	4.120	0.711	11233.47	7987.000	-0.94/F	<<<<-
344	14 Jun 1972	F	5.280	0.933	11657.02	10876.001	-1.26/F	<<<<-
345	16 Jun 1972	F	5.140	0.892	11636.77	10380.001	-1.16/F	<<<<-
346	19 Jun 1972	F	4.680	0.744	11481.18	8542.001	-0.68/F	<<<<-
347	21 Jun 1972	F	4.000	0.592	11099.66	6571.000	-0.24/F	<<<-
348	23 Jun 1972	F	4.580	0.745	11353.02	8458.001	-0.74/F	<<<<-
349	26 Jun 1972	F	4.060	0.713	11095.37	7911.000	-0.96/F	<<<<-
350	28 Jun 1972	F	3.390	0.533	10789.87	5751.000	-0.33/F	<<<<-
351	30 Jun 1972	F	3.360	0.560	10721.43	6004.000	-0.53/F	<<<<-
352	3 Jul 1972	F	5.080	1.026	11682.26	11986.000	-1.97/F	<<<<-
353	5 Jul 1972	F	5.040	0.970	11724.74	11373.001	-1.73/F	<<<<-
354	8 Jul 1972	F	7.520	1.091	12958.75	14138.001	-0.47/F	<<<<-
355	10 Jul 1972	F	6.960	0.886	12611.74	11174.000	0.28/F	->>>
356	12 Jul 1972	F	6.270	0.805	12555.28	10107.000	0.11/F	->
357	14 Jul 1972	F	5.880	0.738	12273.71	9058.001	0.25/F	->>>
358	17 Jul 1972	F	6.580	0.780	12617.95	9842.001	0.55/F	->>>>
359	20 Jul 1972	F	7.670	1.122	13136.36	14739.000	-0.57/F	<<<<-
360	24 Jul 1972	F	9.140	1.419	14479.21	20545.999	-1.29/F	<<<<-

River gaugings for station 13801 : Mekong at Khong Chiam

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
361	26 Jul 1972	F	9.160	1.639	13967.05	22891.999	-2.06/F	<<<<-
362	22 Sep 1972	F	8.020	0.989	13308.39	13162.001	0.45/F	->>>>
363	26 Sep 1972	F	7.730	0.907	12850.05	11655.000	0.83/F	->>>>
364	28 Sep 1972	F	7.500	0.934	12860.81	12012.001	0.44/F	->>>>
365	2 Oct 1972	F	7.040	0.868	12368.66	10736.000	0.57/F	->>>>
366	6 Oct 1972	F	8.330	1.066	12780.49	13624.000	0.56/F	->>>>
367	13 Oct 1972	F	7.720	0.943	12566.28	11850.000	0.73/F	->>>>
368	16 Oct 1972	F	7.540	0.841	12599.29	10596.001	1.14/F	->>>>
369	18 Oct 1972	F	7.610	0.807	12625.77	10189.001	1.41/F	->>>>
370	25 Oct 1972	F	7.170	0.874	12470.25	10899.001	0.62/F	->>>>
371	30 Oct 1972	F	6.680	0.745	12323.49	9181.001	0.98/F	->>>>
372	2 Nov 1972	F	6.360	0.725	12525.52	9081.000	0.71/F	->>>>
373	6 Nov 1972	F	5.610	0.634	12107.26	7676.000	0.72/F	->>>>
374	9 Nov 1972	F	5.020	0.571	11831.87	6756.000	0.67/F	->>>>
375	20 Nov 1972	F	5.210	0.657	11761.03	7727.000	0.30/F	->>>
376	23 Nov 1972	F	4.680	0.542	11422.51	6191.000	0.67/F	->>>>
377	1 Dec 1972	F	3.780	0.452	11057.52	4998.000	0.56/F	->>>>
378	7 Dec 1972	F	3.910	0.524	11085.88	5809.000	0.15/F	->>
379	11 Dec 1972	F	4.750	0.670	11383.58	7627.000	-0.11/F	<-
380	14 Dec 1972	F	4.490	0.594	11228.96	6670.000	0.19/F	->>
381	20 Dec 1972	F	3.550	0.467	10830.83	5058.000	0.29/F	->>>
382	22 Dec 1972	F	3.390	0.482	10755.19	5184.000	0.04/F	->
383	26 Dec 1972	F	3.370	0.487	10767.97	5244.000	-0.02/F	-
384	5 Jan 1973	G	2.460	0.412	10532.28	4339.300	-0.39/G	<<<<-
385	8 Jan 1973	G	2.280	0.376	10373.40	3900.400	-0.33/G	<<<<-
386	11 Jan 1973	G	2.200	0.340	10335.00	3513.900	-0.17/G	<<-
387	15 Jan 1973	G	2.110	0.342	10280.41	3515.900	-0.26/G	<<<-
388	19 Jan 1973	G	2.000	0.322	10227.95	3293.400	-0.23/G	<<<-
389	22 Jan 1973	G	1.950	0.299	10224.41	3057.100	-0.13/G	<<-
390	25 Jan 1973	G	1.910	0.297	10193.60	3027.500	-0.15/G	<<-
391	29 Jan 1973	G	1.860	0.250	10158.00	2539.500	0.13/G	->>
392	1 Feb 1973	G	1.850	0.266	10156.77	2701.700	0.01/G	-
393	5 Feb 1973	G	1.810	0.283	10108.83	2860.800	-0.14/G	<<-
394	8 Feb 1973	G	1.770	0.253	10290.91	2603.600	-0.00/G	-
395	12 Feb 1973	G	1.630	0.192	13373.96	2567.800	-0.12/G	<-
396	15 Feb 1973	G	1.600	0.205	9414.15	1929.900	0.32/G	->>>
397	20 Feb 1973	G	1.540	0.260	7895.39	2052.800	0.17/G	->>
398	22 Feb 1973	G	1.500	0.210	12470.95	2618.900	-0.28/G	<<<-
399	24 Feb 1973	G	1.510	0.210	10072.38	2115.200	0.09/G	->
400	27 Feb 1973	G	1.460	0.200	10017.50	2003.500	0.12/G	->>
401	1 Mar 1973	G	1.450	0.183	10057.38	1840.500	0.24/G	->>>
402	5 Mar 1973	G	1.390	0.184	10003.80	1840.700	0.18/G	->>
403	8 Mar 1973	G	1.350	0.175	10533.72	1843.400	0.14/G	->>
404	12 Mar 1973	G	1.350	0.215	8145.58	1751.300	0.21/G	->>
405	15 Mar 1973	G	1.340	0.218	9866.51	2150.900	-0.11/G	<-
406	19 Mar 1973	G	1.500	0.218	10146.33	2211.900	0.01/G	-
407	9 Apr 1973	G	1.250	0.204	9454.41	1928.700	-0.03/G	<-
408	19 Apr 1973	G	1.100	0.244	9373.77	2287.200	-0.45/G	<<<<-
409	25 Apr 1973	G	1.100	0.178	9475.84	1686.700	0.01/G	-
410	9 May 1973	G	1.700	0.253	9788.14	2476.400	0.02/G	-
411	16 May 1973	G	2.040	0.240	9840.42	2361.700	0.44/G	->>>>
412	21 May 1973	G	2.400	0.339	10102.66	3424.800	0.09/G	->
413	24 May 1973	G	2.310	0.301	10005.98	3011.800	0.26/G	->>>
414	28 May 1973	G	2.180	0.269	9992.94	2688.100	0.35/G	->>>>
415	31 May 1973	G	2.360	0.365	10085.75	3681.300	-0.11/G	<-
416	4 Jun 1973	G	2.560	0.370	10170.54	3763.100	0.04/G	->
417	7 Jun 1973	G	2.510	0.386	10096.96	3898.200	-0.09/G	<-
418	11 Jun 1973	G	3.680	0.612	10738.40	6571.900	-0.39/G	<<<<-
419	14 Jun 1973	G	4.740	0.672	11178.87	7512.200	0.20/G	->>
420	20 Jun 1973	G	5.560	0.726	11608.26	8427.600	0.59/G	->>>>

