An Investigation into the Frequency of Discharge of three Combined Sewer Overflows in the Afan/Kenfig Catchment

NATIONAL RIVERS AUTHORITY

WELSH REGION

SOUTH WEST AREA

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1.0 Introduction

As part of the Afan/Kenfig Catchment Management Plan Consultation Report (Issues No. 1 & 3), investigations into the frequency of discharge of three Combined Sewer Overflows (CSO's) were required in order to provide information for AMP2 purposes, and the opposition of future planning, where appropriate.

2.0 Methods

Newlog dataloggers, connected to Flyght float switches, were installed at Bedford Road CSO (SS 8528 8353), Gwaun Afon CSO (SS 7884 9236), and Tonmawr CSO (SS7964 9620). In addition a conductivity switch was installed at the Bedford Road CSO on the 02/11/95 to increase the sensitivity of detection.
These were designed to record the frequency and duration of discharges, greater than 30 seconds, arising from the overflows. The monitoring period covered 7th July to 20th December 1995, with data retrieved at intervals of two to three weeks. In addition, rainfall intensity data were recorded using tipping bucket rainfall collectors located at the Pelenna Mountain Centre for the Afan catchment (SS 8075 9555), and the Celtic Energy OCCS near Kenfig Hill, for the Kenfig catchment (SS 8575 8385). Data were processed by the computer package RS1.
A fourth discharge at Efail Fach CSO (SS 7906 9458) was unsuitable for monitoring with the equipment available. The headwall was too low to produce sufficient head of discharge to trip the float switch.

3.0 Results

3.1 Kenfig Catchment - Bedford Rd. CSO

A total of 43 discrete discharges were detected from the CSO at Bedford Road (Figs. 1 - 6) (Data in Appendix 1). Of these 31 occurred under conditions of low or negligible rainfall. Discharges varied in duration from 1 minute to 58 hrs 28 minutes. Those discharges that occurred following rainfall tended to be related to short periods of high rainfall intensity or prolonged periods of low to moderate intensity rainfall.

July - Three discharges were detected, each preceded by heavy rainfall (Fig. 1).

On the 15th, a discharge of 1.5 minutes was preceded by steady rain for 2 hours, reaching a peak intensity of 72 mm/hr, 11 minutes prior to the discharge. This heavy rainfall continued through to a second discharge of 19 minutes duration, 19 minutes later.
On the 17th a discharge for 3 minutes followed heavy rainfall, with a peak intensity of 144 mm/hr, 7 minutes prior to the discharge.

August - Negligible rainfall occurred during the month, and no discharges were detected (Fig. 2).
An intense downpour of short duration occurred on 24th (144 mm/hr), but did not result in an overflow.

September - This was generally a dry month and no discharges were detected (Fig. 3). Rainfall intensities of up to 72 mm/hr were recorded though these were of short duration (< 5 min).

October - Nine discharges were detected during the month (Fig. 4).

On the 3rd, 7 minutes of intense rainfall, up to 72 mm/hr, resulted in a discharge of 8 minutes duration.
A discharge on the 5th, of 2 hours 16 minutes, was preceded by 9.5 hours of rainfall, with intensities up to 72 mm/hr. A discharge was observed during servicing work on 5th when the float switch failed to trip.
Two discharges on the 6th (16 min & 26 min) occurred following rainfall intensities up to 36 mm/hr, six and eight minutes prior to the discharge. A further discharge on the 6th, of 16 minutes duration, was preceded by low to moderate rainfall, up to 18 mm/hr.
On the 7th, a discharge of 57 minutes occurred during a period of negligible rainfall (< 7.2 mm/hr).
A discharge on the 24th, of 39 minutes, followed 50 minutes of moderate rainfall up to 36 mm/hr. Rainfall continued at lowered intensities (max 10.3 mm/hr), through to a discharge of 53 minutes, 1 hr 50 minutes after the first.
A discharge on 26th, for 33 minutes, followed low rainfall of up to 10.3 mm/hr. Rainfall increased through the discharge period to 24mm/hr.

November - A conductivity switch was installed in the chamber to increase the sensitivity of detection. A total of 25 discharges were recorded during the month (Fig. 5). Of these, only four were triggered by moderate to high rainfall/intensities.

On the 9th a discharge of 25 hrs 08 min followed 50 minutes of moderate rainfall, up to 24 mm/hr. Rainfall intensities during the discharge period were low (Fig. 7).
On the 15th, moderate rainfall of up to 36 mm/hr triggered a discharge of 2 hrs 30 min. The rain continued at these intensities for 30 minutes into the discharge.
High rainfall intensities (max 72 mm/hr) triggered a discharge for 58 minutes on the 26th. Rainfall moderated during the discharge. Intensities up to 14.4 mm/hr followed, resulting in a second discharge, 11 minutes after the first, of 1 hr 25 min duration (Fig. 8).
During the month 21 discharges occurred in the absence of any significant rainfall. These varied from 5 minutes in duration, to a discharge of 58 hrs 28 min commencing on the 11th (Fig. 8).

December - Six discharges occurred during the period (Fig. 6), none were triggered by significant rainfall (< 15 mm/hr), though high rainfall intensities were recorded in the latter period of a discharge on the 3rd. Durations ranged from 1 min to 4 hrs 04 min.

3.2 Afan Catchment - Gwaun Afon CSO and Tonmawr CSO

A total of 33 discrete discharges were detected from the CSO at Gwaun Afon (Figs. 9 - 14; Appendix 1). These varied in duration from 40 seconds to 1 hr 37 minutes. One discharge was detected under dry weather conditions and 11 under low intensity rainfall. Only 3 discharges were detected at Tonmawr CSO during the monitoring period, one of which was during dry weather conditions for a period of 5 days 2 hours 22 minutes (Figs. 9 - 14; Appendix 1).

July - Four discharges were detected at Gwaun Afon and no discharges at Tonmawr (Fig. 9).

A discharge of 15 minutes on the 14th was preceded by moderate rainfall up to 18 mm/hr. Intensities continued through the discharge period, triggering a second discharge of 8 minutes duration, 16 minutes later. A further discharge on the 14th, of 40 seconds duration, was preceded by heavy and prolonged rainfall of up to 72 mm/hr.
A discharge of 11 minutes on the 17th followed low rainfall, up to 10.3mm/hr. Heavy and prolonged rainfall was recorded at the rain gauge just over an hour after the event. Due to the 4km distance between the CSO and the rain-gauge it is possible that the rain front arrived at Cwmafan before Tonmawr, accounting for the time-lag.
Short duration high intensity rainfall, up to 72 mm/hr, was detected in the absence of discharges.

August - Negligible rainfall occurred throughout the month. No discharges were detected from Gwaun Afon CSO, while one discharge occurred under dry weather conditions at Tonmawr CSO for a period of 5 days 2 hours 22 minutes (Fig. 10). Inspections undertaken by Neath Borough Council showed the discharge to be due to a blockage.

September - A total of 3 discharges were detected from Gwaun Afon, and none from Tonmawr (Fig. 11).
Discharges ranged from 14 minutes to 45 minutes, and all occurred under conditions of low rainfall (< 3.6 mm/hr).
Heavy rainfall on the 24th, up to 74 mm/hr, did not result in a discharge.

October - Eight discharges were recorded from Gwaun Afon, and 2 from Tonmawr, all associated with moderate to heavy rainfall (Fig. 12).
Heavy rain occurred on the 3rd and 4th (72mm/hr), with no associated discharges.
Three discharges on the 6th (25, 7, and 28 minutes), from Gwaun Afon CSO, followed moderate rainfall, with intensities up to 36 mm/hr.
A discharge of 49 minutes on the 7th, at Gwaun Afon CSO, followed prolonged low

intensity rainfall (9 hours, max 10.3mm/hr). This was followed by a further discharge of 27 minutes, 9 mins after the first discharge (max 14.4 mm/hr).
Moderate rainfall on the 24th (max 24 mm/hr), from 1222 hrs, resulted in a discharge of 27 mins duration at Gwaun Afon. Continuing rainfall, increasing in intensity (max. 144 mm/hr), triggered both Gwaun Afon and Tonmawr CSO's for 28 min and 7 min respectively. Further heavy rain (144 mm/hr) triggered both CSO's for 1 hour 11 min and 10 min respectively (Fig. 15).

November - 17 discharges were recorded from Gwaun Afon CSO during the month, but no discharges were recorded at Tonmawr (Fig. 13).
A number of discharges followed prolonged low to moderate intensity rainfall:-
Two discharges on the 9th (1hr 37 min and 39 min, max 24 mm/hr), one on the 11th (1hr 12 min, max 36 mm/hr), 12th (18 min, max. 10.3 mm/hr), 14th (20 min, low intensity) and two on the 21st (53 min & 2 min, low intensity).

On the 24th a discharge of 19 minutes followed 1.5 hours of low to moderate rainfall (max 18 mm/hr). Rainfall continued through to a second discharge of 44 minutes, approximately 1 hour later. A discharge on the 25th for 7 minutes occurred in the absence of rain. A discharge of 1 hour on the 26th followed 1.5 hours of moderate to high rainfall intensities (max. 72mm/hr) (Fig. 16).
Three discharges occurred on the 27th. The first (21 mins) followed low rainfall, intensities. These increased to a maximum of 72 mm/hr, triggering two further discharges of 28 mins and 2 mins. A discharge of 14 mins on the 29th followed low to moderate rainfall (Fig. 16).

December - One discharge was detected from Gwaun Afon during the month, but none from Tonmawr.
A discharge of 1 hour 10 min followed 30 minutes of low intensity rainfall up to 5.5 mm/hr (Fig. 14).

4.0 Discussion

Bedford Rd. CSO

Prior to the installation of the conductivity switch a total of 12 discharges were detected, 8 of which were associated with periods of moderate to high rainfall intensities. During routine maintenance work carried out on the 5/10/95, the CSO was observed to be discharging without tripping the float switch. Detections for the period up to the 5/10/95 can therefore be taken as a minimum estimate. Slight modifications were made to the angle of deployment of the tilt switch but it is likely that the system continued to underestimate the frequency of discharge. A conductivity switch was therefore installed on the 2/11/95 (as soon as it was available). Following this the detected frequency of operation of the CSO increased. This increase was not associated with any apparent increase in rainfall intensity. The conductivity switch was run in conjunction with the float switch, and comparisons of the two data sets indicated only a 20% detection rate for the float switch at this CSO over the period 2/11/95 to 20/12/95.

Out of the total of 43 detected discharges from the Bedford Road CSO, 3/4 occurred under conditions of low or negligible rainfall. Two of these discharges continued for substantial time periods. This indicates that the system is heavily overloaded. The remaining discharges were associated with periods of moderate to high intensity rainfall.

