

**ANGUS COUNCIL****ROADS COMMITTEE****1 DECEMBER 1998**

**BROTHOCK BURN**  
**FLOODING AT HUME STREET/LINDSAY STREET, ARBROATH**  
**ON 16<sup>TH</sup> OCTOBER 1998**

**REPORT BY THE DIRECTOR OF ROADS****ABSTRACT**

This Report outlines the possible cause of the flooding occurrence at Hume Street/Lindsay Street, Arbroath on the 16<sup>th</sup> October 1998 and gives details of the existing flood prevention measures, inspections, maintenance and recent alterations to the water course on the new supermarket site.

**1 RECOMMENDATIONS**

The Committee is requested to note:-

- (i) The history of the flooding and flood prevention arrangements in Arbroath.
- (ii) The inspection and maintenance regime in force and the implications of The Flood Prevention and Land Drainage (Scotland) Act 1997.
- (iii) The recent flooding occurrence and the alterations ongoing to a section of the Brothock Burn.

**2 INTRODUCTION**

In October 1976 and February 1977 severe flooding occurred in the built up area of Arbroath as a result of the Brothock Burn overflowing following exceptional rainfall and volumetric flows and high tides. In March 1977 consulting civil engineers were commissioned to investigate and report on the causes of flooding and propose measures to prevent the recurrence of such flooding.

Acting on the consulting engineers report Tayside Regional Council promoted a Flood Prevention scheme for the Brothock Water through the built up area of Arbroath i.e. from the north end of Dens Road to the outfall at the Harbour. The scheme involved the improvement of the flow characteristics of the channel and the raising of walls and

embankments to contain anticipated future flood flows. The scheme was completed in 1987. Since the completion of the scheme there has been no further occurrence of flooding in the built up area of Arbroath from the Brothock Water until last month's incident.

A new supermarket is being built on the site of the former Giddings and Lewis Fraser Engineering Works lying between the A932 (High Road Bridge) and Hume Street. The Brothock Burn was carried in culverts through the middle of the site below the engineering works. In order to build the supermarket centrally on the site the developer has opted to divert the Brothock Burn in a newly constructed culvert. The new line of the culvert is from the existing culvert at the north end of the site across to and running parallel with Orchard Street and then returning to the original line tying in at the existing bridge at Hume Street.

On 16<sup>th</sup> October the new culvert was carrying the burn but was not completed. The floor and side walls were fully completed but the roof slab was in the process of being cast and therefore the Burn was running in an open channel. After heavy rainfall on the 16<sup>th</sup> October the Brothock Burn spilled over upstream of Hume Street. The new petrol filling station within the supermarket site was flooded. Flood water entered Hume Street and proceeded down Lindsay Street and flooded properties at the lower end of Lindsay Street.

### 3 DETAILS

- (i) The study carried out by consulting engineers following the flooding of 1976 and 1977 indicated that the volume of water flowing in the Burn at the peak of the flood was in the region of  $24\text{m}^3$  per second. The measures put in place and completed in 1987 were designed to contain this volume of flow.
- (ii) The Scottish Environmental Protection Agency (SEPA) have had a gauging station on the Brothock Water since 1989. This is one of a number of stations on various rivers and watercourses in Perth and Kinross and Angus for which SEPA provide an early flood warning service for the two Authorities.

On the 16<sup>th</sup> October 1998 the flood peak recorded at the Brothock Station was  $11.9\text{m}^3$  per second. (50% of the design flow capacity of the watercourse). The peak occurred at 2030 hours. (Appendix 1 shown the Flow hydrograph recorded by SEPA). Since 1989 when records began the above flood peak has been exceeded on 4 occasions. In April this year a peak of  $11.45\text{m}^3$  per second was recorded slightly less than the latest event and without any adverse effects.

A rainfall total of 30.2mm was recorded by SEPA at Colliston during the event of the 16<sup>th</sup> October. There was not a particularly high tide on the 16<sup>th</sup> October and it did not raise water levels in the vicinity of Hume Street. No alarm was notified by SEPA on the evening of October 16<sup>th</sup> as a flow of 50% of the design flood flow does not warrant any alarm. (Appendix 2 shows SEPA rainfall and flow records for 16<sup>th</sup> October 1998).