River gaugings for station 13801 : Mekong at Khong Chiam

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
421	23 Jun 1973	G	5.420	0.882	11603.06	10233.901	-0.36/G	<<<<-
422	27 Jun 1973	G	4.640	0.639	11032.24	7049.600	0.33/G	->>>>
423	29 Jun 1973	G	4.590	0.719	11029.07	7929.900	-0.15/G	<<-
424	5 Jul 1973	G	4.120	0.744	10788.44	8026.600	-0.66/G	<<<<-
425	7 Jul 1973	G	4.420	0.716	10931.42	7826.900	-0.27/G	<<<-
426	11 Jul 1973	G	8.170	1.415	12620.71	17858.301	-0.60/G	<<<<-
427	13 Jul 1973	G	9.520	1.441	13374.88	19273.199	0.25/G	->>>
428	20 Jul 1973	G	9.900	1.465	13506.62	19787.199	0.45/G	->>>>
429	24 Jul 1973	G	8.990	1.311	13108.47	17185.199	0.46/G	->>>>
430	27 Jul 1973	G	8.480	1.252	12880.27	16126.100	0.34/G	->>>>
431	31 Jul 1973	G	7.770	1.208	12513.49	15116.301	0.01/G	-
432	10 Aug 1973	G	8.510	1.236	12959.71	16018.201	0.41/G	->>>>
433	14 Aug 1973	G	10.020	1.501	13851.56	20791.199	0.22/G	->>
434	17 Aug 1973	G	10.130	1.533	13870.45	21263.399	0.17/G	->>
435	21 Aug 1973	G	9.780	1.508	13706.37	20669.199	0.02/G	->
436	24 Aug 1973	G	10.260	1.573	13881.75	21836.000	0.11/G	->
437	28 Aug 1973	G	11.960	1.960	14985.46	29371.500	-0.60/G	<<<<-
438	31 Aug 1973	G	12.270	1.994	15151.66	30212.399	-0.54/G	<<<<-
439	4 Sep 1973	G	13.820	2.373	15989.89	37944.000	-1.23/G	<<<<-
440	7 Sep 1973	G	14.170	2.384	16162.96	38532.501	-1.04/G	<<<<-
441	11 Sep 1973	G	13.900	2.328	16037.46	37335.199	-0.98/G	<<<<-
442	14 Sep 1973	G	13.500	2.103	15767.43	33158.898	-0.18/G	<<-
443	18 Sep 1973	G	12.390	2.052	15241.42	31275.400	-0.74/G	<<<<-
444	21 Sep 1973	G	12.100	1.888	15075.79	28463.098	-0.18/G	<<-
445	25 Sep 1973	G	11.460	1.609	14533.93	23385.100	0.79/G	->>>>
446	28 Sep 1973	G	10.930	1.531	14388.44	22028.699	0.71/G	->>>>
447	2 Oct 1973	G	10.610	1.578	14111.15	22267.399	0.31/G	->>>
448	6 Oct 1973	G	9.540	1.361	13605.66	18517.300	0.53/G	->>>>
449	9 Oct 1973	G	9.020	1.238	13357.91	16537.100	0.73/G	->>>>
450	15 Oct 1973	G	7.370	0.966	12585.71	12157.800	0.78/G	->>>>
451	22 Oct 1973	G	5.610	0.782	11916.62	9318.800	0.23/G	->>>
452	25 Oct 1973	G	5.340	0.704	11520.45	8110.400	0.52/G	->>>>
453	29 Oct 1973	G	5.410	0.672	11559.67	7768.100	0.75/G	->>>>
454	31 Oct 1973	G	5.350	0.764	11537.30	8814.501	0.20/G	->>
455	2 Nov 1973	G	4.910	0.836	11261.12	9414.300	-0.51/G	<<<<-
456	5 Nov 1973	G	4.780	0.732	11267.35	8247.700	-0.10/G	<-
457	7 Nov 1973	G	4.740	0.730	11241.10	8206.000	-0.13/G	<<-
458	9 Nov 1973	G	4.370	0.651	11086.64	7217.400	-0.02/G	<-
459	12 Nov 1973	G	4.030	0.658	10820.21	7119.700	-0.31/G	<<<-
460	14 Nov 1973	G	4.070	0.627	10835.57	6793.900	-0.11/G	<-
461	16 Nov 1973	G	4.140	0.585	10842.22	6342.700	0.19/G	->>
462	19 Nov 1973	G	4.460	0.661	11005.60	7274.700	0.04/G	->
463	21 Nov 1973	G	4.630	0.741	11073.01	8205.100	-0.23/G	<<<-
464	23 Nov 1973	G	4.300	0.673	10901.78	7336.900	-0.15/G	<<-
465	26 Nov 1973	G	3.800	0.599	10718.70	6420.500	-0.19/G	<<-
466	28 Nov 1973	G	3.620	0.617	10622.69	6554.200	-0.44/G	<<<<-
467	30 Nov 1973	G	3.780	0.541	10529.20	5696.300	0.16/G	->>
468	3 Dec 1973	G	4.000	0.649	10852.70	7043.400	-0.31/G	<<<-
469	5 Dec 1973	G	3.920	0.569	10819.51	6156.300	0.06/G	->
470	7 Dec 1973	G	3.600	0.572	10710.49	6126.400	-0.24/G	<<<-
471	12 Dec 1973	G	3.190	0.415	10541.69	4374.800	0.30/G	->>>
472	14 Dec 1973	G	3.180	0.539	10275.51	5538.500	-0.35/G	<<<<-
473	17 Dec 1973	G	3.030	0.439	10450.11	4587.600	0.02/G	->
474	21 Dec 1973	G	2.890	0.376	10440.69	3925.700	0.27/G	->>>
475	25 Dec 1973	G	2.720	0.373	10345.31	3858.800	0.14/G	->>
476	28 Dec 1973	G	2.670	0.418	10177.99	4254.400	-0.15/G	<<-
477	3 Jan 1974	H	2.450	0.364	10257.97	3733.900	-0.30/H	<<<-
478	7 Jan 1974	H	2.310	0.272	10068.75	2738.700	0.30/H	->>>
479	10 Jan 1974	H	2.240	0.264	10107.20	2668.300	0.28/H	->>>
480	14 Jan 1974	H	2.160	0.258	9936.43	2563.600	0.29/H	->>>

River gaugings for station 13801 : Mekong at Khong Chiam

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
481	21 Jan 1974	H	2.030	0.243	9938.68	2415.100	0.28/H	->>>
482	24 Jan 1974	H	2.000	0.265	9957.74	2638.800	0.07/H	->
483	28 Jan 1974	H	1.910	0.265	9933.58	2632.400	-0.02/H	-
484	31 Jan 1974	H	1.900	0.262	9858.40	2582.900	0.01/H	-
485	6 Feb 1974	H	1.810	0.265	9777.74	2591.100	-0.08/H	<-
486	11 Feb 1974	H	1.650	0.322	9824.22	3163.400	-0.69/H	<<<<-
487	15 Feb 1974	H	1.560	0.287	9791.64	2810.200	-0.51/H	<<<<-
488	20 Feb 1974	H	1.600	0.259	9818.92	2543.100	-0.25/H	<<<-
489	25 Feb 1974	H	1.520	0.269	9831.60	2644.700	-0.42/H	<<<<-
490	27 Feb 1974	H	1.680	0.238	9747.48	2319.900	0.02/H	-
491	6 Mar 1974	H	1.580	0.238	9764.28	2323.900	-0.09/H	<-
492	11 Mar 1974	H	1.510	0.229	9716.16	2225.000	-0.07/H	<-
493	15 Mar 1974	H	1.460	0.220	9715.00	2137.300	-0.04/H	<-
494	20 Mar 1974	H	1.400	0.237	9683.12	2294.900	-0.24/H	<<<-
495	5 Apr 1974	H	1.480	0.198	9578.28	1896.500	0.20/H	->>
496	10 Apr 1974	H	1.470	0.201	9568.16	1923.200	0.17/H	->>
497	15 Apr 1974	H	1.620	0.191	9672.77	1847.500	0.39/H	->>>>
498	19 Apr 1974	H	1.780	0.241	9719.09	2342.300	0.10/H	->
499	24 Apr 1974	H	1.640	0.267	9643.82	2574.900	-0.24/H	<<<-
500	29 Apr 1974	H	1.680	0.231	9701.73	2241.100	0.08/H	->
501	3 May 1974	H	1.580	0.211	9647.39	2035.600	0.17/H	->>
502	9 May 1974	H	2.160	0.280	9823.93	2750.700	0.14/H	->>
503	11 May 1974	H	2.240	0.276	9932.61	2741.400	0.22/H	->>>
504	17 May 1974	H	1.940	0.244	9829.51	2398.400	0.21/H	->>
505	25 May 1974	H	2.220	0.273	9927.11	2710.100	0.23/H	->>>
506	29 May 1974	H	2.270	0.259	9941.70	2574.900	0.39/H	->>>>
507	5 Jun 1974	H	3.400	0.528	10467.42	5526.800	-0.46/H	<<<<-
508	7 Jun 1974	H	3.830	0.539	10648.05	5739.300	-0.15/H	<<-
509	13 Jun 1974	H	4.260	0.613	10875.86	6666.900	-0.21/H	<<-
510	17 Jun 1974	H	6.980	1.003	12196.51	12233.100	0.06/H	->
511	20 Jun 1974	H	6.730	0.995	12099.00	12038.501	-0.11/H	<-
512	22 Jun 1974	H	6.140	0.953	11821.51	11265.901	-0.40/H	<<<<-
513	8 Jul 1974	H	5.580	0.878	11193.62	9828.001	-0.37/H	<<<<-
514	9 Jul 1974	H	6.300	0.959	11869.76	11383.100	-0.29/H	<<<-
515	12 Jul 1974	H	6.360	0.991	11905.55	11798.401	-0.39/H	<<<<-
516	15 Jul 1974	H	5.410	0.850	11206.71	9525.701	-0.41/H	<<<<-
517	17 Jul 1974	H	5.370	0.775	11188.52	8671.100	-0.07/H	<-
518	19 Jul 1974	H	5.170	0.768	11083.59	8512.201	-0.20/H	<<-
519	23 Jul 1974	H	6.540	1.027	11981.50	12305.001	-0.40/H	<<<<-
520	26 Jul 1974	H	8.400	1.299	12705.39	16504.301	-0.03/H	<-
521	30 Jul 1974	H	8.700	1.325	12809.51	16972.599	0.12/H	->
522	6 Aug 1974	H	8.680	1.337	12792.90	17104.099	0.06/H	->
523	9 Aug 1974	H	8.620	1.326	12746.53	16901.899	0.06/H	->
524	13 Aug 1974	H	8.570	1.306	12702.68	16589.699	0.11/H	->
525	15 Aug 1974	H	10.920	1.713	13876.01	23769.599	0.31/H	->>>
526	15 Aug 1974	H	11.500	1.869	14169.45	26482.698	0.16/H	->>
527	16 Aug 1974	H	13.630	2.087	15370.20	32077.598	0.90/H	->>>>
528	17 Aug 1974	H	14.520	2.742	15973.81	43800.199	-0.78/H	<<<<-
529	19 Aug 1974	H	15.060	2.805	16272.76	45645.102	-0.62/H	<<<<-
530	20 Aug 1974	H	15.330	3.055	16286.91	49756.500	-1.15/H	<<<<-
531	23 Aug 1974	H	14.570	2.747	16004.04	43963.101	-0.77/H	<<<<-
532	27 Aug 1974	H	13.820	2.297	15480.93	35559.698	0.28/H	->>>
533	29 Aug 1974	H	13.700	2.118	15435.60	32692.599	0.82/H	->>>>
534	3 Sep 1974	H	13.790	2.216	15489.08	34323.799	0.53/H	->>>>
535	6 Sep 1974	H	13.660	2.150	15417.81	33148.300	0.68/H	->>>>
536	9 Sep 1974	H	13.530	2.080	15351.92	31931.999	0.83/H	->>>>
537	12 Sep 1974	H	12.930	2.000	15011.55	30023.100	0.70/H	->>>>
538	16 Sep 1974	H	11.660	1.954	14347.39	28034.800	-0.08/H	<-
539	19 Sep 1974	H	11.040	1.769	13978.63	24728.199	0.17/H	->>
540	23 Sep 1974	H	9.840	1.618	13375.52	21641.600	-0.17/H	<<-