Gwaun Afon CSO

One third of the discharges detected at this CSO occurred during low or negligible rainfall, indicating that the system is currently overloaded. Discharges tended to be associated with prolonged low to moderate rainfall intensities, or periods of high intensity rainfall. As for the Bedford Rd. CSO, the float switch will only give us a minimum estimate, and will not detect small overflows. However, the arrangement at this site was felt to be more effective than that at Bedford Rd., due to the high head of flow that a discharge would produce in the outlet pipe.

Tonmawr CSO

Only three discharges were detected during the monitoring period, two of which were associated with intense rainfall on 24/10/95, which also triggered the CSO at Gwaun Afon. Both discharges were of short duration. One instance of dry weather operation, commencing on the 25/08/95 at 1513 hours (of unknown duration), was detected in August. This was thought to have been caused by a blockage, as when the chamber was serviced, the float switch was discovered to be jammed by a ball of fat/sewage debris. This was later confirmed by Pollution Control, who were notified by Neath Borough Council that the blockage was cleared on the 31/8/95, just over 5 days after the start of the event was recorded.
The float switch arrangement will again only give us a minimum estimate, and will not detect low flow discharges. The detection rate at this site was considered to be satisfactory. The CSO would therefore appear to be working to design.

Efail Fach

The overflow consisted of a chamber with a shallow gulley running through the centre, carrying the sewage. An overflow pipe exited the chamber approximately 4 cm above the chamber floor. Due to the steep angle of the outlet pipe, this CSO was considered to be unsuitable for monitoring using a float switch. Given the small capacity of the chamber, small increases in flow would result in the chamber filling and the overflow functioning. Therefore we would expect the CSO to discharge on a frequent basis.

Conclusion

1. 43 discharges were detected from Bedford Road CSO during the monitoring period. Of these 31 occurred under conditions of low or negligible rainfall. This therefore suggests that the system is heavily overloaded.

2. 33 discharges were detected from Gwaun Afon CSO during the monitoring period, 12 of which were under conditions of low to negligible rainfall. Data indicates the system is overloaded.

3. Only three discharges were detected from Tonmawr CSO during the monitoring period. Available data therefore suggests the overflow is working according to design.

APPENDIX 1

Newloo sample channel sewer overflow state recording

Site Number: 0001
Site Name: BEDFORD RD CSO.

Date	Time	Inout level:
7 Jul 1995	11:22:00	SSO CLOSED
15 Jul 1995	04:16:00	SSO DISCHARGING
15 Jul 1995	04:17:30	SSO CLOSED
15 Jul 1995	04:35:20	SSO DISCHARGING
15 Jul 1995	04:54:10	SSO CLOSED
17 Jul 1995	04:37:20	SSO DISCHARGING
17 Jul 1995	04:40:20	SSO CLOSED
21 Jul 1995	00:00:00	SSO CLOSED
21 Jul 1995	15:01:40	SSO CLOSED
11 Aug 1995	10:20:40	SSO CLOSED
13 Sep 1995	00:00:00	SSO CLOSED
12 Sep 1995	14:11:50	SSO CLOSED
3 Oct 1995	15:55:00	SSO DISCHARGING
3 Oct 1995	16:03:00	SSO CLOSED
5 Oct 1995	10:29:00	SSO CLOSED
5 Oct 1995	10:37:10	SSO DISCHARGING
5 Oct 1995	12:53:40	SSO CLOSED
6 Oct 1995	06:56:50	SSO DISCHARGING
6 Oct 1995	07:12:00	SSO CLOSED
6 Oct 1995	07:24:50	SSO DISCHARGING
6 Oct 1995	07:40:00	SSO CLOSED
6 Oct 1995	11:20:30	SSO DISCHARGING
6 Oct 1995	11:48:40	SSO CLOSED
7 Oct 1995	13:11:20	SSO DISCHARGING
7 Oct 1995	14:08:10	SSO CLOSED
24 Oct 1995	17:26:30	SSO DISCHARGING
24 Oct 1995	18:05:30	SSO CLOSED
24 Oct 1995	21:00:40	SSO DISCHARGING
24 Oct 1995	21:53:00	SSO CLOSED
26 Oct 1995	17:00:20	SSO DISCHARGING
26 Oct 1995	17:03:00	SSO CLOSED
26 Oct 1995	17:03:50	SSO DISCHARGING
26 Oct 1995	17:33:50	SSO CLOSED
2 Nov 1995	00:00:00	SSO CLOSED
2 Nov 1995	13:49:40	SSO CLOSED
8 Nov 1995	19:19:10	SSO DISCHARGING
8 Nov 1995	20:53:30	SSO CLOSED
8 Nov 1995	21:10:30	SSO DISCHARGING
8 Nov 1995	22:28:10	SSO CLOSED
9 Nov 1995	01:58:20	SSO DISCHARGING
9 Nov 1995	02:45:10	SSO CLOSED
9 Nov 1995	05:34:50	SSO DISCHARGING
9 Nov 1995	10:15:00	SSO CLOSED
9 Nov 1995	12:11:00	SSO DISCHARGING
10 Nov 1995	13:19:40	SSO CLOSED
10 Nov 1995	13:28:10	SSO DISCHARGING
10 Nov 1995	13:40:40	SSO CLOSED
10 Nov 1995	14:15:00	SSO DISCHARGING
10 Nov 1995	15:26:00	SSO CLOSED
10 Nov 1995	15:33:00	SSO DISCHARGING
10 Nov 1995	15:45:10	SSO CLOSED
10 Nov 1995	18:22:10	SSO DISCHARGING

