



living with the risk

The floods in Boscastle
and North Cornwall 16 August 2004

We are the Environment Agency. It's our job to look after your environment and make it **a better place** – for you, and for future generations.

Your environment is the air you breathe, the water you drink and the ground you walk on. Working with business, Government and society as a whole, we are making your environment cleaner and healthier.

The Environment Agency. Out there, making your environment a better place.

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Foreword

If, on 17 August 2004 as I looked over the sheer devastation that was Boscastle, I had been told that on the next May Day there would be a celebration to mark the re-birth of this community, I would have found it hard to believe.

However, like so many other unbelievable aspects of the flash floods of 16 August 2004, that is just what happened.

That crowds of residents and visitors gathered round the harbour on May Day to celebrate the village's regeneration and the re-opening of nearly all the affected businesses, is testimony to the spirit and determination of the people of Boscastle.

The Environment Agency was pleased to participate and to have been able to lend support to the event, which also marked the completion of our new culvert for the River Jordan and the other remedial work.

We have produced this booklet '*Living with the risk*' to learn about the events of 16 August 2004.

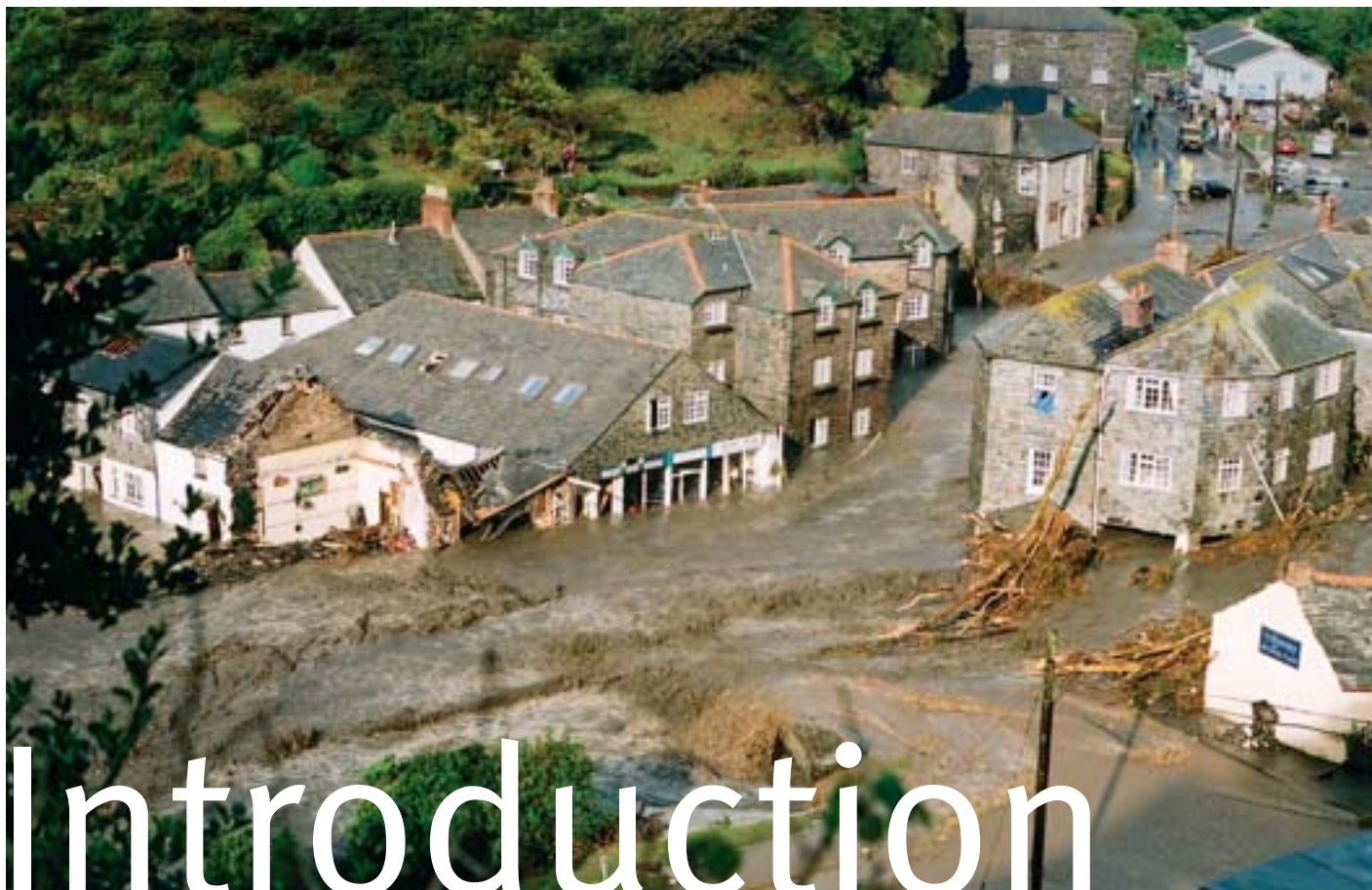
A handwritten signature in black ink, appearing to read 'Clive Gronow'. The signature is fluid and cursive, with a large initial 'C'.