River gaugings for station 13801 : Mekong at Khong Chiam

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
541	27 Sep 1974	H	8.620	1.477	12762.76	18850.599	-0.56/H	<<<<-
542	3 Oct 1974	H	7.970	1.253	12309.34	15423.600	-0.10/H	<-
543	7 Oct 1974	H	7.840	1.181	12249.36	14466.501	0.11/H	->
544	10 Oct 1974	H	7.400	1.160	12033.27	13958.600	-0.15/H	<<-
545	12 Oct 1974	H	7.210	1.046	11946.56	12496.100	0.19/H	->>
546	15 Oct 1974	H	6.940	1.043	11804.12	12311.700	-0.01/H	-
547	18 Oct 1974	H	6.400	1.082	11703.05	12662.701	-0.68/H	<<<<-
548	21 Oct 1974	H	5.990	0.945	11470.37	10839.500	-0.38/H	<<<<-
549	24 Oct 1974	H	5.420	0.777	11199.23	8701.800	-0.03/H	<-
550	28 Oct 1974	H	4.880	0.686	10916.47	7488.700	-0.00/H	-
551	30 Oct 1974	H	4.630	0.609	10732.35	6536.000	0.22/H	->>>
552	5 Nov 1974	H	4.200	0.466	10609.87	4944.200	0.68/H	->>>>
553	8 Nov 1974	H	4.740	0.596	10940.44	6520.500	0.34/H	->>>>
554	13 Nov 1974	H	4.840	0.679	10988.37	7461.100	-0.03/H	<-
555	15 Nov 1974	H	4.440	0.593	10723.61	6359.100	0.13/H	->>
556	19 Nov 1974	H	4.140	0.501	10564.47	5292.800	0.42/H	->>>>
557	22 Nov 1974	H	4.100	0.536	10547.76	5653.600	0.17/H	->>
558	4 Dec 1974	H	3.380	0.454	10336.56	4692.800	0.01/H	-
559	7 Dec 1974	H	3.180	0.434	10290.32	4466.000	-0.05/H	<-
560	10 Dec 1974	H	3.030	0.396	10152.53	4020.400	0.09/H	->
561	16 Dec 1974	H	2.760	0.382	10040.84	3835.600	-0.06/H	<-
562	23 Dec 1974	H	2.590	0.351	9959.83	3495.900	0.01/H	-
563	27 Dec 1974	H	2.530	0.338	9921.30	3353.400	0.05/H	->
564	6 Jan 1975	I	2.330	0.329	9811.67	3228.040	-0.14/I	<<-
565	10 Jan 1975	I	2.340	0.325	9823.51	3192.640	-0.11/I	<-
566	23 Jan 1975	I	2.560	0.398	8442.41	3360.080	0.01/I	-
567	7 Feb 1975	I	2.220	0.265	9760.08	2586.420	0.14/I	->>
568	15 Feb 1975	I	1.970	0.212	9661.51	2048.240	0.24/I	->>>
569	18 Feb 1975	I	1.930	0.183	9607.65	1758.200	0.40/I	->>>>
570	21 Feb 1975	I	1.840	0.254	9562.87	2428.970	-0.14/I	<<-
571	26 Feb 1975	I	1.760	0.220	9499.77	2089.950	0.00/I	-
572	28 Feb 1975	I	1.760	0.196	9489.49	1859.940	0.16/I	->>
573	5 Mar 1975	I	1.710	0.243	9487.08	2305.360	-0.19/I	<<-
574	10 Mar 1975	I	1.710	0.242	9501.41	2299.340	-0.18/I	<<-
575	14 Mar 1975	I	1.670	0.195	9477.74	1848.160	0.07/I	->
576	20 Mar 1975	I	1.590	0.191	9411.36	1797.570	0.03/I	->
577	24 Mar 1975	I	1.560	0.185	9412.92	1741.390	0.04/I	->
578	28 Mar 1975	I	1.530	0.234	9407.65	2201.390	-0.30/I	<<<-
579	2 Apr 1975	I	1.490	0.150	9398.00	1409.700	0.20/I	->>
580	8 Apr 1975	I	1.480	0.174	9347.24	1626.420	0.04/I	->
581	11 Apr 1975	I	1.500	0.175	9383.20	1642.060	0.05/I	->
582	16 Apr 1975	I	1.540	0.189	9360.21	1769.080	-0.00/I	-
583	21 Apr 1975	I	1.540	0.193	9394.97	1813.230	-0.03/I	<-
584	24 Apr 1975	I	1.560	0.190	9408.74	1787.660	0.01/I	-
585	6 May 1975	I	1.810	0.240	9547.75	2291.460	-0.08/I	<-
586	14 May 1975	I	1.630	0.207	9764.73	2021.300	-0.08/I	<-
587	19 May 1975	I	2.090	0.248	9974.96	2473.790	0.08/I	->
588	23 May 1975	I	2.240	0.302	10071.19	3041.500	-0.12/I	<-
589	28 May 1975	I	2.730	0.442	10319.43	4561.190	-0.50/I	<<<<-
590	3 Jun 1975	I	3.110	0.515	10510.23	5412.770	-0.58/I	<<<<-
591	9 Jun 1975	I	4.710	0.577	11304.75	6522.840	0.45/I	->>>>
592	16 Jun 1975	I	5.540	0.720	11724.26	8441.470	0.35/I	->>>>
593	20 Jun 1975	I	6.130	0.720	12032.68	8663.531	0.84/I	->>>>
594	25 Jun 1975	I	8.040	1.113	12997.28	14465.971	0.20/I	->>
595	25 Jun 1975	I	8.060	1.118	12999.00	14532.880	0.20/I	->>
596	30 Jun 1975	I	7.970	1.094	13011.90	14235.021	0.23/I	->>>
597	7 Jul 1975	I	6.140	0.853	11770.49	10040.231	0.21/I	->>
598	10 Jul 1975	I	6.480	0.920	11992.97	11033.531	0.11/I	->
599	14 Jul 1975	I	6.710	0.972	12004.36	11668.242	0.06/I	->
600	17 Jul 1975	I	8.910	1.482	13300.45	19711.260	-1.01/I	<<<<-
601	21 Jul 1975	I	8.910	1.506	13503.66	20336.510	-1.25/I	<<<<-

C.9.11 Station 13901 - Pakse

Figure C9.11.1 shows the number of gaugings per year from 1960 to 1987. Figure C9.11.2 shows the consistent set of gaugings made at Pakse together with the average rating curve. There is only a small ammount of scatter within the group making Pakse the most stable gauging site on the Mekong.

Figure C9.11.3 shows the three individual rating curves derived for this station form a very close group.

Individual ratings curves fit very well as illustrated by Figures C9.11.4b to C9.11.4e. Rating B, from 1960 to 1961 has an excellent set of gaugings with the rating well defined throughout a wide range of flows. A two part rating was fitted to data from this period. The upper part of rating B was used, with appropriate change in datum, to provide upper segments for ratings C and E, which do not have a well defined flood flow rating.

The difference between ratings B and C was so small that rating B could be used between 1962 (from the end of rating B) and 1966 (to the start of rating C).

Gaugings made during 1970 and 1971 are not consistent with any other gaugings made at Pakse so have been excluded from the fitting procedure.