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10 Nov 1995  21:41:10  SSO CLOSED
11 Nov 1995  06:42:30  SSO DISCHARGING
13 Nov 1995  17:10:40  SSO CLOSED
13 Nov 1995  17:33:50  SSO DISCHARGING
13 Nov 1995  17:46:50  SSO CLOSED
13 Nov 1995  18:12:30  SSO DISCHARGING
13 Nov 1995  18:47:10  SSO DISCHARGING
Fouled (duration not known)
15 Nov 1995  22:06  SSO DISCHARGING
16 Nov 1995  00:36  SSO CLOSED
16 Nov 1995  00:54  SSO DISCHARGING
16 Nov 1995  00:59  SSO CLOSED
21 Nov 1995  04:13  SSO DISCHARGING
21 Nov 1995  04:42  SSO CLOSED
21 Nov 1995  04:59  SSO DISCHARGING
Fouled (duration not known)
24 Nov 1995  09:39  SSO DISCHARGING
24 Nov 1995  09:49  SSO CLOSED
24 Nov 1995  10:13  SSO DISCHARGING
24 Nov 1995  10:28  SSO CLOSED
24 Nov 1995  12:45  SSO DISCHARGING
24 Nov 1995  13:13  SSO CLOSED
26 Nov 1995  16:34  SSO DISCHARGING
26 Nov 1995  17:32  SSO CLOSED
26 Nov 1995  17:43  SSO DISCHARGING
26 Nov 1995  19:08  SSO CLOSED
27 Nov 1995  15:49  SSO DISCHARGING
27 Nov 1995  18:17  SSO CLOSED
28 Nov 1995  10:10  SSO DISCHARGING
28 Nov 1995  10:50  SSO CLOSED
28 Nov 1995  16:34:10  SSO CLOSED
28 Nov 1995  17:02:30  SSO DISCHARGING
28 Nov 1995  18:10:10  SSO CLOSED
29 Nov 1995  08:44:20  SSO DISCHARGING
29 Nov 1995  10:20:30  SSO CLOSED
 3 Dec 1995  11:20:00  SSO DISCHARGING
 3 Dec 1995  15:12:20  SSO CLOSED
 6 Dec 1995  00:00:00  SSO CLOSED