Clive Gronow

Chairman South West Regional Flood Defence Committee

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Pam Durrant

Introduction

Some of the worst floods ever seen in Britain devastated Boscastle and surrounding areas of North Cornwall on 16 August 2004.

Rivers overflowed after five hours of torrential rain. Walls of water swept rapidly down the steep valleys into Boscastle and Crackington Haven, carrying away trees, cars and even buildings.

Swift action by local people and emergency services meant that no lives were lost. Seven helicopters rescued about 100 people from rooftops, cars and trees.

The flash floods affected some 100 homes and businesses, destroyed four properties in Boscastle and two at Crackington Haven, swept away about 115 vehicles and badly damaged roads, bridges, sewers and other infrastructure.

People in Boscastle and surrounding areas have worked hard at rebuilding their lives since the disaster. The regeneration has also involved the local authorities, the Environment Agency and other organisations.

This booklet has been produced by the Environment Agency to explain what happened, the work we have done since and the possible options that may reduce the risk of future flooding.

It is based on an expert study of the floods that we commissioned from consultants HR Wallingford with support work by Halcrow, the Centre for Ecology and Hydrology, Wallingford, the Met Office and Royal Haskoning. They analysed information about the storms, rainfall and rivers in the area.

We used this study to advise North Cornwall District Council on the rebuilding of properties and to help us look at improvement options. We said there was a one-in-400 chance of the Boscastle floods recurring in any one year.

We hope this booklet will help and inform not only the people of Boscastle and North Cornwall but also others who want to learn about the events of 16 August 2004.

Setting the scene



Location

Boscastle is a village 14 miles south-west of Bude. Its natural harbour is the only one for 20 miles along the rugged north Cornwall coast, and developed into a thriving port and fishing community.

The coming of the railways brought decline to the port and the first influx of tourists. Visitors now come in their thousands, drawn by the attractive historic harbour, the steep wooded valley of the River Valency and walks along the coast, an Area of Outstanding Natural Beauty.

Much of the land in and around Boscastle is owned and managed by the National Trust. Its 300 acres include the cliffs guarding the winding harbour entrance, the harbour itself, the lower bridge and parts of the Valency valley.

Some fishing boats remain but tourism is now the mainstay of the Boscastle area. It supports the shops, pubs, hotels and guests houses and other local businesses.

Summer, and particularly August, is the busiest time of year for tourism, and the village's large car park next to the River Valency is often crowded.



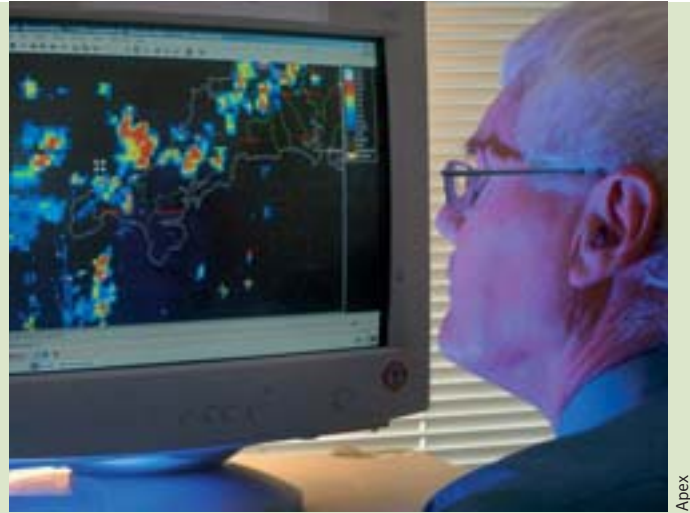
David Mansell

Regeneration: A new culvert is laid along side the Jordan as rebuilding work continues at Boscastle

The Valency reaches the sea at Boscastle, and its tributary, the Jordan, flows into the Valency in the centre of the village.

Both are designated 'main' rivers which means the Environment Agency has the powers to manage them. Their catchment (the area they drain) is relatively small at 20 square kilometres (km) or 7.7 square miles - and steep, rising more than 300 metres (m) or 984 feet (ft) in 6km (3.7 miles).

Crackington Haven is 8km (5 miles) up the coast from Boscastle and is a popular holiday location with local shops, a small number of houses, a pub and hotel. The Crackington Stream flows down to the beach, which is surrounded by high cliffs. The stream and its tributaries are designated 'ordinary' watercourses so the Environment Agency does not manage them. In this case the powers lie with North Cornwall District Council.