Gauging History - 013901 Pakse

Year	Gauging numbers	Number of gaugings	Rating letter	Shifts (Y=yes)	Fitting method
1923#		0	A		2
1960	1 - 9	9		Y	
1961	10 - 118	109	B	Y	2
1967	119 - 136	18	C	Y	9 *
1970	137 - 137	1			not used
1971	138 - 149	12			not used
1973	150 - 165	16			
1974#		0	D		2
1986	166 - 173	8		Y	
1987	174 - 201	28	E		9 *
	Total =	201			

= and subsequent years

Dubious gaugings (HYDATA flag ?) - 137-149
Rare flood gaugings (HYDATA flag +) - None

Observed stage range 0.16 metres to 14.48 metres
Gauged stage range 0.38 metres to 12.83 metres

See Section C.9.1 for description of the table

* Notes on special fitting :

Rating C . Comprises gaugings from 1967 and 1973. Insufficient gaugings in the individual years to warrant separate ratings. Gaugings in 1970 and 1971 not used because they were inconsistent with other gaugings at this site. Few extreme flood gaugings, so upper segment of rating B, which is very well defined, used with rating C.

Rating E . Few flood gaugings during this period, upper part of rating B used for flood flows as with rating C.

Rating equations - 13901 Mekong at Pakse

Rating Letter	Date	Parameters (a, c, b)	Maximum Stage
A from	1 Jan 1923	$Q = 723.056\,(h + 1.160)^{1.534}$	9.74 m
		$Q = 530.954\,(h + 1.160)^{1.664}$	15.00 m
B from	1 Jan 1960	$Q = 846.180\,(h + 1.020)^{1.475}$	8.67 m
		$Q = 629.214\,(h + 1.020)^{1.605}$	15.00 m
C from	1 Jan 1967	$Q = 855.797\,(h + 0.990)^{1.475}$	9.66 m
		$Q = 629.214\,(h + 0.990)^{1.605}$	15.00 m
D from	1 Jan 1974	$Q = 723.056\,(h + 1.160)^{1.534}$	9.74 m
		$Q = 530.954\,(h + 1.160)^{1.664}$	15.00 m
E from	1 Jan 1986	$Q = 778.551\,(h + 0.960)^{1.509}$	8.00 m
		$Q = 629.214\,(h + 0.960)^{1.605}$	15.00 m