- (iii) The first call to the Roads Department came at 1935 hours at which time the Alma Bar was already flooded and the Fire Service were in attendance. Assistance was given by the Roads Department with sandbags and the provision of signs to close off adjacent streets on the request of the Police.
- (iv) In preparing the design and line of the culvert diversion at the Supermarket site the consulting civil engineers acting for the Developer have submitted details to SEPA and Angus Council for observations and approval. Both authorities are satisfied that the new culvert through the Supermarket site, when completed, will be capable of carrying the design flood flow of  $24 \text{ m}^3$  per second and that the hydraulic characteristics of the new culvert will cause no adverse effects upstream or downstream.
- (v) Under the Flood Prevention and Land Drainage (Scotland) Act 1997 Angus Council has a duty to inspect, assess and maintain watercourses in the Council's area to prevent the flooding of non agricultural land. A report (1146/97) was submitted to the Council on 6<sup>th</sup> November 1997 detailing the Council's duties and responsibilities under the 1997 Act.

The Burn has been inspected through the town by the Roads Department of Tayside Regional Council and Angus Council since the inception of the Flood Prevention Scheme in 1987.

This inspection has been carried out on a monthly basis to ensure that any debris which is likely to obstruct road bridges or culverts on the line of the burn is identified and removed. The burn was inspected on 5<sup>th</sup> October 1998.

- (vi) The only significant maintenance operation recently carried out was in 1997 when the culvert beneath the A92 was cleared of silt. (At that time one of the 3 parallel sections below Burnside Drive was badly blocked and this was cleared together with a section upstream and downstream of the A92)
- (vii) Future maintenance of the Brothock Burn will entail cleaning of the channel of silt and weed growth etc., to ensure free flow. The flood prevention scheme will also be reassessed for satisfactory levels of all walls and clearances of bridges and culverts to ensure that the original design flow of  $24 \text{ m}^3$  per second can still be accommodated.

#### 4 FINANCIAL IMPLICATIONS

There are no financial implications at this stage. The costs of inspections and minor clearance works will be contained in future years revenue budgets.

#### 5 CONSULTATION

The Chief Executive, the Director of Law and Administration and the Director of Finance have been consulted in the preparation of this Report.

## 6 CONCLUSION

There had been no flooding occurrences on the Brothock Burn since the completion of the flood prevention scheme in 1987 until the occurrence on 16<sup>th</sup> October 1998 which resulted from a flow amounting to 50% of the design flood flow. The event occurred at a location on the Burn where construction work was being carried out and affected properties immediately downstream of that location.

Dr Bob McLellan  
DIRECTOR OF ROADS

### NOTE

The following background papers, as defined by Section 50D of the Local Government (Scotland) Act 1973 (and not containing confidential or exempt information) were relied on to a material extent in preparing the above Report:-

Report No 1146/97 - Flood Prevention and Land Drainage (Scotland) Act 1997 - Reporting - Angus Council Roads Committee - 6 November 1997.