Apex

Rainfall radar

Flood forecasting and warning

It is important to understand the Environment Agency's role in forecasting floods and issuing flood warnings. This is an outline of our work:

We work out where is at risk of flooding using Flood Maps, which can be accessed via our website www.environment-agency.gov.uk. These show the extent of floodplains - areas at risk of flooding from rivers or tides.

The Flood Map for Boscastle generally matches the area flooded in August 2004 - around the Wellington Hotel, the car park and Valency Row.

We also use automatic sensors and rainfall radar to monitor rainfall and the levels in many main rivers 24 hours a day. The information is fed into our regional flood forecasting centre at Exeter.

We use this information and detailed weather forecasts from the Met Office to predict the possibility of flooding.

Where we can forecast flooding, we issue warnings through the media or automated phone messages to people at risk. We also issue warnings through our Floodline - 0845 988 1188 or www.environment-agency.gov.uk/floodline. Floodline also gives advice on what to do before, during and after a flood.

It's not possible to accurately forecast flooding in some areas such as parts of north Cornwall, where steep valleys mean that rivers can rise so rapidly after heavy rain that, with current technology, there's not enough time to issue warnings.

Who does what in flood risk management

Environment Agency

- Builds, maintains and inspects flood and tidal defences on coasts and designated main rivers;
- Monitors water levels and flows;
- Issues flood warnings, forecasts and implements major incident plans;
- Has a supervisory role over all flood defences;
- Provides flood risk advice to developers and planners;
- Manages and operates flood defences.

Local authorities

- Build and maintain flood and tidal defences on other rivers and streams;
- Develop and implement major incident plans such as North Cornwall Emergency Flood Response Plan;

- Deal with some flooded roads and culverts (Highways Agency deals with trunk roads);
- Support police in arranging evacuation and providing rest centres and emergency accommodation.

Police

- Co-ordinate emergency response in major floods;
- Help save life and property.

Fire services

- Rescue people trapped by floodwater;
- Can pump out buildings.



Aftermath: stones carried down by the Jordan in the 1963 flood spill out of the Wellington Hotel

History of flooding

Boscastle has been regularly affected by severe flooding over the centuries, but that of 16 August 2004 was the worst on record.

Previously the worst flood was on 3 June 1958 when the River Valency rose 4.5m (15ft) in 20 minutes, according to eyewitnesses. People had to be rescued from their flooded homes and local bandmaster Charlie Berryman drowned after being washed off his feet.

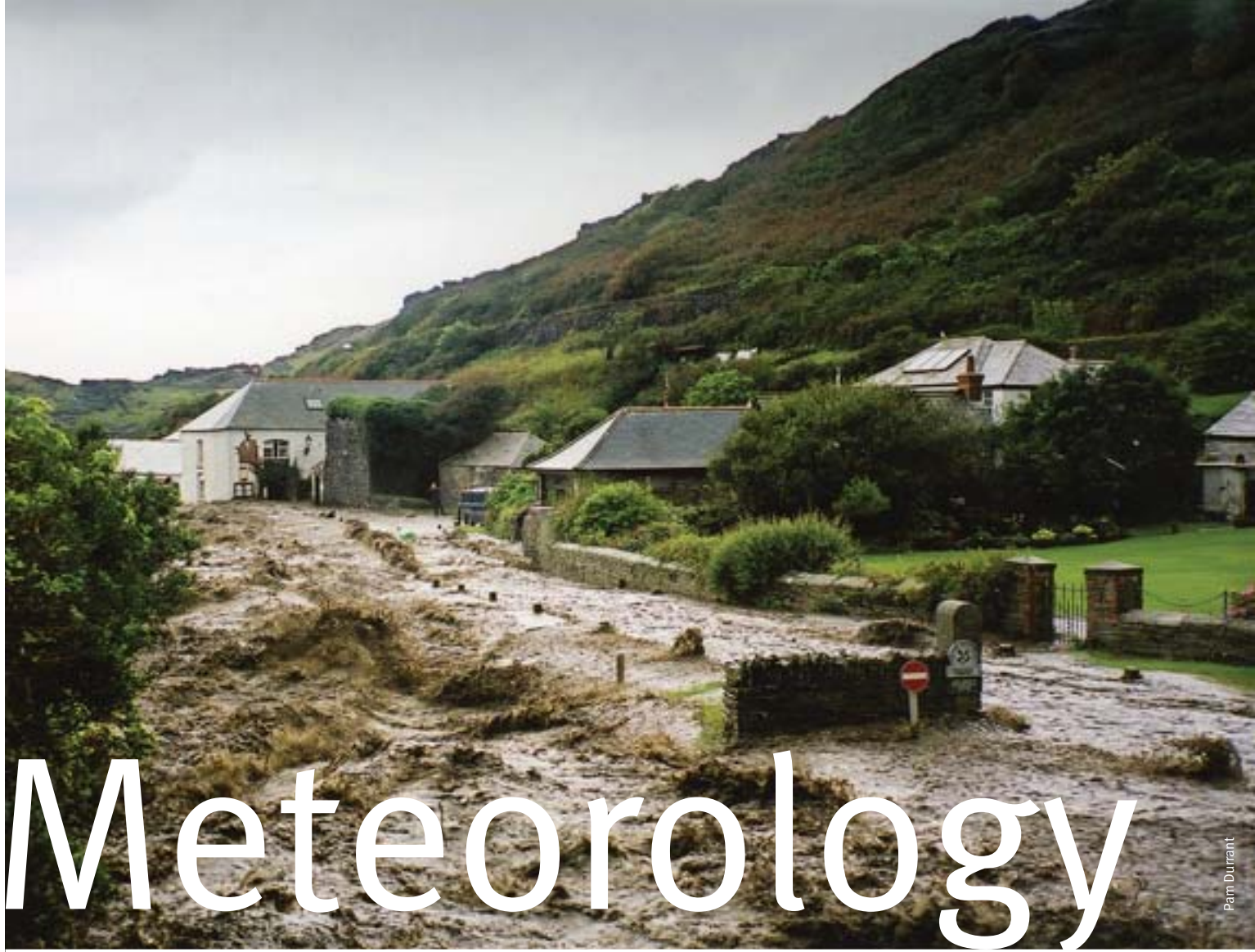
A flood on 30 August 1950 was described in the *Cornish and Devon Post*: 'The most remarkable sight at Boscastle were the trees which the Valency River had uprooted from its banks in flooding further up the valley... Trees 20 feet high and more, mostly ash, had been ripped up, and the river was carrying them away, roots and all.'