Ratings A and D are the average rating

Number of gaugings per year

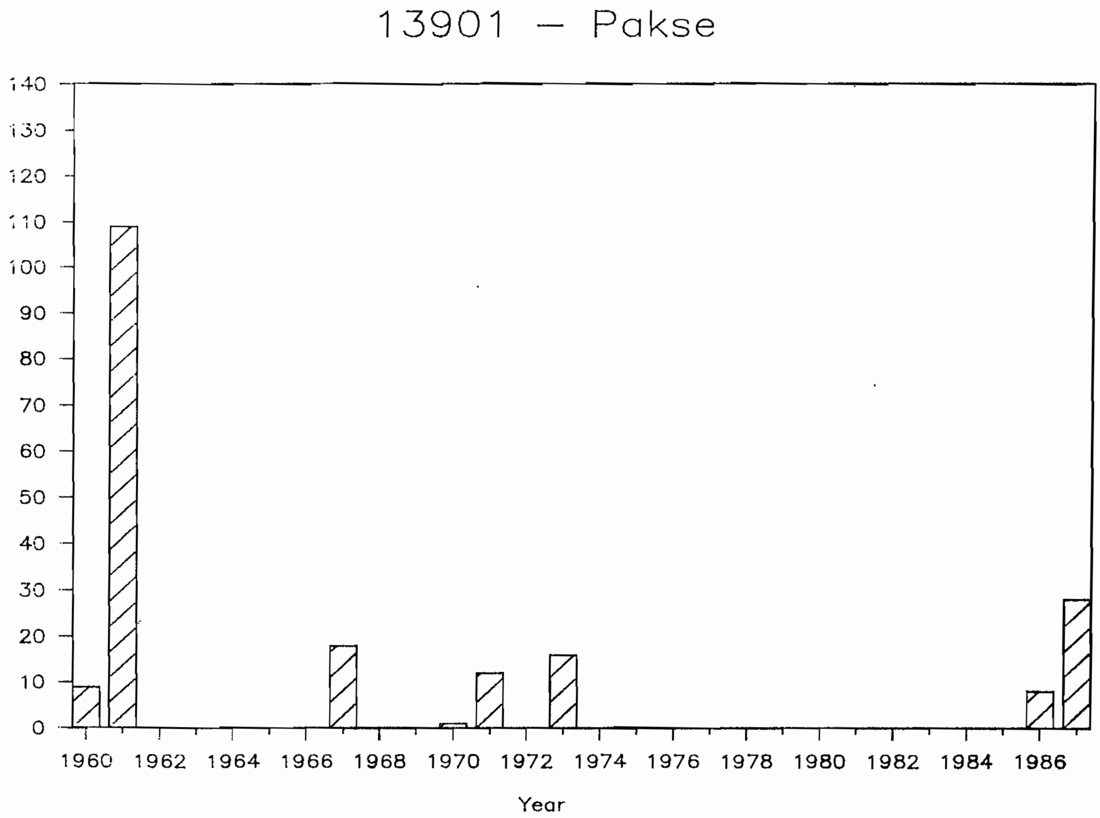


Figure C9.11.1

Rating equations

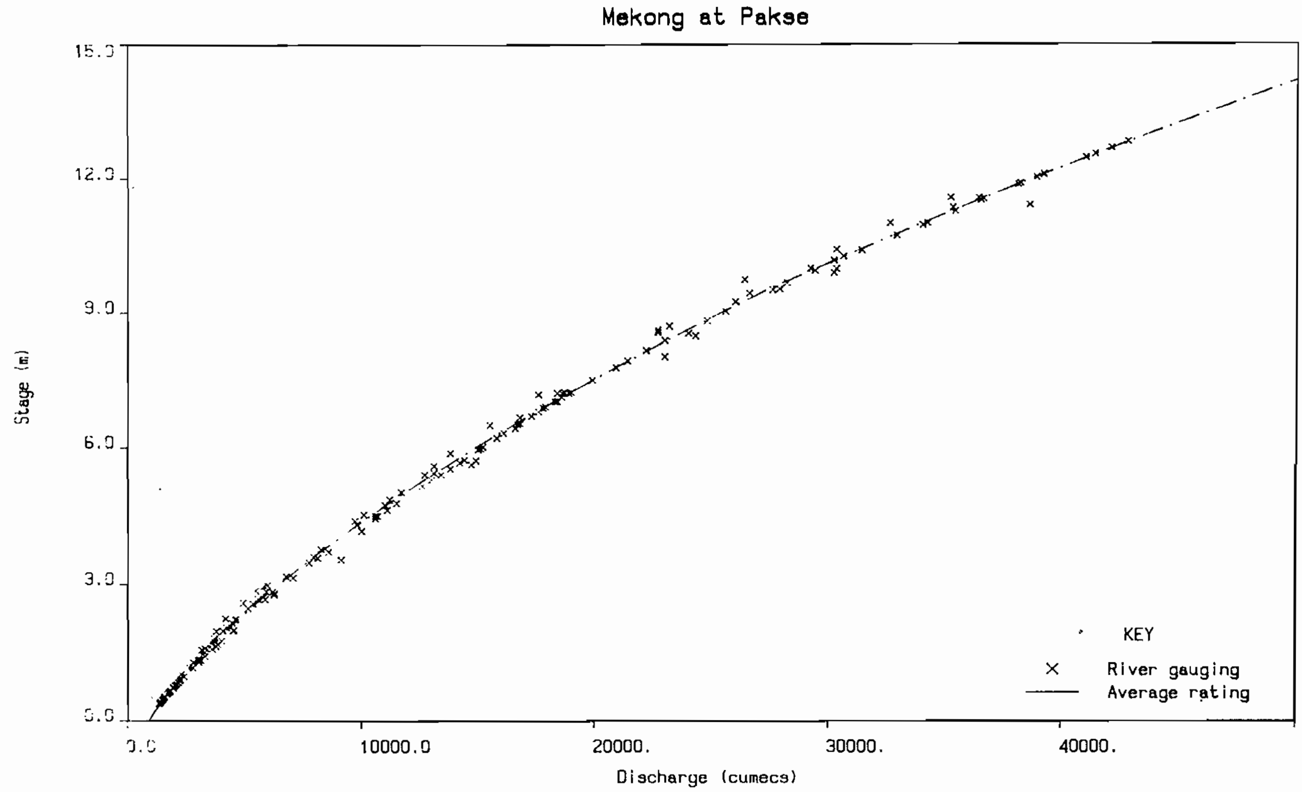


Figure C9.11.2

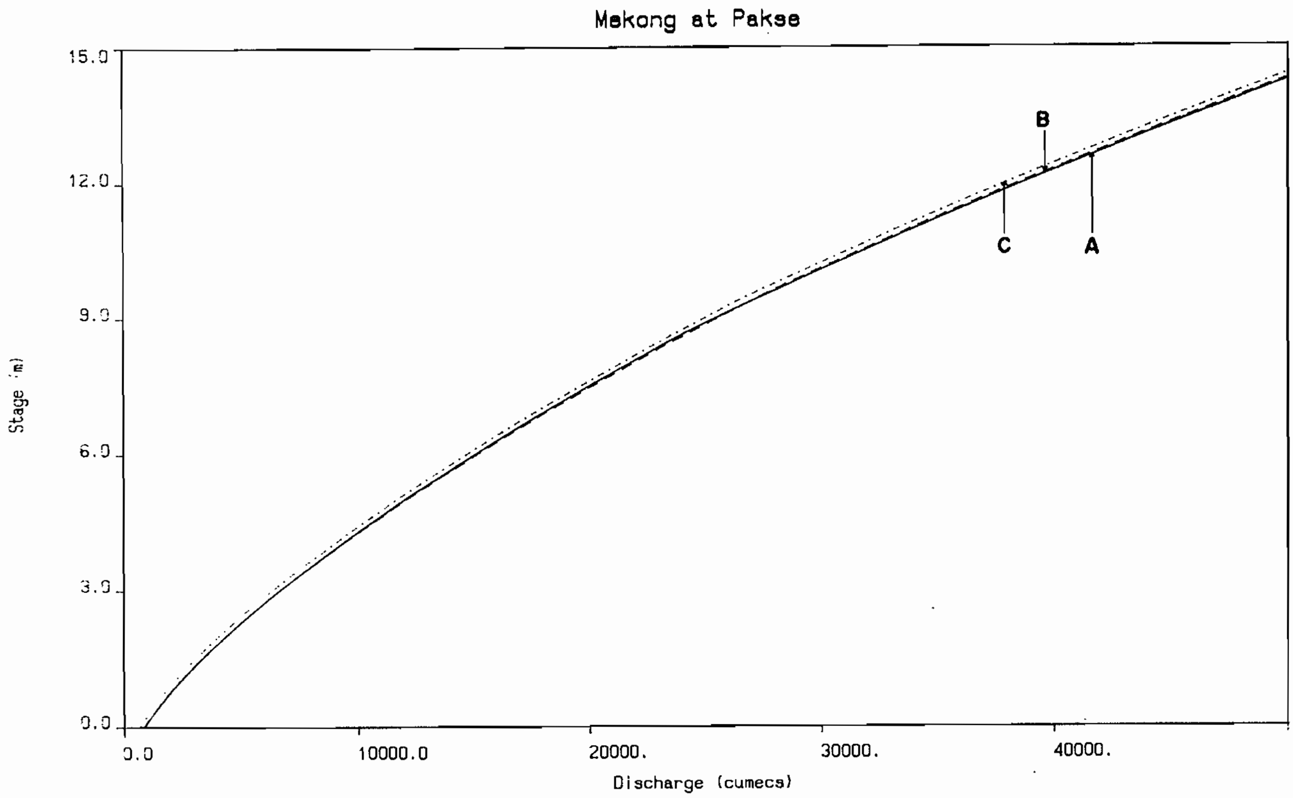


Figure C9.11.3

Rating equations

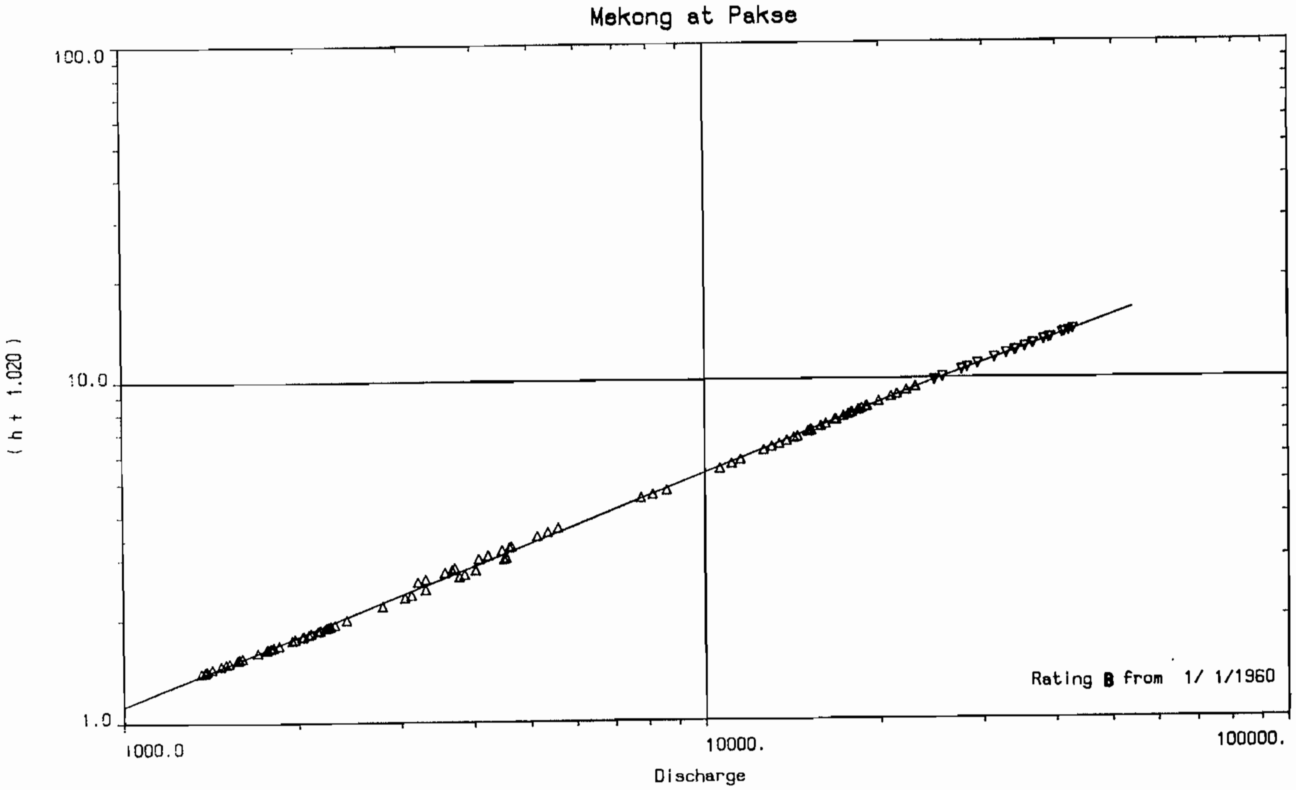


Figure C9.11.4b

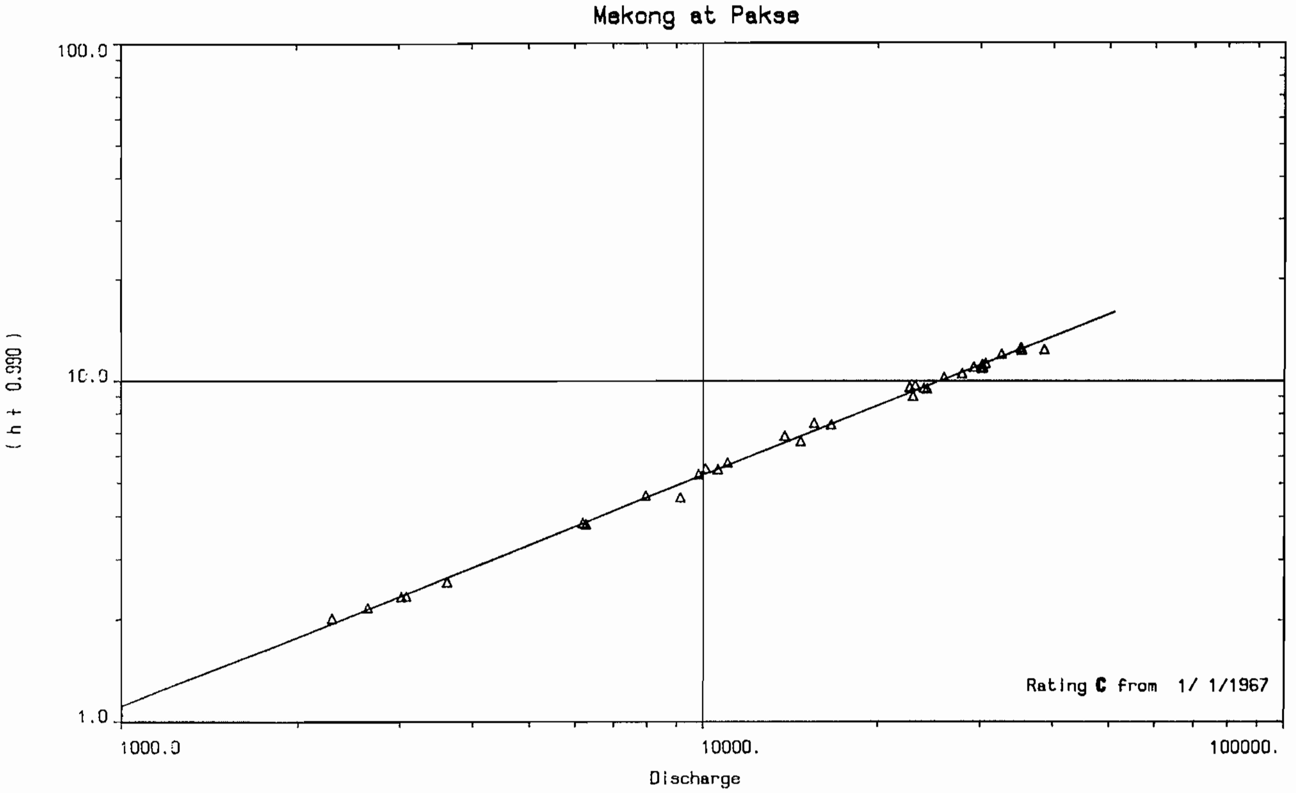


Figure C9.11.4c

Rating equations

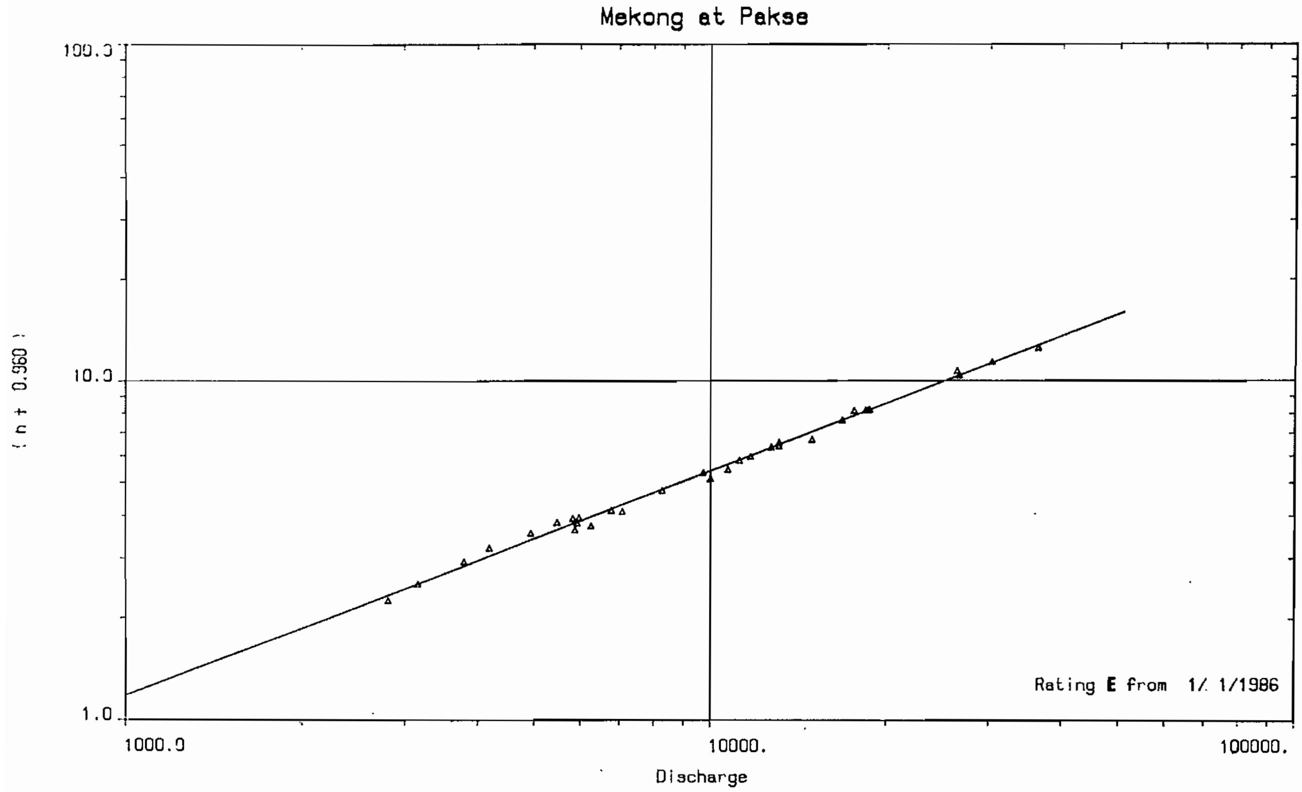


Figure C9.11.4e

River gaugings for station 13901 : Mekong at Pakse

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
1	20 Oct 1960	B	6.230			15800.000	-0.02/B	<-
2	8 Dec 1960	B	1.770			4030.000	-0.09/B	<-
3	10 Dec 1960	B	1.690			3860.000	-0.09/B	<-
4	14 Dec 1960	B	2.010			4550.000	-0.10/B	<-
5	15 Dec 1960	B	1.990			4510.000	-0.10/B	<-
6	19 Dec 1960	B	1.650			3780.000	-0.09/B	<-
7	23 Dec 1960	B	1.430			3310.000	-0.07/B	<-
8	28 Dec 1960	B	1.340			3130.000	-0.07/B	<-
9	29 Dec 1960	B	1.300			3050.000	-0.07/B	<-
10	2 Jan 1961	B	1.170			2790.000	-0.06/B	<-
11	12 Jan 1961	B	0.980			2420.000	-0.04/B	<-
12	16 Jan 1961	B	0.900			2270.000	-0.03/B	<-
13	18 Jan 1961	B	0.850			2180.000	-0.03/B	<-
14	20 Jan 1961	B	0.890			2250.000	-0.03/B	<-
15	25 Jan 1961	B	0.840			2160.000	-0.03/B	<-
16	27 Jan 1961	B	0.810			2100.000	-0.02/B	<-
17	31 Jan 1961	B	0.770			2030.000	-0.02/B	-
18	2 Feb 1961	B	0.740			1970.000	-0.01/B	-
19	6 Feb 1961	B	0.730			1950.000	-0.01/B	-
20	10 Feb 1961	B	0.670			1850.000	-0.01/B	-
21	14 Feb 1961	B	0.640			1790.000	-0.00/B	-
22	17 Feb 1961	B	0.620			1760.000	-0.00/B	-
23	2 Mar 1961	B	0.590			1700.000	0.01/B	-