 6 Dec 1995  12:27:50  SSO CLOSED
 6 Dec 1995  16:19:40  SSO DISCHARGING
 6 Dec 1995  16:23:40  SSO CLOSED
17 Dec 1995  09:08:10  SSO DISCHARGING
17 Dec 1995  11:37:20  SSO CLOSED
17 Dec 1995  11:53:50  SSO DISCHARGING
17 Dec 1995  12:56:30  SSO CLOSED
19 Dec 1995  22:22:00  SSO DISCHARGING
20 Dec 1995  02:26:50  SSO CLOSED
20 Dec 1995  06:03:30  SSO DISCHARGING
20 Dec 1995  06:04:30  SSO CLOSED
End of data
```

Newlog single channel sewer overflow state record:

Site Number: 0002
Site Name: CWM..... GWAUN AFON

Date	Time	Input level:
7 Jul 1995	12:54:40	SSO CLOSED
10 Jul 1995	16:30:10	SSO CLOSED
10 Jul 1995	16:32:10	SSO CLOSED
14 Jul 1995	04:43:30	SSO DISCHARGING
14 Jul 1995	05:03:20	SSO CLOSED
14 Jul 1995	05:19:10	SSO DISCHARGING
14 Jul 1995	05:27:50	SSO CLOSED
14 Jul 1995	18:57:00	SSO DISCHARGING
14 Jul 1995	18:57:40	SSO CLOSED
17 Jul 1995	01:26:20	SSO DISCHARGING
17 Jul 1995	01:37:30	SSO CLOSED
21 Jul 1995	00:00:00	SSO CLOSED
21 Jul 1995	15:57:00	SSO CLOSED
11 Aug 1995	11:09:10	SSO CLOSED
7 Sep 1995	23:53:10	SSO DISCHARGING
8 Sep 1995	00:29:30	SSO CLOSED
10 Sep 1995	09:07:10	SSO DISCHARGING
10 Sep 1995	09:21:50	SSO CLOSED
11 Sep 1995	17:59:10	SSO DISCHARGING
11 Sep 1995	18:44:00	SSO CLOSED
11 Sep 1995	18:44:10	SSO DISCHARGING
11 Sep 1995	18:44:30	SSO CLOSED
13 Sep 1995	00:00:00	SSO CLOSED
5 Oct 1995	11:34:10	SSO CLOSED
6 Oct 1995	06:46:20	SSO DISCHARGING