DG/AS  
19 November 1998  
REPORTS/brothock.burn

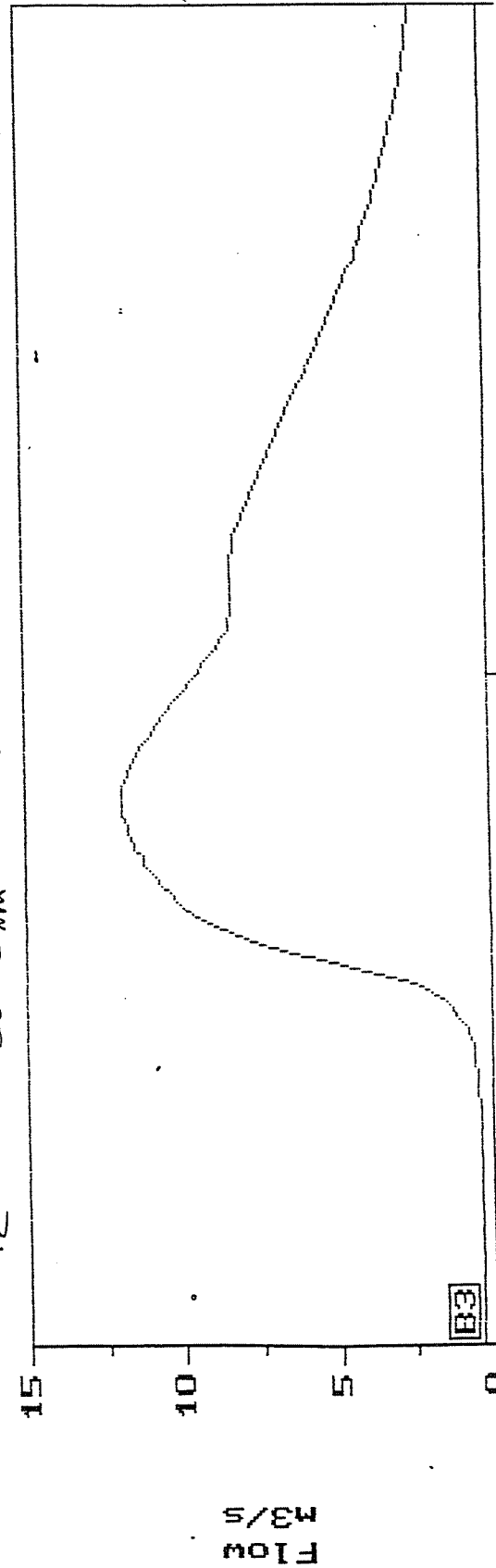
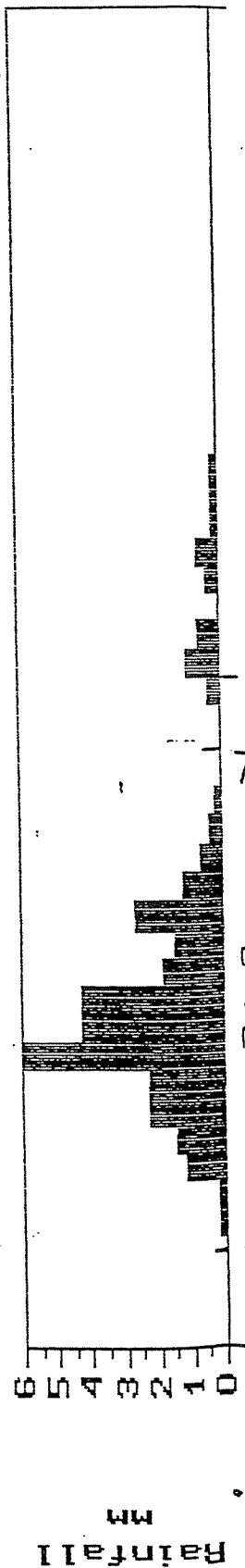
HYDROLOG Archive Report