24	6 Mar 1961	B	0.530			1600.000	0.01/B	-
25	7 Mar 1961	B	0.520			1580.000	0.01/B	-
26	8 Mar 1961	B	0.510			1570.000	0.01/B	-
27	13 Mar 1961	B	0.510			1570.000	0.01/B	-
28	15 Mar 1961	B	0.520			1580.000	0.01/B	-
29	16 Mar 1961	B	0.530			1600.000	0.01/B	-
30	17 Mar 1961	B	0.530			1600.000	0.01/B	-
31	21 Mar 1961	B	0.480			1520.000	0.01/B	-
32	22 Mar 1961	B	0.470			1500.000	0.02/B	-
33	24 Mar 1961	B	0.450			1470.000	0.02/B	-
34	28 Mar 1961	B	0.420			1420.000	0.02/B	-
35	29 Mar 1961	B	0.400			1390.000	0.02/B	-
36	30 Mar 1961	B	0.390			1380.000	0.02/B	-
37	31 Mar 1961	B	0.380			1360.000	0.02/B	->
38	17 Apr 1961	B	0.630			1770.000	0.00/B	-
39	19 Apr 1961	B	0.780			2040.000	-0.02/B	-
40	20 Apr 1961	B	0.800			2080.000	-0.02/B	-
41	27 Apr 1961	B	0.650			1810.000	-0.00/B	-
42	28 Apr 1961	B	0.650			1810.000	-0.00/B	-
43	2 May 1961	B	0.630			1770.000	0.00/B	-
44	3 May 1961	B	0.620			1760.000	-0.00/B	-
45	5 May 1961	B	0.740			1970.000	-0.01/B	-
46	9 May 1961	B	0.730			1950.000	-0.01/B	-
47	15 May 1961	B	0.900			2270.000	-0.03/B	<-
48	16 May 1961	B	0.920			2310.000	-0.04/B	<-
49	17 May 1961	B	0.880			2230.000	-0.03/B	<-
50	22 Jun 1961	B	5.690			14200.000	-0.06/B	<-
51	23 Jun 1961	B	5.420			13400.001	-0.07/B	<-
52	27 Jun 1961	B	7.520			19900.000	0.03/B	->
53	28 Jun 1961	B	7.240			18999.999	0.02/B	-
54	30 Jun 1961	B	8.840			24799.999	-0.01/B	-
55	5 Jul 1961	B	7.040			18299.999	0.02/B	->
56	7 Jul 1961	B	7.250			18999.999	0.03/B	->
57	10 Jul 1961	B	6.720			17299.999	0.00/B	-
58	13 Jul 1961	B	6.550			16799.999	-0.01/B	-
59	14 Jul 1961	B	6.340			16100.001	-0.01/B	-
60	17 Jul 1961	B	5.170			12600.001	-0.05/B	<-