A contemporary account details the Boscastle flood of 28 October 1827: 'The whole street was filled with a body of water rolling down and carrying all materials with (it)... At Bridge teams of Wagon Horses were saved

with difficulty. Pigs also belonging to the Cottagers were taken out of ye Roofs of Houses.' (*Journal of Thomas Pope Rosevear*).

In places like Boscastle with a history of flooding, the Environment Agency looks at possible solutions that could help reduce the risk. We produced a report on the Valency in 1996 in our 10-year plan for flood defence in Cornwall, which recognised the need but the greater priority was to carry out improvements to the River Jordan tributary.

Our medium-term plan for the flood risk management of the region included improvements on the River Jordan. We decided in May 2004 to improve the existing culvert from above Marine Terrace to where the Jordan meets the Valency. Work on this scheme had been due to start in September 2004, but following the August flood a revised scheme was built (see section *What's happened since*).



Meteorology

Pam Durrant

Full spate: Looking downstream as the water races towards the sea.

Overview

The Meteorological Office had forecast heavy, often torrential downpours developing over the region through the day on 16 August 2004, but were unable to say exactly where these would develop.

A string of slow-moving thunderstorms caused localised extreme rainfall over north Cornwall. The rain was extreme in both its intensity and duration: up to 200 millimetres (mm) or 7.9 inches (in) fell in 24 hours.

But across north Cornwall there were wide variations in that day's rainfall, with extreme amounts in some places and only small amounts in others.

Otterham, 6km (4 miles) east of Boscastle, recorded 200mm (7.9in) of rain in 24 hours and Lesnewth, 3km (2 miles) east, had 184mm (7.2in), while St Breward, 14km (9 miles) south, had a mere 1.5mm (0.06in).

Climate change

Many people have asked if the flood was due to climate change.

It is impossible for any single event to be connected directly with climate change. However, events such as Boscastle are consistent with climate change predictions of more storminess and flash flooding over summer months

The storms grew out of a large depression low pressure area that dominated the eastern Atlantic that day. It had sucked in pulses of warm, moist tropical air, including the remnants of hurricane Alex...

What caused the storms

The storms grew out of a large depression low pressure area that dominated the eastern Atlantic that day. It had sucked in pulses of warm, moist tropical air, including the remnants of hurricane Alex.

This moist air blowing in from the sea in the prevailing south-westerly wind and a morning of warm sunshine combined to produce clouds over the north Cornwall coast. Some of these grew in size and spawned 'stormlets', individual small thunderstorms, upwind and downwind.

Eyewitnesses in north Cornwall saw what looked like one long thunderstorm. It was in fact a narrow band of 'stormlets' about 5km (3 miles) across but with no gaps between them.

The storms were small in size but produced very intense rainfall. That intensity came from the storms' high moisture content and their 'uplift', the process of warm moisture-laden air being driven upwards, causing rain to fall as the air cools.

The storms were channelled along the coast by what weather experts call a strong line of convergence a line

where a moving airflow meets an opposing one and the air is forced upwards.

As the south-westerly wind blew over the land, friction from the rough surface slowed the wind and swung it from south-west to south-southwest.

This south-southwesterly wind pushed up against the prevailing wind at the coast and created strong uplift.

The uplift may have been reinforced by higher air temperatures onshore, caused by the earlier sunshine heating the land - air rises as it heats.