A East Region

1013017 - Colliston

B3 013010

- Arbroath



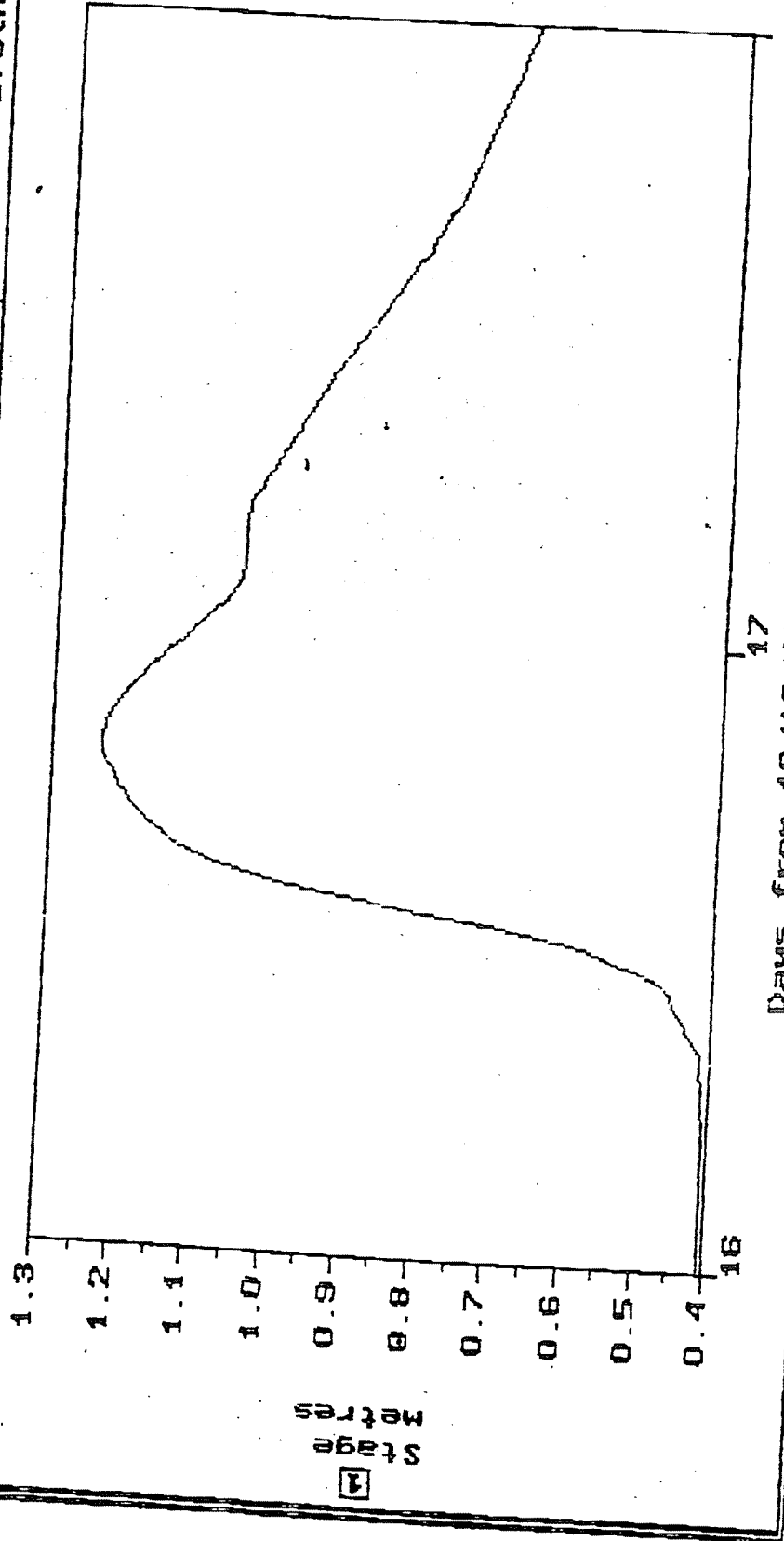
SEPA East Region

Auth.: 013010

Name: Arbroath

HYDROLOG Archive Rep/

Locat.: Brothock Water



Days from 16/10/1998 at 00:00

17

16

Stage  
metres

SEPA East Region

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 Report Type : Archive Recorded  
 Parameter : Flow  
 Units : m3/s

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 Catchment Ref. : 13  
 Grid Ref. : NO 639418  
 Gauge Zero : 0.000 MAOD  
 Catchment Area: 50.000 Sq Km