6 Oct 1995	07:11:30	SSO CLOSED
6 Oct 1995	07:23:40	SSO DISCHARGING
6 Oct 1995	07:30:30	SSO CLOSED
6 Oct 1995	19:26:50	SSO DISCHARGING
6 Oct 1995	19:54:20	SSO CLOSED
7 Oct 1995	10:03:20	SSO DISCHARGING
7 Oct 1995	10:52:40	SSO CLOSED
7 Oct 1995	11:01:30	SSO DISCHARGING
7 Oct 1995	11:28:10	SSO CLOSED
24 Oct 1995	15:49:20	SSO DISCHARGING
24 Oct 1995	16:16:40	SSO CLOSED
24 Oct 1995	17:15:50	SSO DISCHARGING
24 Oct 1995	17:43:20	SSO CLOSED
24 Oct 1995	20:51:10	SSO DISCHARGING
24 Oct 1995	22:02:20	SSO CLOSED
2 Nov 1995	00:00:00	SSO CLOSED
2 Nov 1995	12:14:40	SSO CLOSED
9 Nov 1995	07:27:20	SSO DISCHARGING
9 Nov 1995	09:04:10	SSO CLOSED
9 Nov 1995	11:10:40	SSO DISCHARGING
9 Nov 1995	11:49:10	SSO CLOSED
11 Nov 1995	22:32:20	SSO DISCHARGING
11 Nov 1995	23:44:00	SSO CLOSED
12 Nov 1995	19:06:40	SSO DISCHARGING
12 Nov 1995	19:24:40	SSO CLOSED
14 Nov 1995	17:35:00	SSO DISCHARGING
14 Nov 1995	17:55:00	SSO CLOSED

15	Nov	1995	00:00:00	SSO CLOSED
15	Nov	1995	11:13:10	SSO CLOSED
15	Nov	1995	18:24:00	SSO DISCHARGING
15	Nov	1995	18:40:10	SSO CLOSED
21	Nov	1995	07:25:20	SSO DISCHARGING
21	Nov	1995	08:18:00	SSO CLOSED
21	Nov	1995	08:54:10	SSO DISCHARGING
21	Nov	1995	08:56:00	SSO CLOSED
24	Nov	1995	09:06:40	SSO DISCHARGING
24	Nov	1995	09:25:10	SSO CLOSED
24	Nov	1995	10:30:40	SSO DISCHARGING
24	Nov	1995	11:14:10	SSO CLOSED
25	Nov	1995	12:12:00	SSO DISCHARGING