River gaugings for station 13901 : Mekong at Pakse

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
61	18 Jul 1961	B	5.310			13000.001	-0.04/B	<-
62	20 Jul 1961	B	7.140			18600.000	0.03/B	->
63	21 Jul 1961	B	7.050			18400.000	0.00/B	-
64	24 Jul 1961	B	6.900			17800.000	0.03/B	->
65	26 Jul 1961	B	6.820			17599.999	0.01/B	-
66	31 Jul 1961	B	6.030			15200.001	-0.04/B	<-
67	2 Aug 1961	B	6.030			15200.001	-0.04/B	<-
68	3 Aug 1961	B	6.040			15200.001	-0.03/B	<-
69	4 Aug 1961	B	6.000			15100.000	-0.03/B	<-
70	10 Aug 1961	B	6.540			16699.999	0.01/B	-
71	11 Aug 1961	B	6.920			17900.000	0.02/B	->
72	14 Aug 1961	B	7.230			18899.999	0.04/B	->
73	15 Aug 1961	B	8.400			23000.000	0.04/B	->
74	16 Aug 1961	B	9.040			25600.001	-0.00/B	-
75	18 Aug 1961	B	9.680			28200.000	0.01/B	-
76	21 Aug 1961	B	11.280			35400.000	-0.02/B	-
77	23 Aug 1961	B	11.880			38100.001	0.01/B	-
78	28 Aug 1961	B	11.560			36599.999	0.01/B	-
79	1 Sep 1961	B	10.740			32899.999	-0.01/B	-
80	6 Sep 1961	B	10.970			34000.000	-0.02/B	<-
81	7 Sep 1961	B	11.010			34200.000	-0.02/B	<-
82	11 Sep 1961	B	11.530			36500.000	-0.00/B	-
83	14 Sep 1961	B	12.560			41400.000	0.00/B	-
84	19 Sep 1961	B	12.030			38899.999	-0.01/B	-
85	20 Sep 1961	B	12.100			39199.998	-0.00/B	-
86	21 Sep 1961	B	11.900			38199.999	0.01/B	-
87	2 Oct 1961	B	12.830			42800.000	-0.01/B	-
88	4 Oct 1961	B	12.690			42100.000	-0.01/B	-
89	5 Oct 1961	B	12.480			40999.999	0.00/B	-
90	10 Oct 1961	B	10.410			31400.001	0.00/B	-
91	11 Oct 1961	B	9.960			29399.999	0.01/B	-
92	12 Oct 1961	B	9.520			27599.999	-0.01/B	-
93	17 Oct 1961	B	8.410			23000.000	0.05/B	->
94	18 Oct 1961	B	8.180			22200.000	0.04/B	->
95	19 Oct 1961	B	7.800			20900.000	0.03/B	->
96	23 Oct 1961	B	7.950			21400.000	0.03/B	->
97	31 Oct 1961	B	5.980			15000.000	-0.02/B	<-
98	1 Nov 1961	B	5.750			14400.000	-0.06/B	<-
99	2 Nov 1961	B	5.560			13800.001	-0.06/B	<-
100	7 Nov 1961	B	4.790			11500.000	-0.06/B	<-
101	8 Nov 1961	B	4.640			11100.001	-0.07/B	<-
102	9 Nov 1961	B	4.450			10600.000	-0.08/B	<-
103	14 Nov 1961	B	3.720			8590.000	-0.07/B	<-
104	15 Nov 1961	B	3.590			8130.000	-0.03/B	<-
105	16 Nov 1961	B	3.490			7760.000	0.02/B	-
106	28 Nov 1961	B	2.680			5580.000	0.11/B	->
107	29 Nov 1961	B	2.580			5360.000	0.10/B	->
108	30 Nov 1961	B	2.480			5140.000	0.10/B	->
109	6 Dec 1961	B	2.170			4470.000	0.10/B	->
110	7 Dec 1961	B	2.230			4600.000	0.10/B	->
111	12 Dec 1961	B	2.250			4640.000	0.10/B	->
112	14 Dec 1961	B	2.060			4230.000	0.10/B	->
113	15 Dec 1961	B	1.990			4080.000	0.10/B	->
114	19 Dec 1961	B	1.820			3710.000	0.12/B	->
115	20 Dec 1961	B	1.780			3670.000	0.10/B	->
116	22 Dec 1961	B	1.730			3570.000	0.10/B	->
117	27 Dec 1961	B	1.610			3310.000	0.11/B	->
118	29 Dec 1961	B	1.560			3210.000	0.11/B	->
119	15 May 1967	C	1.030	0.510	4490.20	2290.000	0.07/C	->
120	22 May 1967	C	1.360	0.590	5220.34	3080.000	-0.03/C	<-

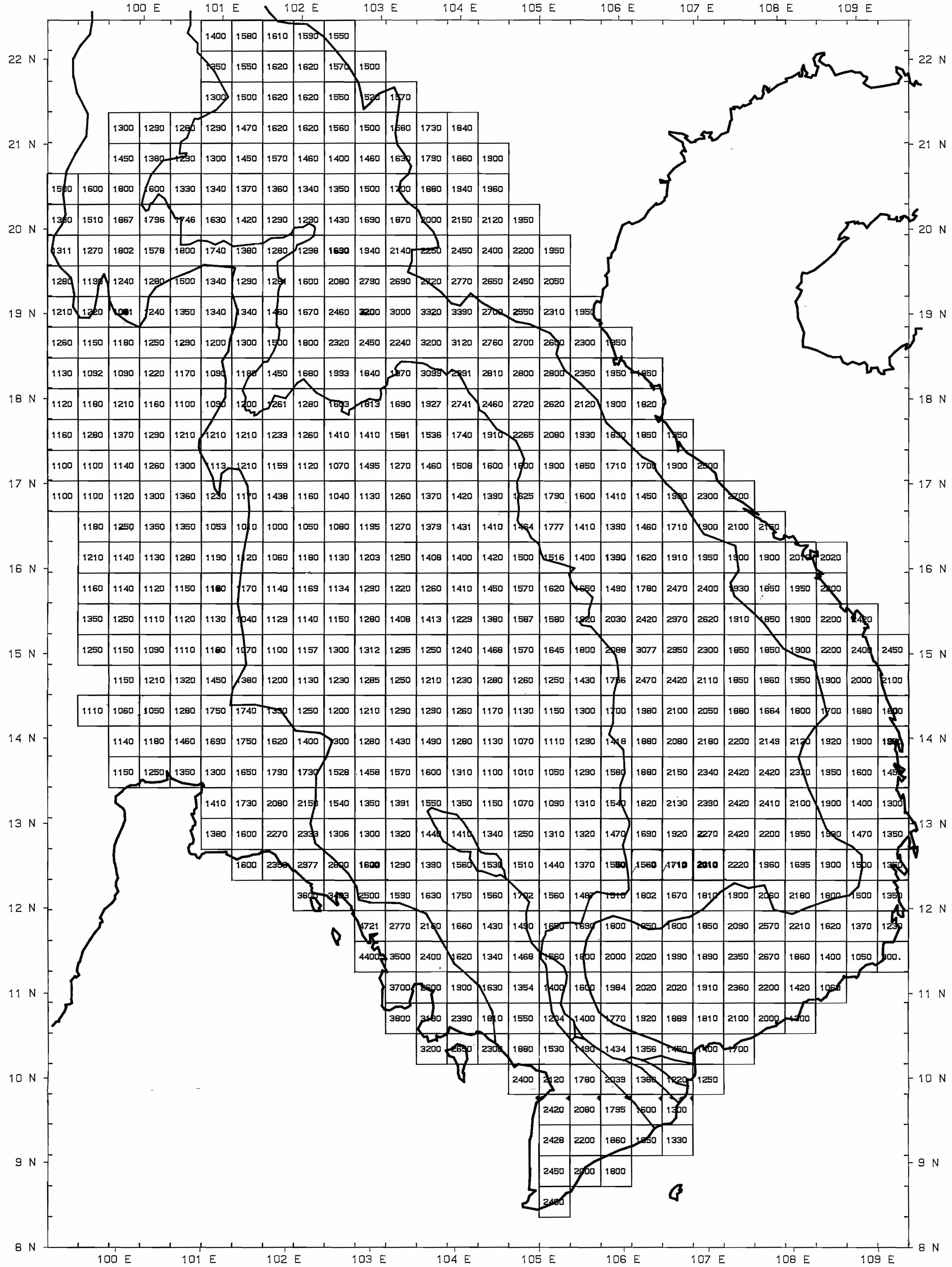
River gaugings for station 13901 : Mekong at Pakse