Storm showers along the whole north Cornwall coast all started at about the same time, 1pm. It is thought likely that this synchronised timing was due to the convergence along the coast.

The storms moved slowly up the coast, shedding their load of thousands of tonnes of rain. It's estimated that two million tonnes (440 million gallons) of rainwater flowed through Boscastle that day.

Distribution of rainfall

The Environment Agency measures rainfall using a network of rain gauges. These showed that the area with exceptional rainfall on 16 August 2004 was very small.

In the Boscastle area, only three of the nearby daily rain gauges recorded exceptional rain. These were at:

- Otterham, 6km (4 miles) east of Boscastle, with 200mm (7.9in) of rain in 24 hours;
- Lesnewth, 3km (2 miles) east, with 184mm (7.2in);
- Creddacott, 14km (9 miles) east-northeast, with 123mm (4.8in).

We also use radar to track rainfall and this revealed that the intensity of the storm varied. The radar

showed that the highest rainfall was over Otterham in the first hour of the storm from 1-2pm.

From 2-3pm the maximum rainfall was still over Otterham. Rainfall lessened slightly from 3-4pm, but then it intensified again from 4-5pm and the line of maximum rainfall had shifted west by about 2km (1.2 miles). By 5-6pm the main area of rain had moved away north.

Our radar showed that during the afternoon the heaviest total rainfall was probably a few kilometres south-west of Otterham near the A39, with three consecutive hours of more than 30mm (1.1in).



Morning after the storm: Trees block the road bridge in Boscastle as the clean-up begins

Working out the chances

Hydrology - the study of water distribution on the land's surface - helps us understand why the extreme rainfall caused such severe flooding in north Cornwall and work out the chances of it happening again.



David Mansell

Calm after the storm: Boscastle harbour entrance

Our consultants HR Wallingford have predicted these chances using a hydrological analysis of the rainfall on 16 August 2004 and past floods.

There is a relatively high degree of uncertainty in estimating the chances of repeat severe floods in the Valency and Crackington Stream catchments. River flows in these catchments are not measured with gauges, so there is no historic data on which to base a hydrological analysis.

However, the chances of floods on the rivers at **Boscastle** have been worked out using a combination of methods.

We know, from analysis of many flood records elsewhere, the statistical relationship between rainfall, catchment characteristics and floods. We can also use computerised models to convert rainfall data into runoff. Runoff is water running off the land into streams and rivers.

We are fortunate to have very good records of the rainfall on 16 August and observations of the flood that can be calibrated as flows. We are therefore able to compare the study findings with what we know happened that day, and during other floods, to check that they make sense.

This combination of methods shows that the 2004 flood was a very rare event. It's estimated that it has a one in 400 chance of happening again in any year.

It is harder to assess the chances of another severe flood at **Crackington Haven** as little or no historic flood records can be traced.

But the size of the peak flow on Crackington Stream and the dramatic changes upstream of Crackington Haven suggest that the flood was extreme. The chance of it recurring in any year is thought to be more remote than one in 100.

Changes to land use

There were suggestions that recent changes in land use might have worsened the Boscastle flooding through increased runoff – rainwater running off buildings and other hard surfaces and farmland.

It was suggested that increased development in the upper village might have meant more rainwater reaching the Jordan. It was also suggested that removal of some traditional banked hedges to create larger fields might have meant more runoff to the Valency and Jordan.

But our consultants HR Wallingford concluded in their technical study that land use changes would have had little impact on the severity of the flooding in the centre of Boscastle.

Changes to rivers

Peak flows on the Valency below its confluence with the Jordan were about 180 cubic metres (6,350 cubic feet) per second. All this water tearing down the Valency caused major changes to its channel.

The main channel along most of the river was widened and deepened, and many trees were washed down the valley. In some places the Valency abandoned its old channel and cut a new one through the floodplain.

This erosion added a huge amount of material to the flow, ranging from silt to large boulders. Tonnes of silt were deposited inside buildings where the floodwaters were slower-moving.



Apex

Dramatic rescue: Margaret Templar and her grandson Kieran are winched to safety from Bridge Walk in Boscastle by an RAF helicopter

What happened...

Overview

No account of the dramatic events of 16 August 2004 can convey the trauma of those caught up in the floods or watching their homes, businesses or cars being battered or swept away.

At one point it was feared that hundreds of lives were at risk in Boscastle, and the morning after the flood there were still 16 people unaccounted for. The fact that no lives were lost has been described as a miracle.

This part of our booklet describes what happened, but not in great detail. That has already been done by the media and by David Rowe's book *Boscastle 16 August 2004 - the day of the flood* (see 'Further reading' inside back cover).

Homes and businesses in Boscastle's harbour area lie close to the rivers Valency and Jordan so many suffered major flooding, but the damage was localised and other parts of Boscastle were unscathed.