25	Nov	1995	12:16:50	SSO CLOSED
25	Nov	1995	12:18:00	SSO DISCHARGING
25	Nov	1995	12:19:10	SSO CLOSED
26	Nov	1995	17:26:30	SSO DISCHARGING
26	Nov	1995	18:26:20	SSO CLOSED
27	Nov	1995	12:51:50	SSO DISCHARGING
27	Nov	1995	13:12:10	SSO CLOSED
27	Nov	1995	13:45:50	SSO DISCHARGING
27	Nov	1995	14:13:50	SSO CLOSED
27	Nov	1995	14:51:30	SSO DISCHARGING
27	Nov	1995	14:53:40	SSO CLOSED
29	Nov	1995	08:15:30	SSO DISCHARGING
29	Nov	1995	08:39:30	SSO CLOSED
6	Dec	1995	00:00:00	SSO CLOSED
6	Dec	1995	11:11:30	SSO CLOSED
19	Dec	1995	22:23:30	SSO DISCHARGING
19	Dec	1995	23:33:20	SSO CLOSED
20	Dec	1995	00:00:00	SSO CLOSED

End of data

Newlog single channel sewer overflow state recording

Site Number: 0001
Site Name: TONMAWR.....

Date	Time	Input level:
21 Jul 1995	16:14:20	SSO CLOSED
11 Aug 1995	11:22:00	SSO CLOSED
25 Aug 1995	15:13:10	SSO DISCHARGING
30 Aug 1995	17:35:00	SSO CLOSED
13 Sep 1995	13:17:10	SSO CLOSED
5 Oct 1995	11:56:40	SSO CLOSED
24 Oct 1995	17:24:10	SSO DISCHARGING
24 Oct 1995	17:31:10	SSO CLOSED
24 Oct 1995	21:23:30	SSO DISCHARGING
24 Oct 1995	21:33:50	SSO CLOSED
2 Nov 1995	00:00:00	SSO CLOSED
2 Nov 1995	12:29:00	SSO CLOSED
15 Nov 1995	00:00:00	SSO CLOSED
6 Dec 1995	11:30:50	SSO CLOSED
20 Dec 1995	00:00:00	SSO CLOSED

End of data

Appendix 2

Text in Wordperfect:

G:\CATCHMEN\AFANKENF\REPORTS\TECHMEMO\WTM96_06.wpd

Data in RS1:

Acidw @CSO@AFANKENFIG