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
121	25 May 1967	C	1.350	0.600	5033.33	3020.000	-0.01/C	-
122	29 May 1967	C	1.180	0.560	4714.29	2640.000	0.02/C	->
123	5 Jun 1967	C	1.590	0.600	6033.33	3620.000	-0.08/C	<-
124	13 Jun 1967	C	4.540			10100.001	0.20/C	->>
125	20 Jun 1967	C	3.550	1.040	8778.85	9130.001	-0.44/C	<<<<-
126	26 Jun 1967	C	2.810	0.790	7936.71	6270.000	-0.06/C	<-
127	4 Jul 1967	C	2.840	0.790	7835.44	6190.000	0.01/C	-
128	10 Jul 1967	C	3.610	0.890	8943.82	7960.000	0.06/C	->
129	17 Jul 1967	C	4.510			10600.000	-0.01/C	-
130	24 Jul 1967	C	4.320			9820.001	0.08/C	->
131	28 Jul 1967	C	6.450			16599.999	-0.03/C	<-
132	9 Aug 1967	C	5.900			13800.001	0.30/C	->>>
133	14 Aug 1967	C	4.750			11000.001	0.09/C	->
134	23 Aug 1967	C	8.580			22699.999	0.34/C	->>>>
135	28 Aug 1967	C	8.720			23199.999	0.34/C	->>>>
136	8 Sep 1967	C	6.520			15500.000	0.38/C	->>>>
137	31 Mar 1970	?	0.400			724.000	0.50/C	->>>>
138	31 Aug 1971	?	10.750			25824.698	1.67/C	->>>>
139	14 Sep 1971	?	9.950			23459.029	1.50/C	->>>>
140	17 Sep 1971	?	9.340			20585.349	1.69/C	->>>>
141	20 Sep 1971	?	8.790			18000.029	1.89/C	->>>>
142	22 Sep 1971	?	8.270			17713.199	1.46/C	->>>>
143	15 Oct 1971	?	5.722			12052.301	0.70/C	->>>>
144	18 Oct 1971	?	5.232			10019.000	0.92/C	->>>>
145	22 Oct 1971	?	5.840			8292.201	2.17/C	->>>>
146	15 Nov 1971	?	3.100			5438.120	0.59/C	->>>>
147	26 Nov 1971	?	2.420			4050.530	0.54/C	->>>>
148	30 Nov 1971	?	2.220			3608.130	0.56/C	->>>>
149	7 Dec 1971	?	2.080			3090.780	0.68/C	->>>>
150	14 Aug 1973	C	8.500			24300.000	-0.18/C	<<-
151	21 Aug 1973	C	8.040			23000.000	-0.28/C	<<<-
152	24 Aug 1973	C	8.630			22699.999	0.39/C	->>>>
153	27 Aug 1973	C	10.010			29199.999	0.08/C	->
154	29 Aug 1973	C	9.910			30199.998	-0.26/C	<<<-
155	31 Aug 1973	C	10.190			30199.998	0.02/C	->
156	3 Sep 1973	C	11.020			32600.000	0.31/C	->>>
157	4 Sep 1973	C	11.360			35299.998	0.06/C	->
158	6 Sep 1973	C	11.580			35199.999	0.30/C	->>>
159	11 Sep 1973	C	11.420			38600.000	-0.59/C	<<<<-
160	18 Sep 1973	C	10.280			30599.999	0.02/C	->
161	20 Sep 1973	C	10.000			30300.000	-0.19/C	<<-
162	24 Sep 1973	C	9.540			27900.001	-0.09/C	<-
163	28 Sep 1973	C	9.260			25999.999	0.13/C	->>
164	3 Oct 1973	C	8.560			23999.999	-0.03/C	<-
165	18 Oct 1973	C	5.650			14700.001	-0.23/C	<<<-
166	12 Nov 1986	E	2.990			5970.000	0.09/E	->
167	18 Nov 1986	E	2.970			5830.000	0.13/E	->>
168	25 Nov 1986	E	2.870			5480.000	0.19/E	->>
169	28 Nov 1986	E	2.600			4940.000	0.16/E	->>
170	3 Dec 1986	E	2.260			4190.000	0.17/E	->>
171	12 Dec 1986	E	1.980			3790.000	0.09/E	->
172	23 Dec 1986	E	1.570			3160.000	-0.00/E	-
173	30 Dec 1986	E	1.300			2810.000	-0.08/E	<-
174	21 Jul 1987	E	5.460			13100.001	-0.07/E	<-
175	27 Jul 1987	E	4.180			10000.000	-0.29/E	<<<-
176	4 Aug 1987	E	5.740			14900.001	-0.37/E	<<<<-
177	8 Aug 1987	E	5.420			12700.000	0.02/E	-
178	11 Aug 1987	E	4.870			11200.001	-0.02/E	<-
179	15 Aug 1987	E	4.510			10700.000	-0.21/E	<<-
180	26 Aug 1987	E	11.580			36399.999	0.01/E	-

River gaugings for station 13901 : Mekong at Pakse

Order Number	Date	Rating	Stage (m)	Velocity (ms^{-1})	Area (m^2)	Discharge (m^3s^{-1})	--- Comparison --- Diff./Rat.	Plot
181	31 Aug 1987	E	10.430			30300.000	0.21/E	->>
182	5 Sep 1987	E	9.450			26600.000	0.10/E	->
183	11 Sep 1987	E	9.760			26399.999	0.46/E	->>>>
184	17 Sep 1987	E	7.250			18700.000	-0.01/E	-
185	24 Sep 1987	E	7.230			18600.000	-0.00/E	-
186	28 Sep 1987	E	7.230			18400.000	0.06/E	->
187	2 Oct 1987	E	7.200			17599.999	0.26/E	->>>
188	10 Oct 1987	E	6.690			16799.999	-0.01/E	-
189	15 Oct 1987	E	5.620			13100.001	0.09/E	->
190	20 Oct 1987	E	5.030			11700.000	-0.03/E	<-
191	24 Oct 1987	E	4.400			9720.001	0.03/E	->
192	29 Oct 1987	E	3.780			8270.000	-0.05/E	<-
193	5 Nov 1987	E	3.190			6780.000	-0.05/E	<-
194	10 Nov 1987	E	2.850			5930.000	-0.03/E	<-
195	19 Nov 1987	E	3.160			7080.000	-0.20/E	<<-
196	24 Nov 1987	E	2.680			5880.000	-0.18/E	<<-
197	28 Nov 1987	E	2.780			6260.000	-0.24/E	<<<-
198	3 Dec 1987	E	2.260			4190.000	0.17/E	->>
199	12 Dec 1987	E	1.980			3790.000	0.09/E	->
200	23 Dec 1987	E	1.570			3160.000	-0.00/E	-
201	30 Dec 1987	E	1.300			2810.000	-0.08/E	<-

LOWER MEKONG BASIN

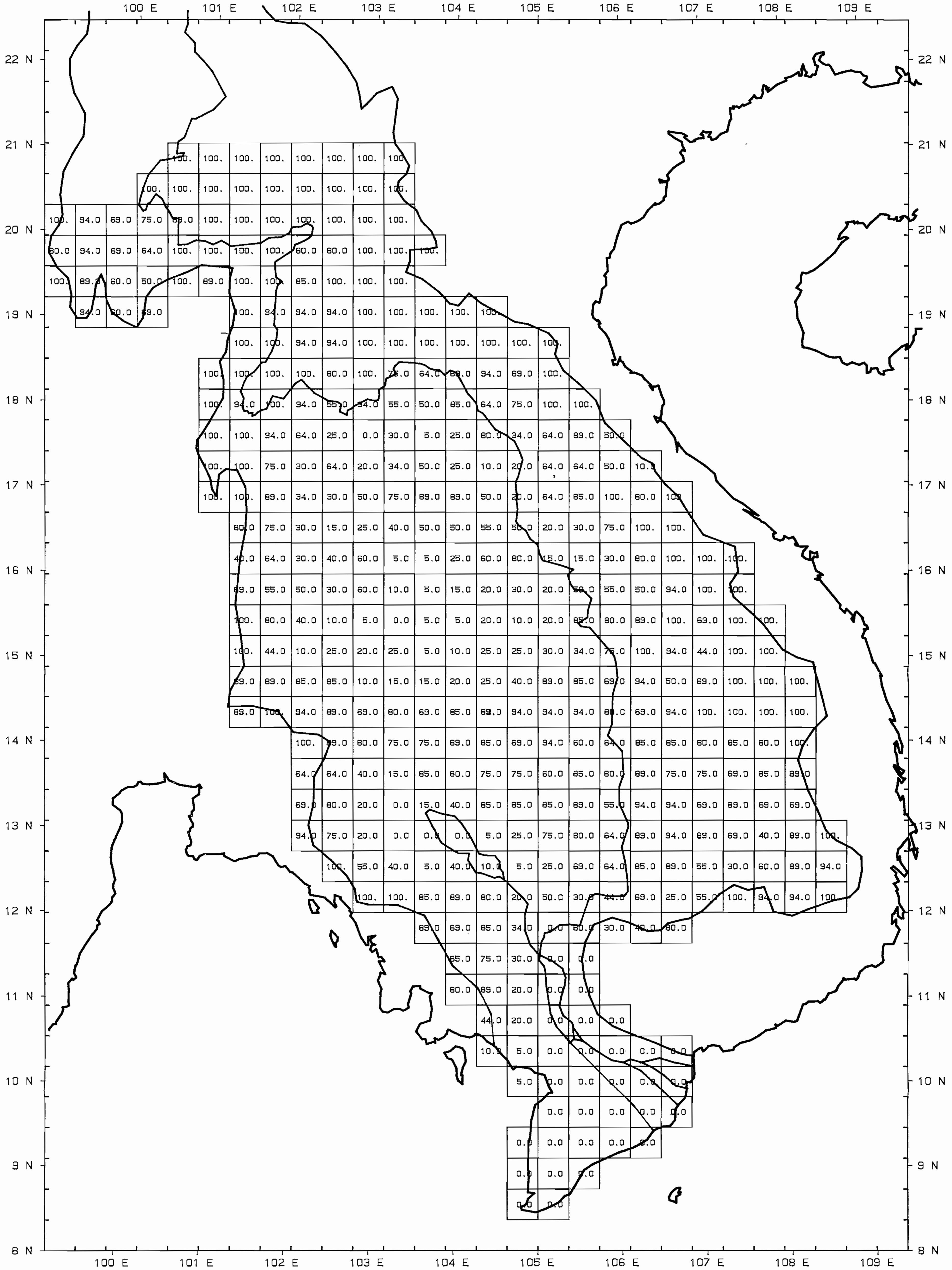


Grid size. 40 km x 40 km   Scale 1 : 5,000,000   UTM Projection

ANNUAL AVERAGE RAINFALL (AAR) mm

Figure B.2.1

LOWER MEKONG BASIN



Grid size 40 km x 40 km   Scale 1: 5,000,000   UTM Projection

SOIL INDEX (SOIL)

Figure B.2.2