Almost 60 properties in Boscastle were flooded and four washed away: the Visitor Centre, Clovelly Clothes, Things gift shop and the Harbour Light tea room, Boscastle's oldest and most-photographed building.

Stone bridge parapets collapsed as floating cars smashed into them and wooden footbridges were washed away. There was also serious damage to Boscastle's infrastructure, with water, power and telephone services cut and roads extensively damaged.

Raw sewage contaminated floodwater at Boscastle and led to public health concerns after about 300m (984ft) of sewer pipes were blocked or washed away.

Two properties were destroyed at Crackington Haven and others badly damaged, the car park was wrecked and the road bridge undermined.

There was also major flooding elsewhere in north Cornwall, for example on the rivers Ottery and Neet, particularly at Helebridge and Canworthy Water. Homes were affected, and some stretches of road damaged by floods had to be completely rebuilt.

Eyewitness accounts

The floods that struck Boscastle and Crackington Haven on 16 August 2004 were not only among the worst in Britain but also some of the most thoroughly recorded. They happened during a summer's day when the villages were busy with visitors, and many people photographed and videoed the drama.

We recognised it was vital to get a good record of the flooding, so we swiftly had the 'trash marks' - the highest line of flood debris - surveyed. We also collected eyewitness accounts from residents and others, some through a special drop-in centre.

This information plus the photos and video enabled our expert consultants HR Wallingford to reconstruct what happened.

Eyewitnesses at both Boscastle and Crackington Haven described water levels rising in only minutes or even seconds. Many people at Boscastle reported seeing walls or waves of water rushing downstream.

There have been suggestions that the rapid rises in water level at Boscastle were caused by debris dams blocking the rivers upstream and then bursting.

While that is possible, the study by HR Wallingford concluded that it was more likely the rapid rises were caused by bridges blocking or walls falling, such as when the 2.7m (9ft) wall next to Boscastle car park collapsed.

The course of the floodwaters also seemed to change during the event. Possible causes for these changes were:

- bridges becoming blocked with trees, cars and other debris washed downstream;
- walls falling down, releasing floodwater;
- water bursting through buildings.

16 August 2004

Floods at Boscastle



Apex

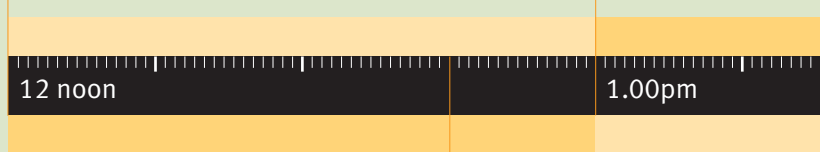
Full spate: Some of the 115 cars washed down the river at the height of the Boscastle flood

This timeline of the Boscastle floods has been drawn up using information collected by the Environment Agency, emergency services and North Cornwall District Council, and by David Rowe for his book on the Boscastle floods.

All times are British Summer Time and approximate.

12 noon
Extreme rainfall begins in parts of north Cornwall

1.00pm
Flows in Valency and tributaries begin to increase



12.45pm
Lesnewth rain gauge records 12mm (half an inch) in 15 minutes

Timeline

3.45pm: Car park rescue

Holidaymakers sat sheltering from the rain in their cars in Boscastle car park when it started to flood.

Among them were Rachele Strauss and her husband Richard, on holiday from Gloucestershire with their three-year-old daughter.

'Cars started to move and I watched the water rising. In less than a minute it was up to the bottom of the car doors,' said Rachele. They managed to drive up the hill and Richard went back to help people who were by now stranded in their cars.

'I heard people screaming and realised that they were trapped in their cars unable to get out because of the force of the water against the doors,' Rachele said. 'People were calling out of their sunroofs for help, some frozen by fear and unwilling to get out of their cars; they had to be physically dragged out.'

Her husband and two other men linked arms and waded through deep water to rescue people trapped in their cars. One driver slipped and fell but Richard managed to grab her before she was swept away.

3.53pm

Fire crews from five Cornish towns sent to Boscastle in next hour

3.45pm

Cars in car park start to float; water on B3263 a few inches deep

3.44pm

Local coastguard Graham King warns visitors not to wade through floodwater, then warns Falmouth Coastguard of incident developing at Boscastle

3.43pm

Cornwall Fire Service gets first call for help, from Riverside Hotel; Launceston fire crew mobilised

2.00pm

Two Environment Agency operatives sent to check drains in Boscastle

3.00pm

Visitors' cars almost fill the 170-space car park

3.15pm

Valency at Boscastle almost full after three hours of extreme rainfall

1.30pm

Possible showers noted on weather radar. Hourly monitoring of local rainfall begins

3.15pm

Environment Agency opens flood incident room at Bodmin

3.30pm

Valency begins to spill over north bank between the two bridges

3.45pm

Lesnewth rain gauge records 15mm - half an inch - in five minutes

2.00pm

3.00pm

4.0

Continued ►

4.00pm: Trapped in the Visitor Centre

4.00pm

Witnesses see 3m (10ft) wall of floodwater sweep across car park into Visitor Centre; deep, fast-flowing water makes B3263 impassable