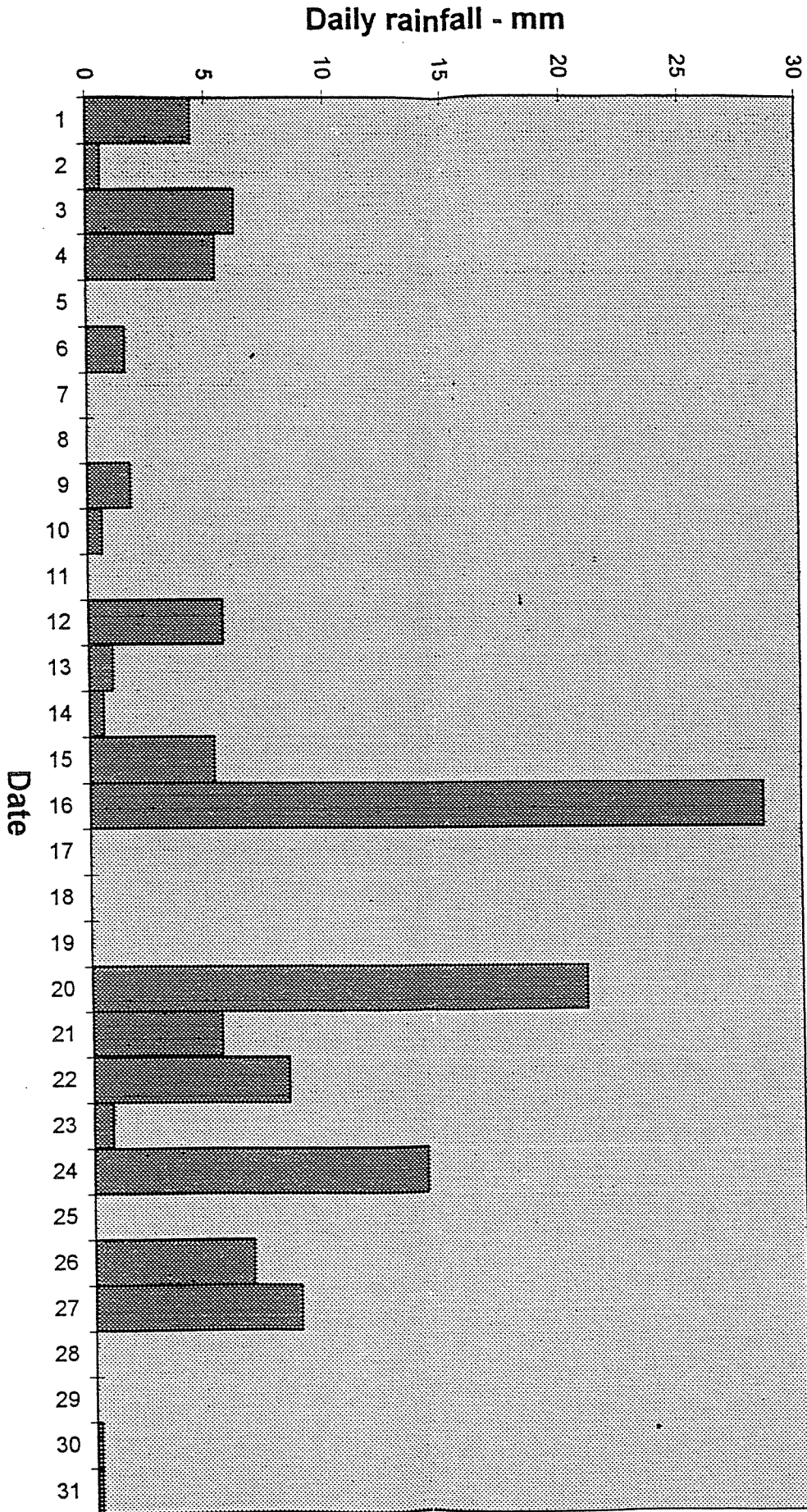
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06:00	0.361	0.361	0.361	0.365	0.365	0.370	0.374	0.374	0.379	0.383	0.401	0.415	0.415
09:00	0.453	0.477	0.487	0.521	0.552	0.572	0.593	0.625	0.647	0.765	0.903	1.062	1.062
12:00	1.223	1.364	1.593	1.941	2.393	3.247	4.103	5.093	5.899	6.753	7.653	8.172	8.172
15:00	8.679	9.254	9.615	9.939	10.184	10.348	10.636	10.843	11.010	11.156	11.240	11.471	11.471
18:00	11.471	11.640	11.682	11.810	11.895	11.895	11.916	11.895	11.852	11.831	11.725	11.598	11.598
21:00	11.513	11.366	11.240	11.052	10.927	10.740	10.595	10.389	10.204	10.020	9.797	9.535	9.535
17/10/98 00:00	9.494	9.314	9.114	8.936	8.738	8.520	8.503	8.425	8.347	8.108	8.269	8.269	8.269
03:00	8.250	8.269	8.269	8.250	8.269	8.269	8.230	8.211	8.153	8.075	7.998	7.921	7.921
06:00	7.806	7.691	7.596	7.501	7.388	7.294	7.162	7.087	6.975	6.901	6.808	6.698	6.698
09:00	6.606	6.496	6.404	6.313	6.223	6.114	5.989	5.881	5.775	5.651	5.527	5.440	5.440
12:00	5.335	5.231	5.127	5.024	4.938	4.853	4.751	4.650	4.566	4.466	4.366	4.234	4.234
15:00	4.119	4.071	4.006	3.941	3.860	3.780	3.716	3.590	3.511	3.464	3.402	3.355	3.355
18:00	3.278	3.247	3.170	3.109	3.064	3.003	2.928	2.883	2.808	2.764	2.720	2.661	2.661
21:00	2.617	2.559	2.516	2.455	2.429	2.393	2.375	2.349	2.323	2.296	2.270	2.244	2.244







Rainfall recorded at Colliston in October 1998

## Rainfall recorded at Colliston in October 1998

Date	Daily rainfall	Date	Daily rainfall
1	4.4	16	28.4
2	0.6	17	0
3	6.2	18	0
4	5.4	19	0
5	0	20	20.8
6	1.6	21	5.4
7	0	22	8.2
8	0	23	0.8
9	1.8	24	14
10	0.6	25	0
11	0	26	6.6
12	5.6	27	8.6
13	1	28	0
14	0.6	29	0
15	5.2	30	0.2
		31	0.2

Daily rainfall expressed in millimetres