BEDCSO - Bedford Rd discharge data
BEDR - Bedford Rd Rainfall data
KENFIG - combined rainfall/discharge

AFANCSO - Afan discharge data
AFANRAIN - Afan rain data
AFANCOM - combined rainfall/discharge

Fig. 1	KENJUL
Fig. 2	KENAUG
Fig. 3	KENSEP
Fig. 4	KENOCT
Fig. 5	KENNOV
Fig. 6	KENDEC
Fig. 7	KEN081195
Fig. 8	KEN241195
Fig. 9	AFANJUL
Fig.10	AFANAUG
Fig.11	AFANSEP
Fig.12	AFANOCT
Fig.13	AFANNOV
Fig.14	AFANDEC
Fig.15	AFAN241095
Fig.16	AFAN241195

Fig. 1 Relationship between CSO discharge and Rainfall intensity at Bedford Rd. CSO during July

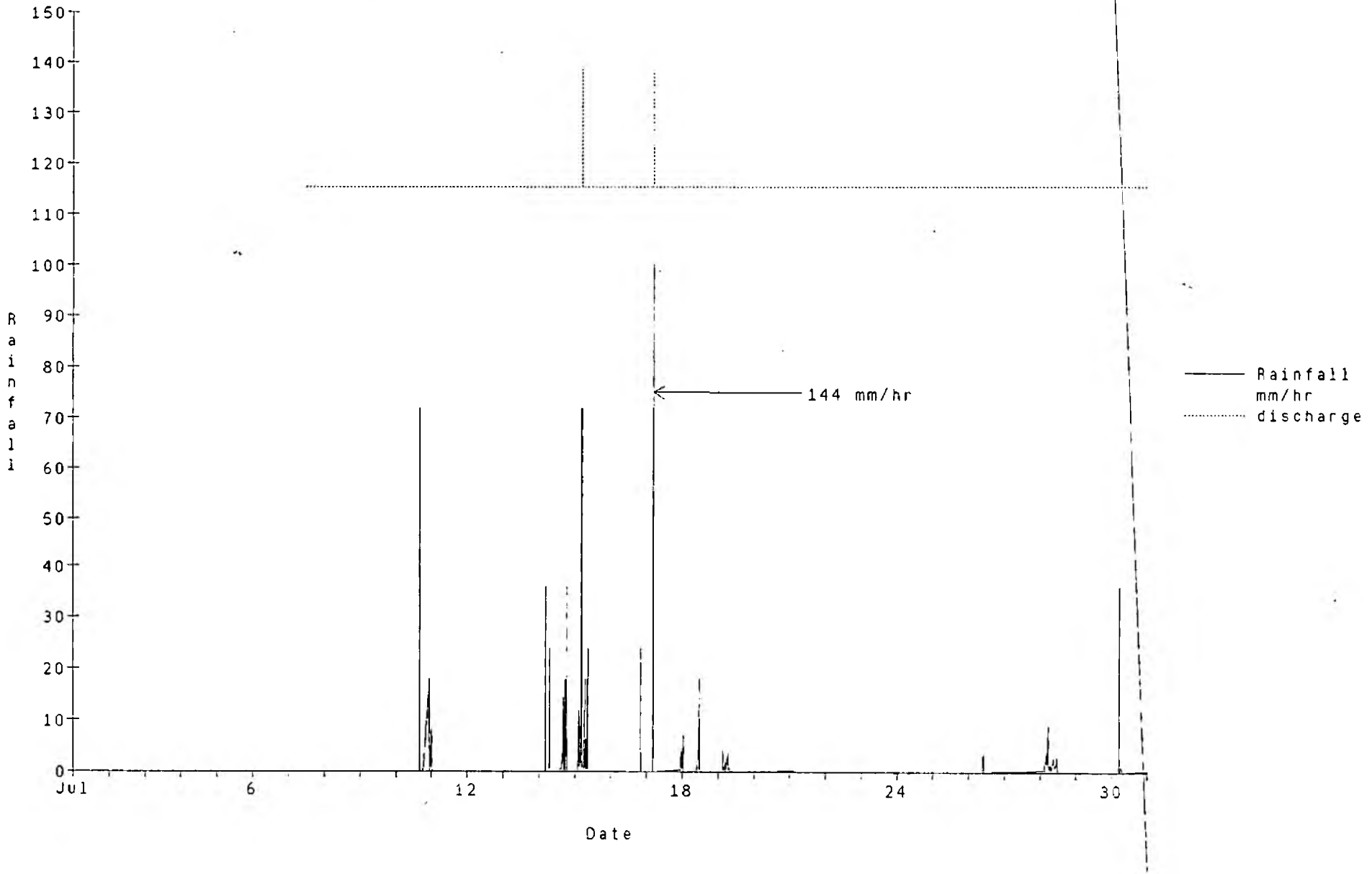

Fig. 2 Relationship between CSO discharge and Rainfall intensity at Bedford Rd. CSO during August

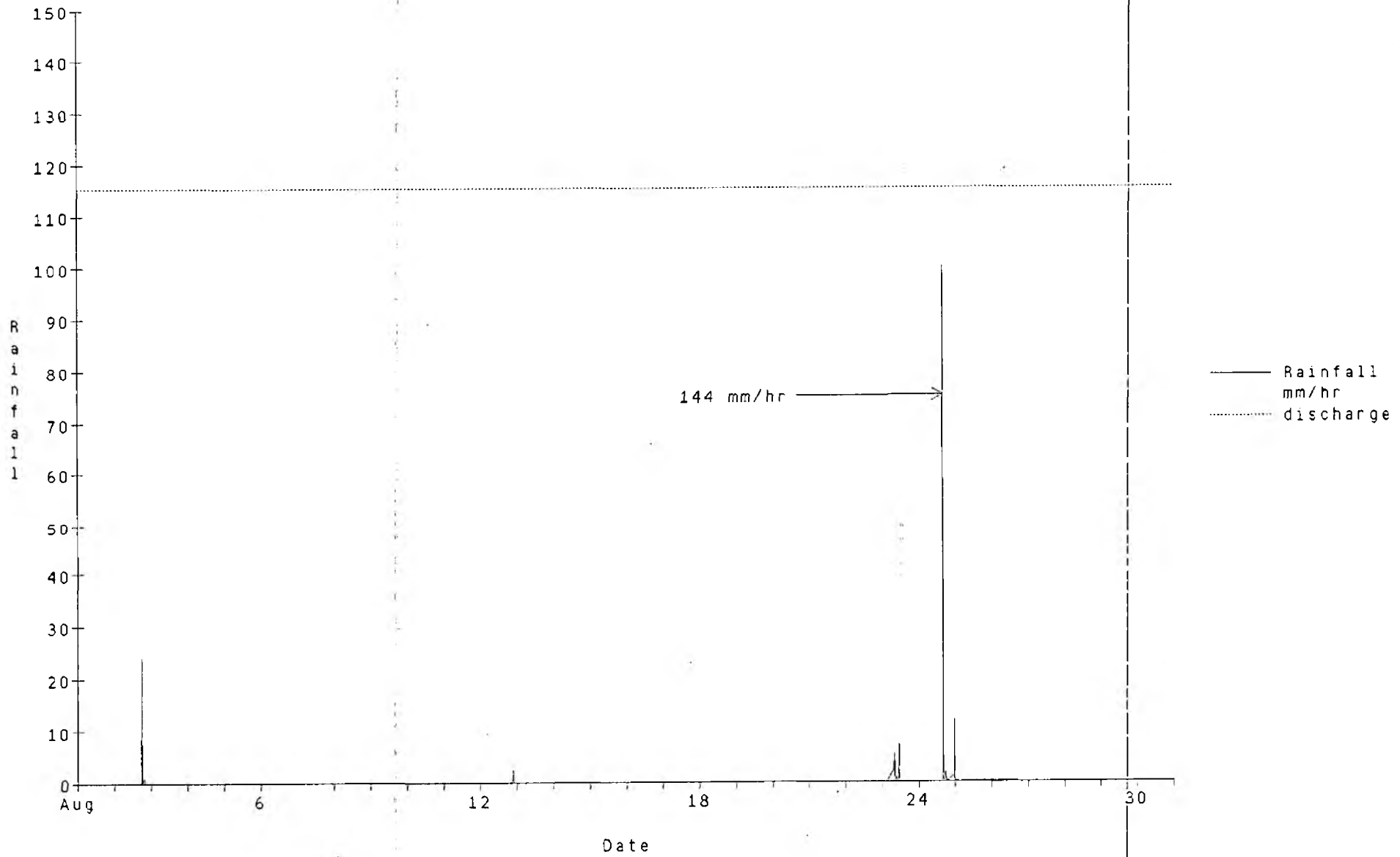

Fig. 3 Relationship between CSO discharge and Rainfall intensity at Bedford Rd. CSO during September

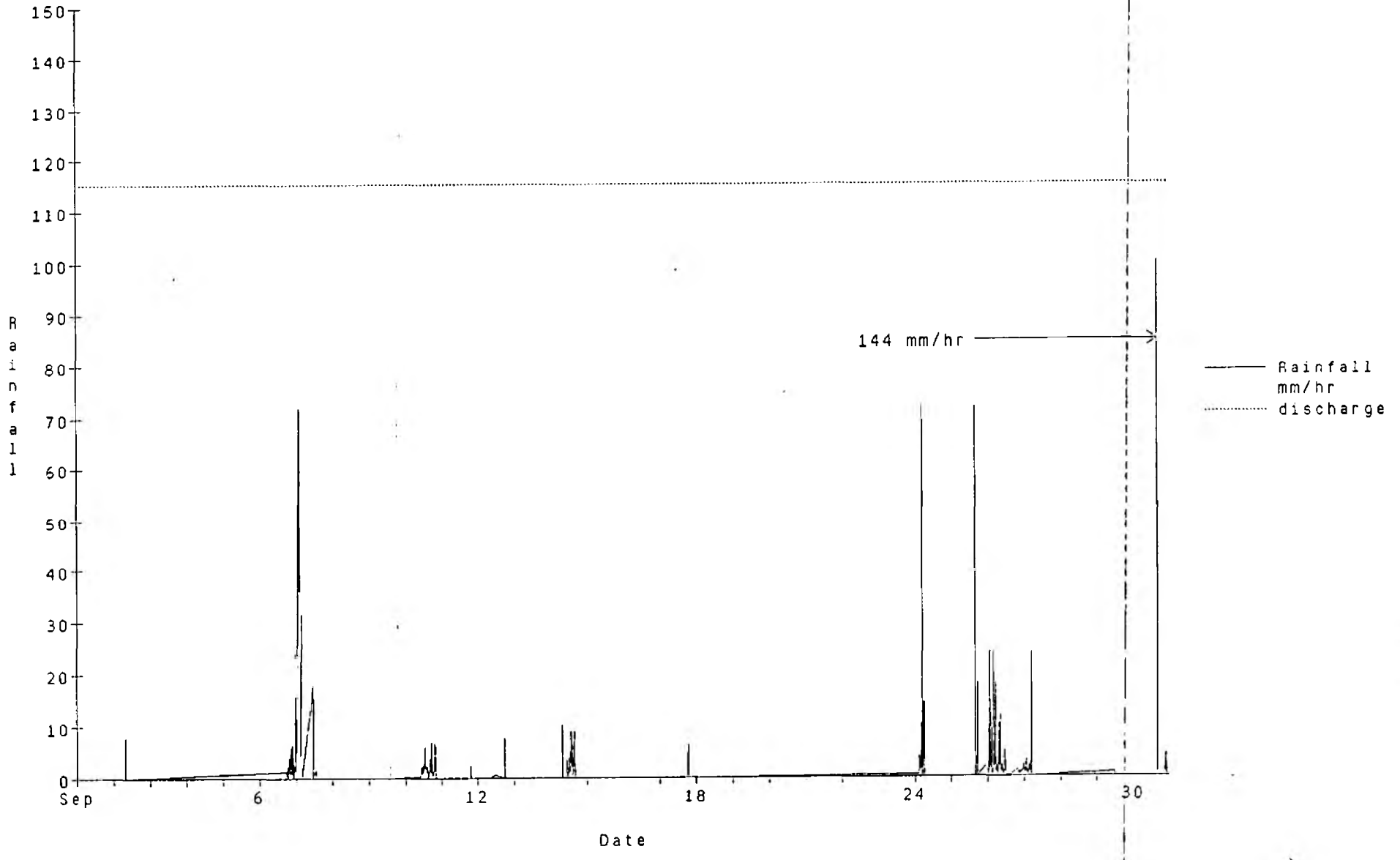

Fig. 4 Relationship between CSO discharge and Rainfall intensity at Bedford Rd. CSO during October

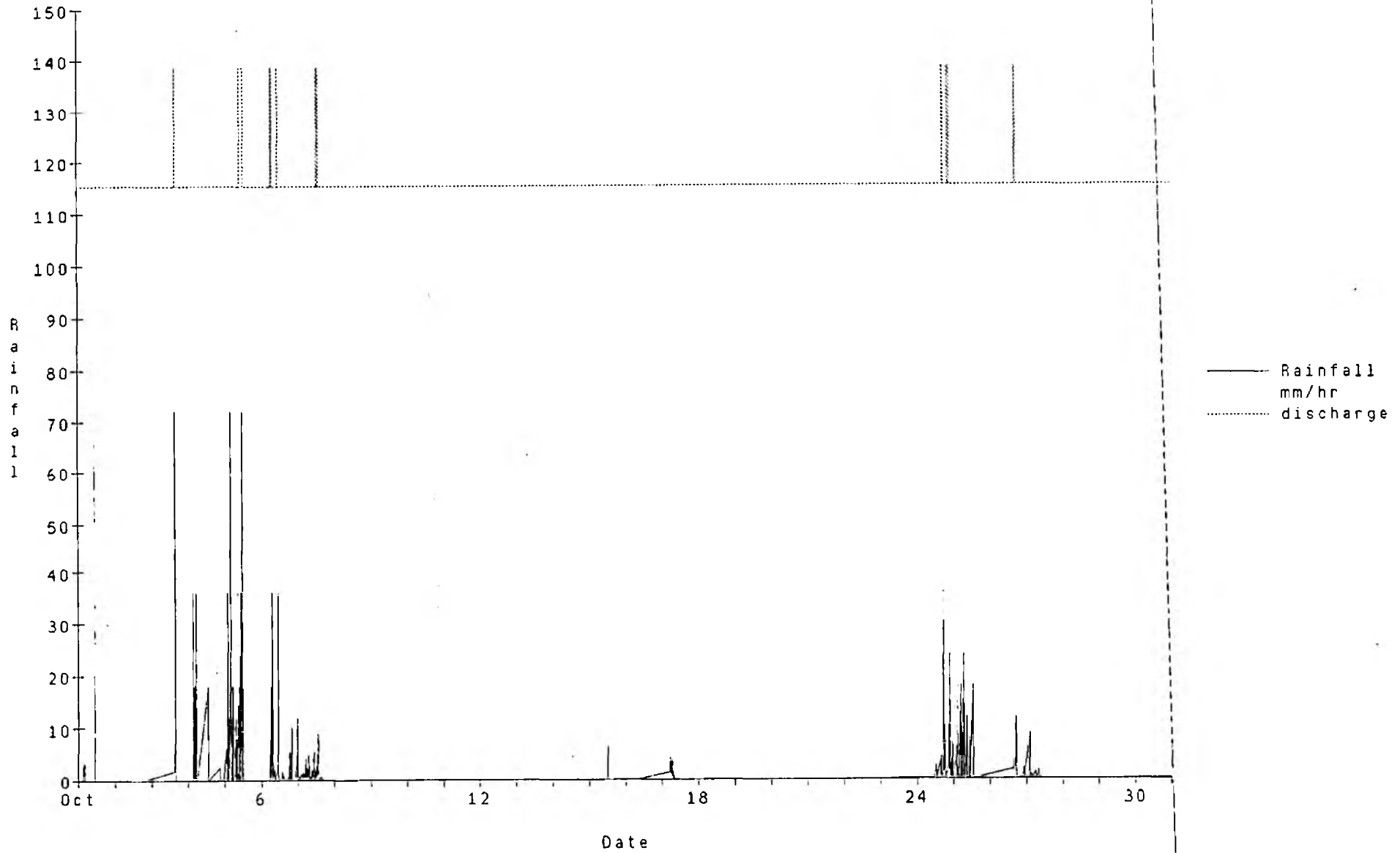

Fig. 5 Relationship between CSO discharge and Rainfall intensity at Bedford Rd. CSO during November

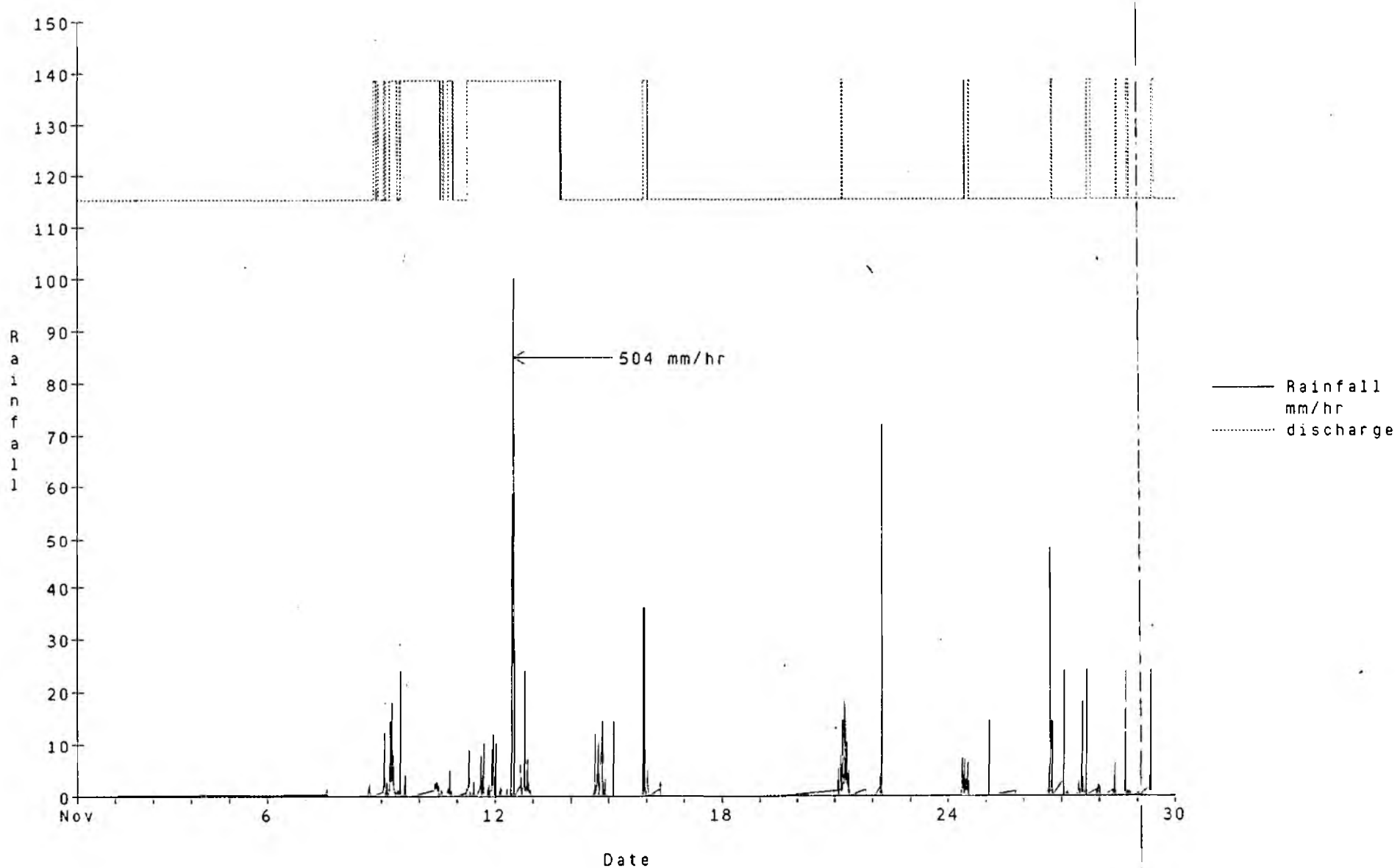

Fig. 6 Relationship between CSO discharge and Rainfall intensity at Bedford Rd. CSO during December

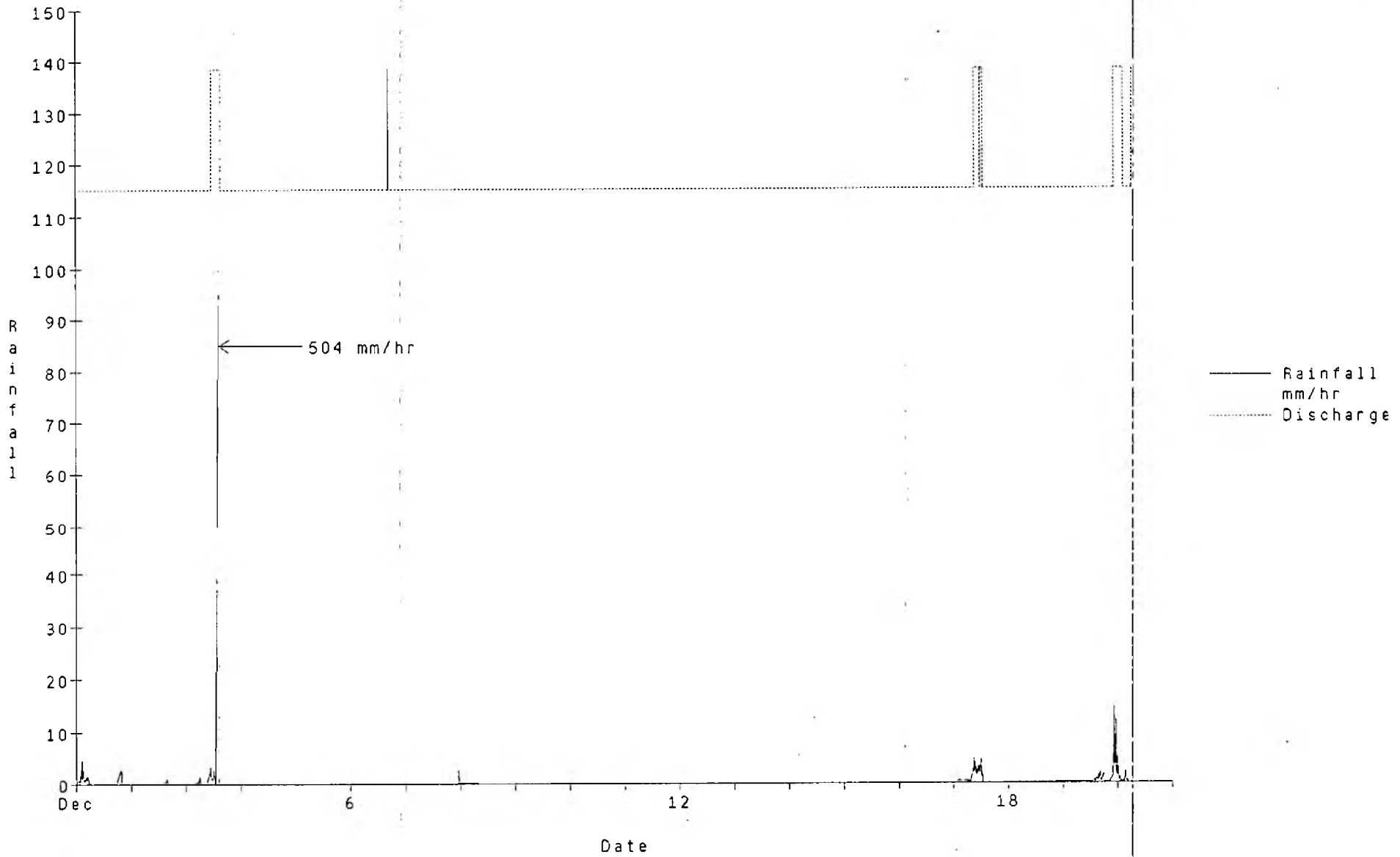

Fig. 7 Relationship between CSO discharge and Rainfall intensity at Bedford Rd. CSO, 8th - 13th November 1995