4.00pm

Visitor Centre manager ushers families into attic to escape floods

4.10pm

Main road bridge blocked by debris, causing water levels upstream to rise rapidly; Spinning Wheel restaurant flooded

4.10pm

Water levels on car park rise and cars start to be carried through village by floodwater

4.15pm

Flooding on Jordan worsens; main road bridge impassable

4.45pm

First of seven helicopters from Royal Navy, RAF and Coastguard on scene

5.00pm

Floods at their peak; cars washed down from car park

5.00pm

End wall of Visitor Centre and much of roof collapses

5.12pm

Fire service and Coastguard declare a major incident

5.55pm

Truro and Plymouth hospitals put on standby in case of casualties

Boscastle Visitor Centre: 12 people rescued



Apex

4.00pm

5.00 pm

6.00pm

4.30pm

High wall by car park collapses, sending water surging down B3263; people start evacuating buildings

4.30pm

Witnesses see another wall of water crash into Visitor Centre, smashing its doors; water from Jordan starts to pour through Wellington Hotel

4.30pm

Visitor Centre starts to collapse; cars and other large debris washed down either side of Riverside Hotel

5.23pm

Rescue helicopters begin winching people up from buildings

6.00pm

Floods started to recede

Rescue: At the height of the floods, an RAF helicopter flies in to winch up people trapped in buildings.



Pam Durrant



Pam Durrant

Devastation: The floods peak at Boscastle

4.30pm: Escape from the 'Welly'

Guest house owner Dave Fletcher saw floodwaters from the Jordan building up at the back of the Wellington Hotel, which was packed with people.

He realised that the downstairs bar was about to flood and told everyone to evacuate.

Minutes after the hotel was cleared, hundreds of tonnes of water, rocks and mud burst through the first-floor windows, smashed through the floor and filled the bar below.

4.30pm: Rescue in Valency Row

Emily Maughan was knocked off her feet when the floods smashed down her front door in Valency Row.

'The door just flew towards me and a tidal wave of water came over the top,' said Emily, who was swept out of her house by the current.

She clung to a drainpipe in chest-deep water and screamed for help. She was heard by neighbour John McLaughlin who opened his front door - letting in floodwater three feet deep - and hauled Emily inside to safety.

7.00 pm

8.00pm

9.00pm

5.00pm: Cars washed downriver

At the time it wasn't known if anybody had been swept away or if people were in the cars washed away. About 84 wrecked cars were later recovered from Boscastle's harbour, streets and gardens, but another 32 were washed out to sea.

8.00pm

Water levels back within river banks

9.00pm

Helicopters start returning to base

Timeline



Environment Agency staff clear flood debris behind Marine Terrace in Boscastle

What we did during the event



Marooned by floods: This couple were rescued from their roof at Helebridge after being spotted by an Environment Agency staff member

- We helped advise the immediate emergency and rescue response, working with the local authority, emergency services and other organisations.
- We carried out emergency works at Marine Terrace on the River Jordan clearing the culvert and debris.
- We sent people to join the emergency control centres Gold at Devon and Cornwall Police Headquarters at Exeter, and Silver at Boscastle and Wadebridge.
- We monitored the flood situation around the clock and issued flood warnings liaising closely with colleagues at the Met Office.
- We worked with North Cornwall District Council and Cornwall County Council to restore riverbed levels on the River Valency removing 4,000 tonnes of shingle.
- We worked with landowners to clear debris and trees from the Valency Valley.
- At Helebridge near Bude an Environment Agency officer spotted a couple marooned by the floods on the roof of their bungalow and dialled 999. They were rescued by helicopter.
- Our emergency workforce put out sandbags and pumped out properties at other affected places including Camelford and Bude.
- We replaced walls demolished by the flood at Helebridge with reinforced concrete stone clad walls.
- 16 properties were flooded in Canworthy Water by the River Ottery. In the immediate aftermath we temporarily repaired the damaged flood banks until longer term improvements could be made.
- More details on our work see page 24.



Environment Agency staff clear flood debris behind Marine Terrace in Boscastle





David Mansell

Repaired: The road bridge at Crackington Haven which was badly damaged in the floods

Floods come to Crackington Haven

Crackington Haven suffered in much the same way as its neighbour down the coast, but on a smaller scale.

Water levels rose as rapidly as at Boscastle. The road bridge over the Crackington Stream quickly became blocked by large trees and debris washed downstream.

Eyewitnesses reported that within an hour of the flood starting, the bridge was overtopped with floodwater and became impassable. Several properties were completely surrounded by fast-flowing water.

A total of 12 properties were flooded, two of which - Tremar and Camry - were destroyed. Most buildings suffered floods more than 1m (3.2ft) deep and had thick deposits of sediment, which caused their owners major loss and disruption.