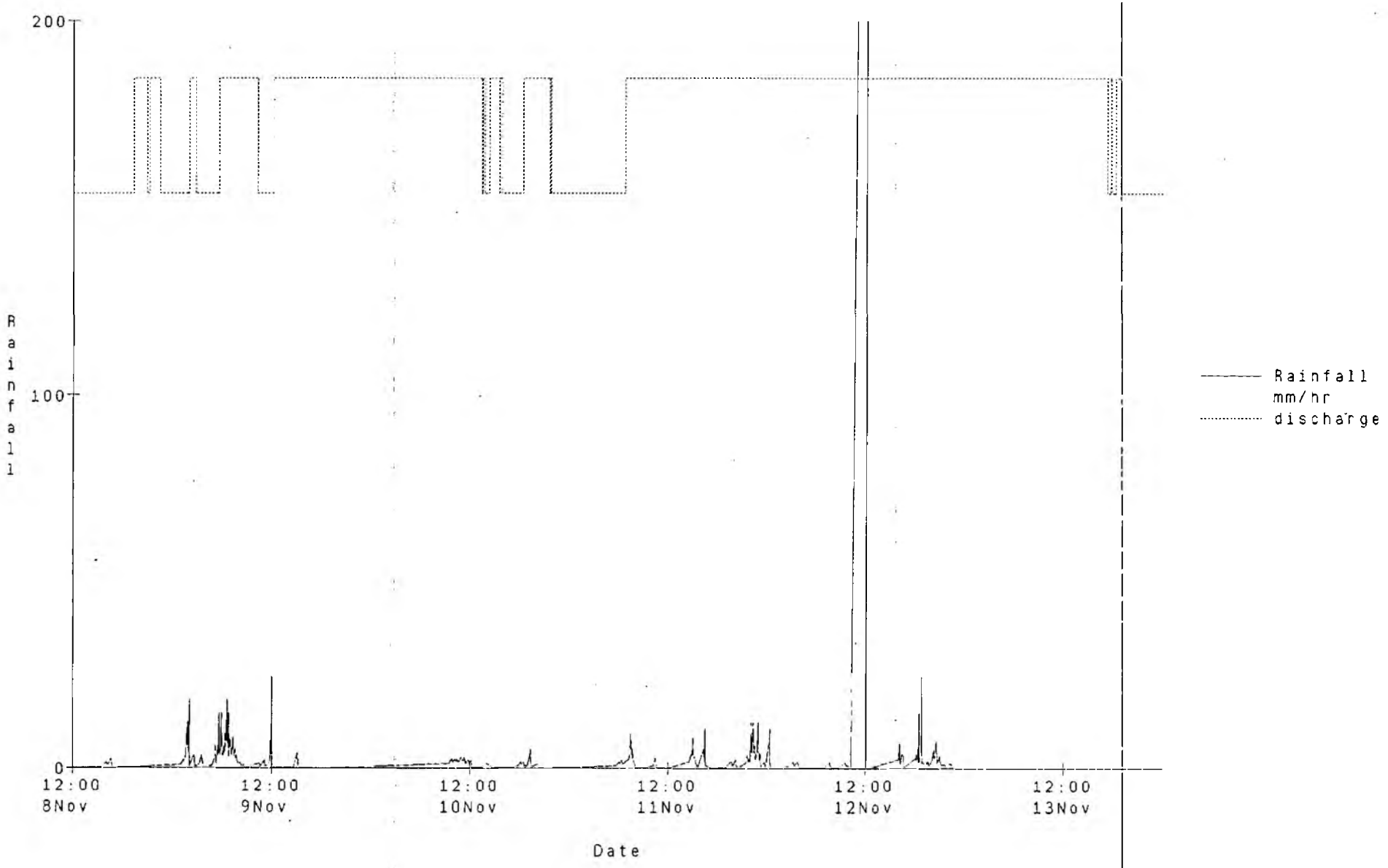

Fig. 8 Relationship between CSO discharge and Rainfall intensity at Bedford Rd. CSO, 24th - 29th November 1995

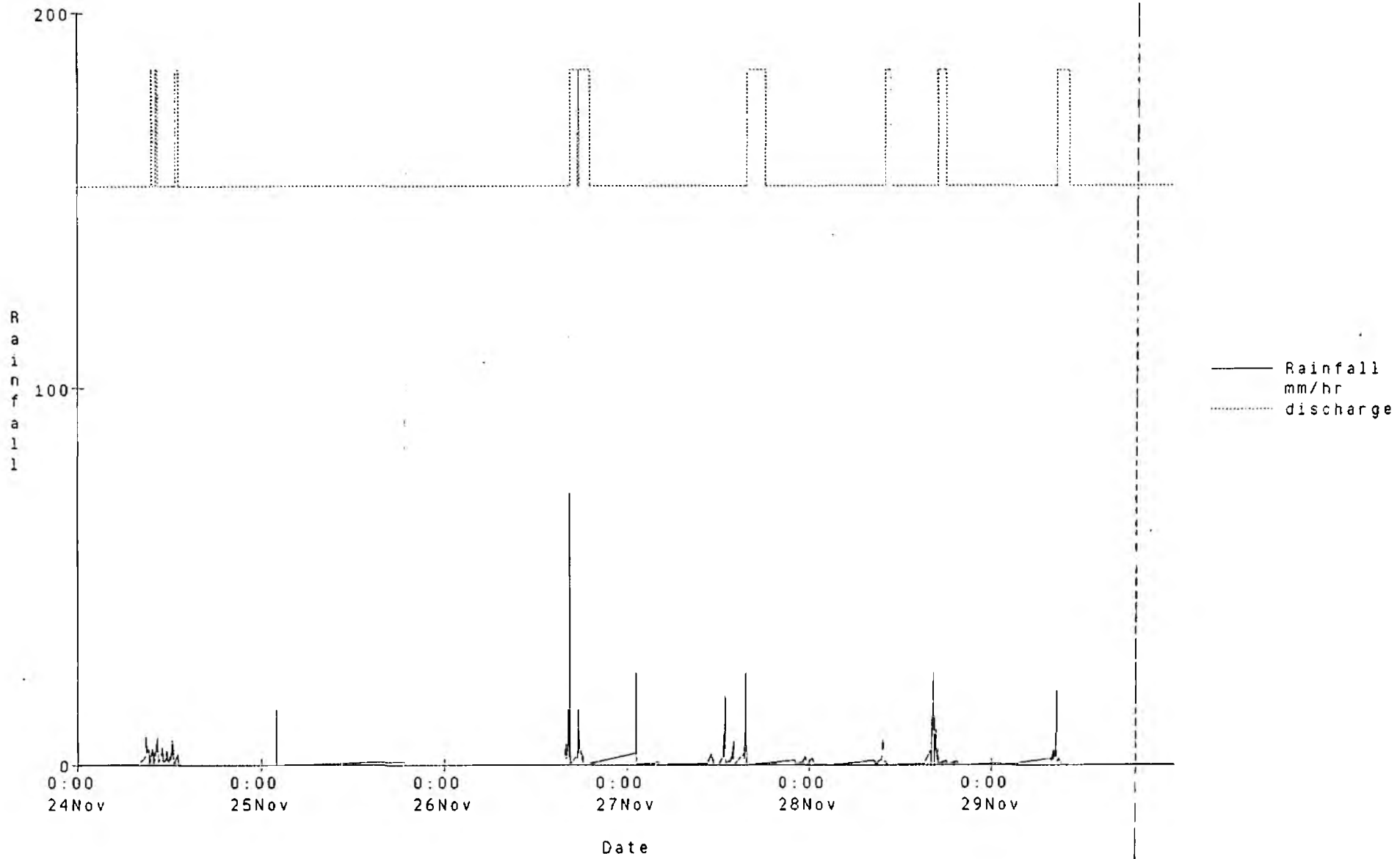

Fig. 9 Relationship between CSO discharge and Rainfall intensity for the Afan Catchment during July

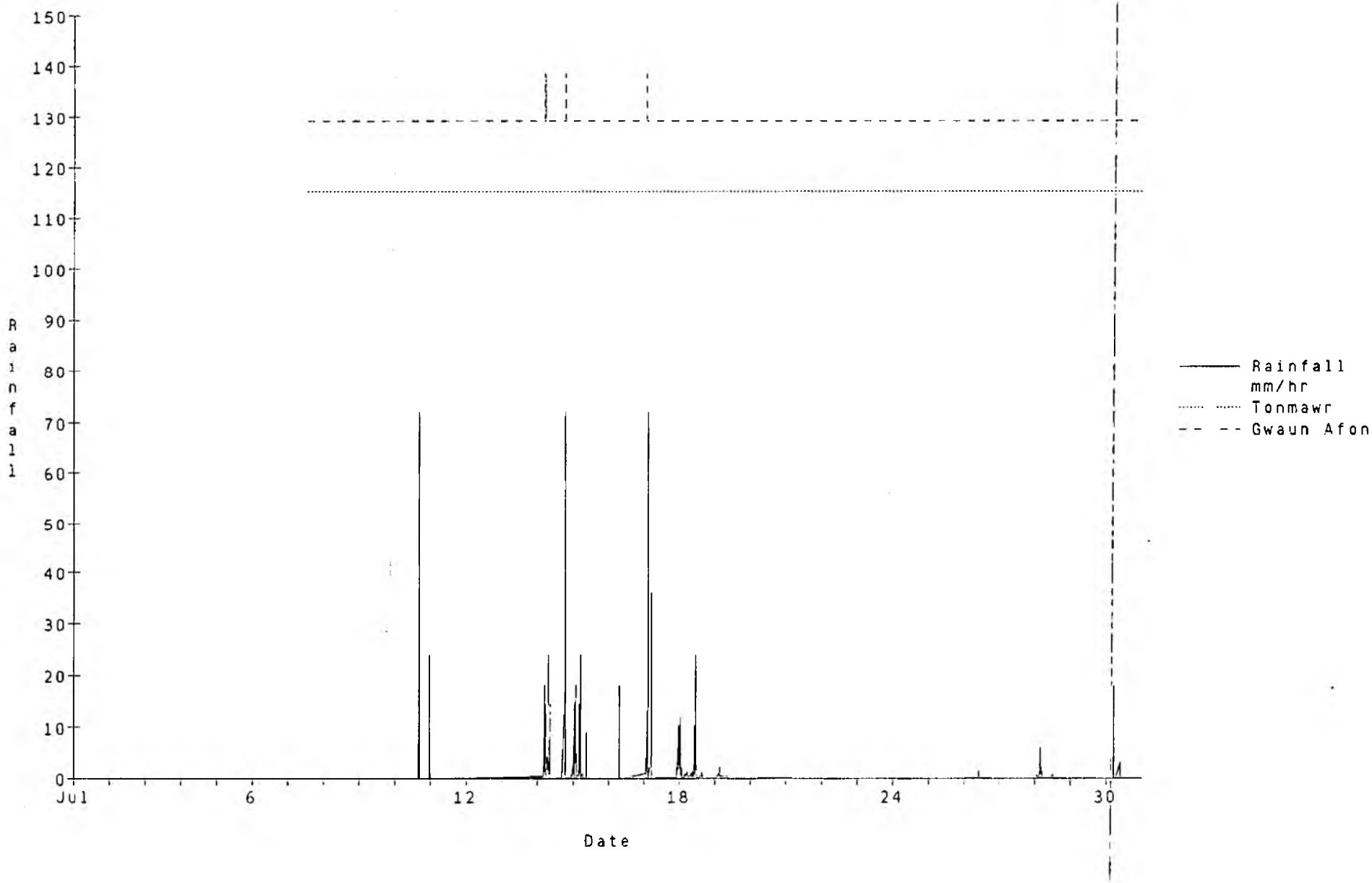

Fig. 10 Relationship between CSO discharge and Rainfall intensity for the Afan Catchment during August

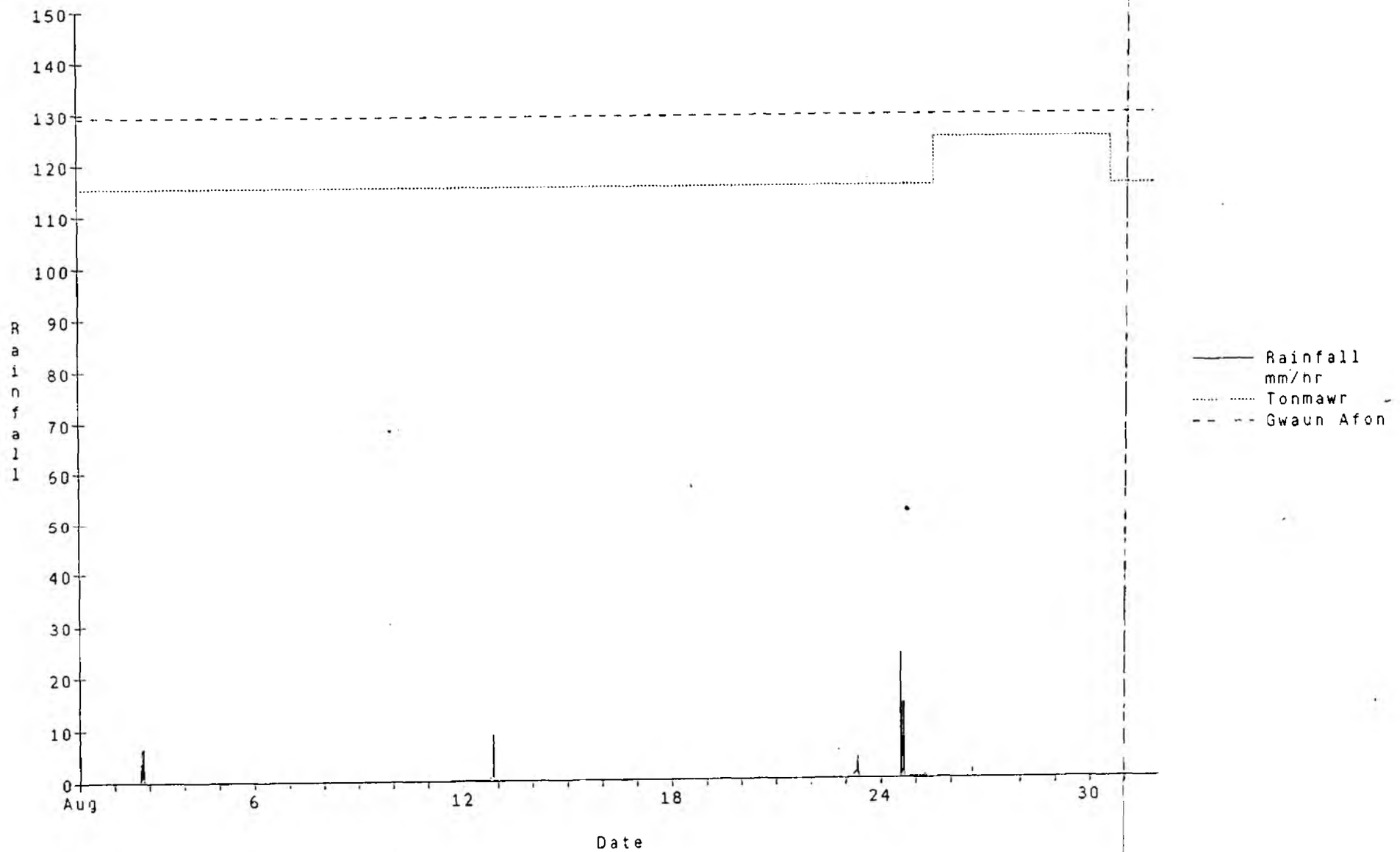

Fig. 11 Relationship between CSO discharge and Rainfall intensity for the Afan Catchment during September

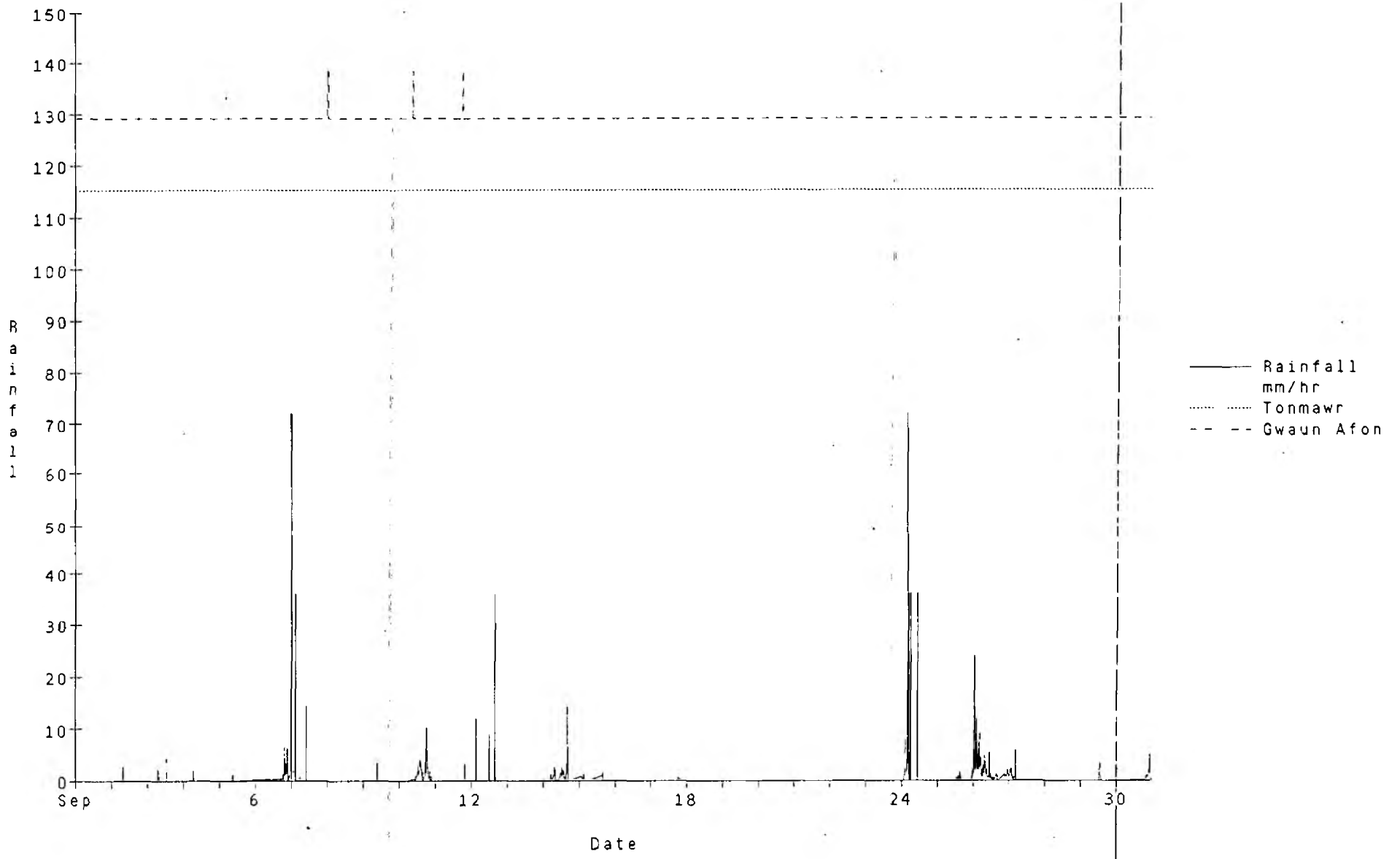

Fig. 12 Relationship between CSO discharge and Rainfall intensity for the Afan Catchment during October

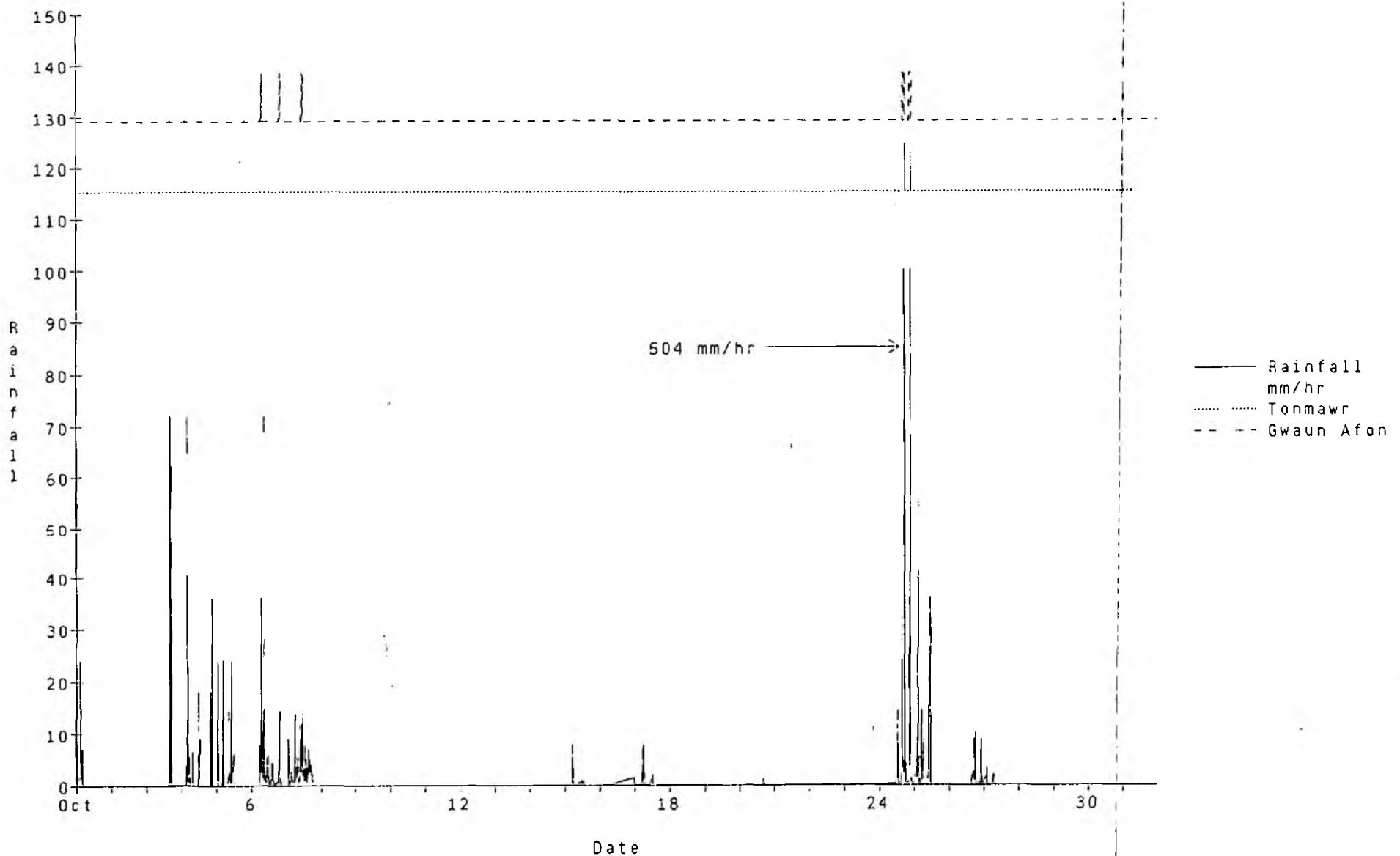

Fig. 13 Relationship between CSO discharge and Rainfall intensity for the Afan Catchment during November

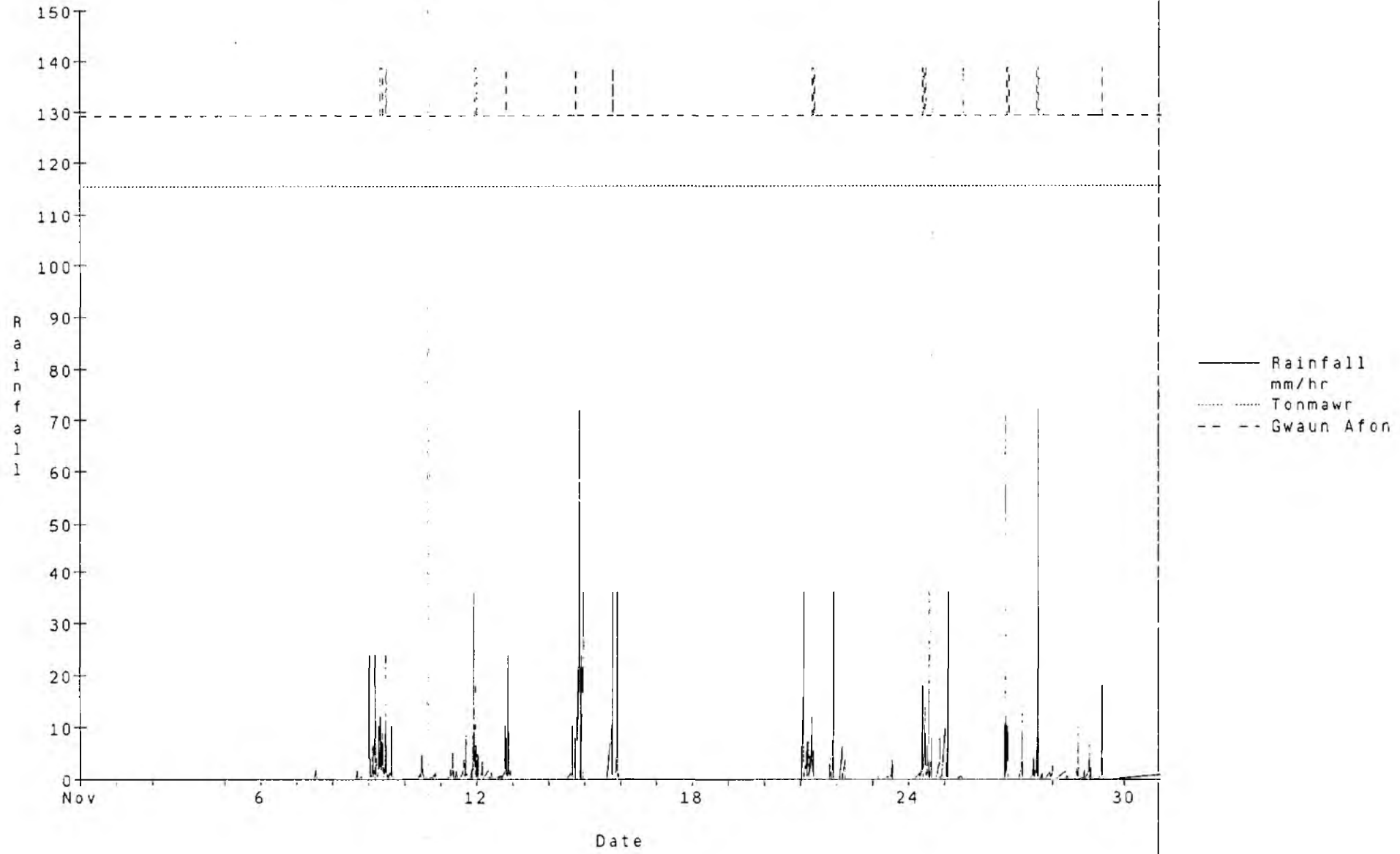

Fig. 14 Relationship between CSO discharge and Rainfall intensity for the Afan Catchment during December

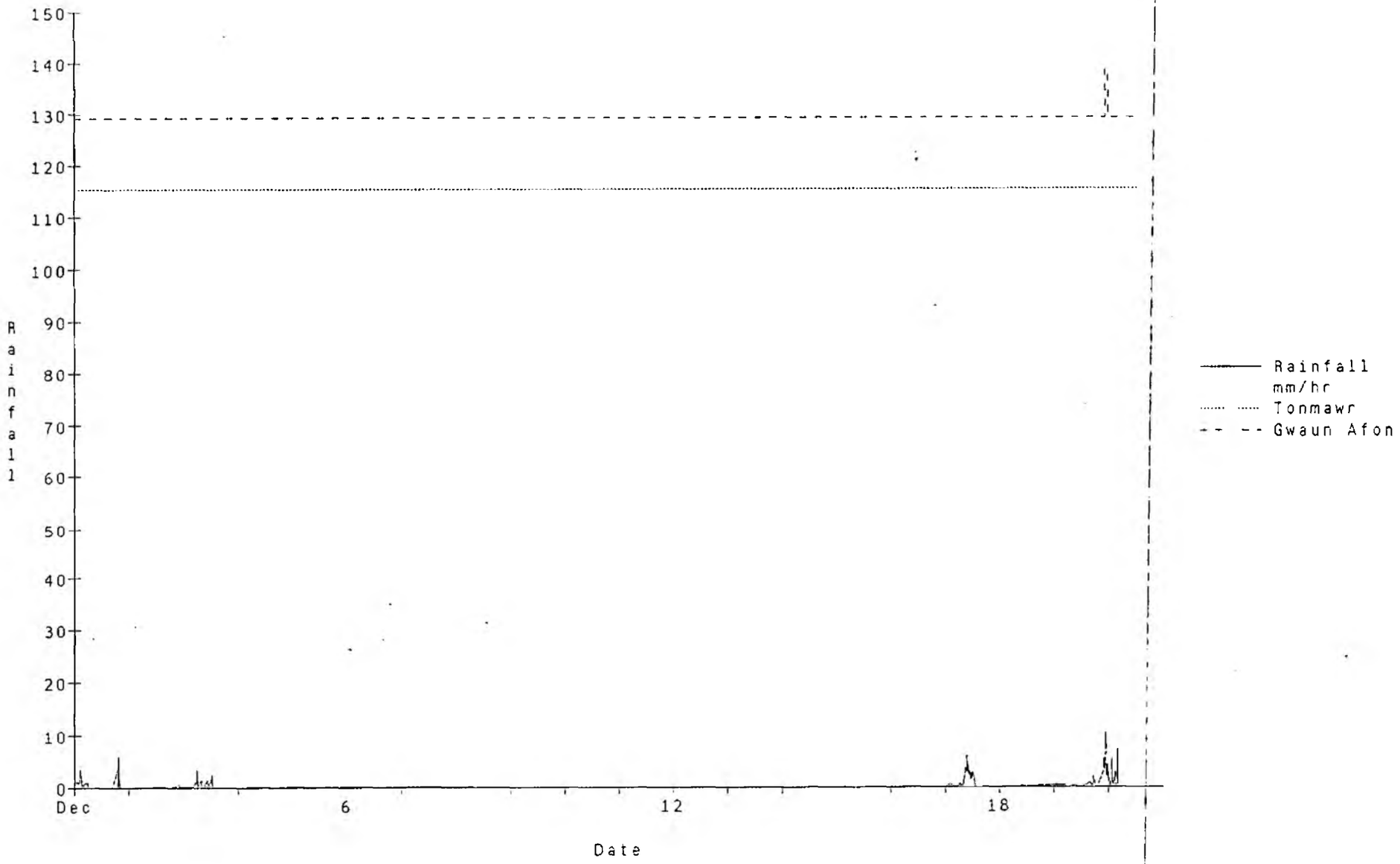

Fig. 15 Relationship between CSO discharge and Rainfall intensity for the Afan Catchment on 24/10/95

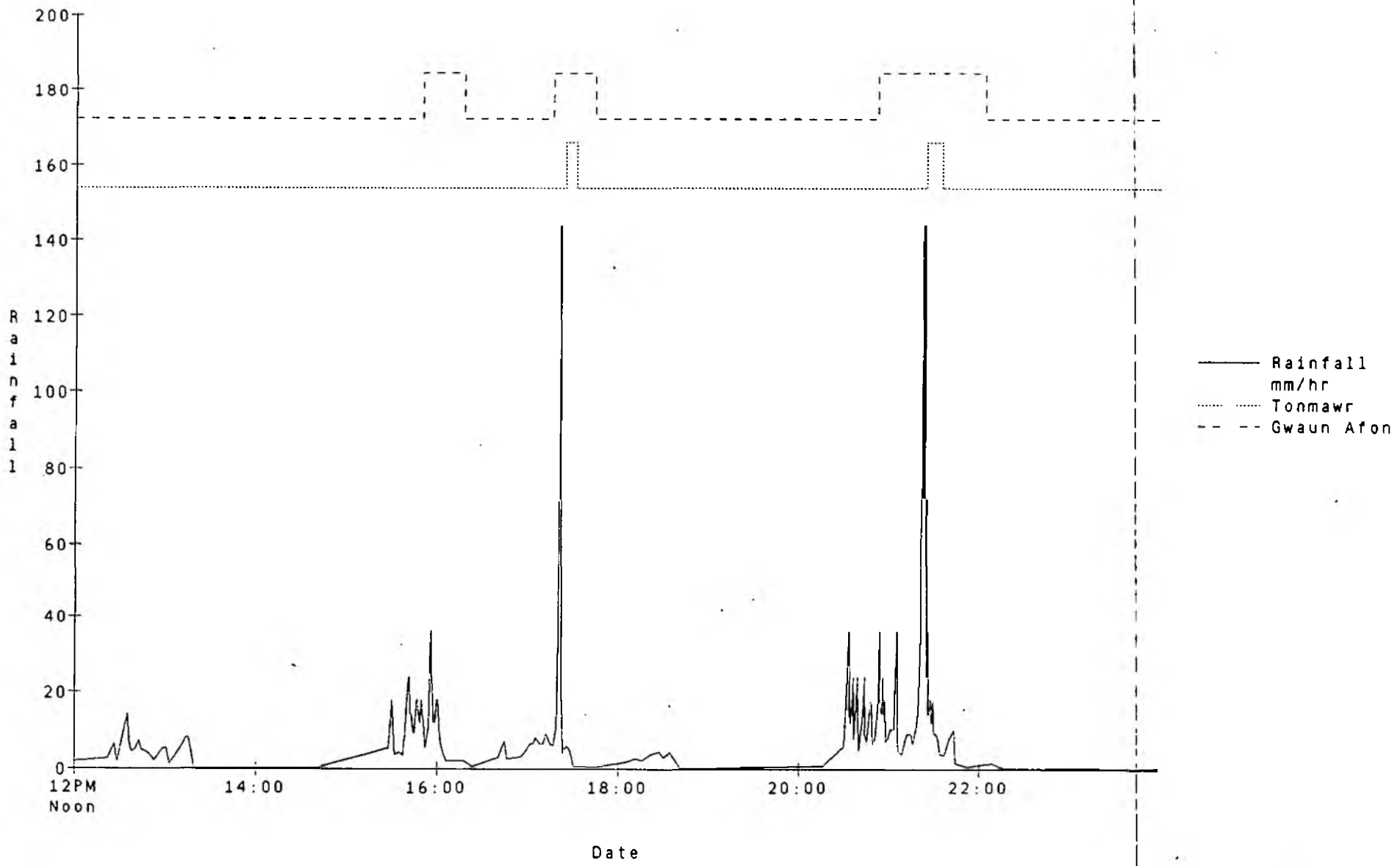

Fig. 16 Relationship between CSO discharge and Rainfall intensity for the Afan Catchment on 24th - 29th November 1995