Many cars, a caravan and footbridges were washed away, and the car park and a water main were badly damaged.



Debris washed down the Crackington Stream by floodwaters

A tributary of the Crackington Stream, the Pengold Stream, overtopped the stone bridge just upstream of where it joins the main river, and three properties were flooded.

Extremely fast flows in both streams eroded not only the banks but also the bridge over the Pengold Stream and undermined the foundations of the main road bridge.

Some properties were flooded by overland flows after the Crackington Stream overtopped its banks. They included the Blase properties which flooded despite being about 3m (10ft) above the stream bed.

Among the worst-hit homes were Chy-an-Pont, which flooded to a depth of 1.8m (5ft 11in), and Manor Cottage, where the floodwater was 1.2m (4ft 3in) deep.

Two commercial properties were flooded: the Coombe Barton Hotel shop, which had 1.8m (5ft 11in) of flooding, and the Cabin Cafe, where the basement was completely submerged although the cafe itself was only flooded to a depth of 0.1m (4in).

Hydrology consultants HR Wallingford recreated the flood using a computer model. The results suggested that the rapid blocking of the lowest bridge on the Crackington Stream would have made the water level rise rapidly by about 3m (10ft).



Pictures left to right:
 At work in Boscastle: Telecoms engineer Steve Osteen from Camelford - BT spent six weeks restoring phone services after the floods.
 Rebuilding: Stonemasons at work for the National Trust by Valency Row in Boscastle.
 Ewe first: Local farmer Raymond Bright in Boscastle with one of his sheep.



David Mansell

Back in business: Tracey Lane de Courcin, owner of the Cornish Stores, with Kate Holland

If it was a miracle that no lives were lost in the Boscastle flood of 2004, then the community's rapid recovery has been equally miraculous...



Celebration: May Day marks Boscastle's regeneration. The parade passes our new defence works

What's happened since

Overview

If it was a miracle that no lives were lost in the Boscastle flood of 2004, then the community's rapid recovery has been equally miraculous.

Flooded businesses worked hard to ensure they reopened as soon as possible and many were back in business by Easter 2005. Residents moved into temporary accommodation while their flooded homes were dried out and repaired.

The village's infrastructure was restored: water supplies, sewers and telephone lines which were put out of action were repaired, the electricity sub-station replaced and damaged roads reinstated.

There was a massive clean-up operation after the flood. It involved not only residents and business owners but also the fire service, district and county councils, Environment Agency, National Trust and others.

Several thousand tonnes of stones and other debris washed down by the floods were quickly cleared to allow access and reduce the risk of further flooding.

The affected area resembled one big building site in the months after the flood, with contractors and mechanical diggers everywhere.

Despite the upheaval, local people went about the task of getting back to normal with what one observer described as 'quiet determination'.

Business owners set a deadline of Easter – the start of the tourist season – for reopening, but some were back in business much earlier, including Boscastle Pottery and the Cornish Stores mini-market.

National Trust staff and volunteers laboured to reopen the harbour area before Christmas by removing debris and repairing harbour access roads, and later repaired the river walls and Trust buildings, including the shop.

Environment Agency staff worked with the National Trust and landowners to agree and carry out a clear-up of debris along the Valancy that could be washed downstream and cause obstruction again. Volunteers planted a tonne of daffodil bulbs on Trust land.

Donations poured in to a national appeal for those affected by the flooding. It was launched by the British Red Cross and later run by local trustees, with help from North Cornwall District Council.

Over £350,000 had been donated by January 2005 and the trustees had distributed more than half that amount. Details of the appeal are on the district council's website, www.ncdc.gov.uk.

Search operation

There were still 16 people unaccounted for at 9am the day after the Boscastle floods, and the huge search operation continued until everybody was accounted for.

It involved the police, fire service, district council, specialist search teams with sniffer dogs, coastguards, RNLI and others.

RSPCA staff found missing animals and recovered pets from abandoned homes, reuniting them with their owners. They included dogs, cats, birds, hamsters, a rabbit and rat and a goldfish in a tank.



David Mansell

Environment Agency staff help rebuild stone walls above Marine Terrace in Boscastle

Work by the Environment Agency

Our immediate task after the flood was to clear the 1.5m-deep (5ft) mass of stones and flood debris blocking the rear of Marine Terrace.

Some 1,850 tonnes (150 truck-loads) of debris were shifted by our emergency workforce at Boscastle. We worked with the National Trust and other landowners to clear trees and debris washed down the Valency valley.

We then reviewed what happened on 16 August 2004 and identified two top priorities:

1. Finding out why the north Cornwall floods were so extreme.
2. Improving the culvert carrying the Jordan down Old Road which became blocked in the flood.

1. Finding out why it happened

We wanted to find out what were the chances of floods as bad or worse affecting Boscastle and Crackington Haven again.

This would help us work out what could be done to reduce the flood risk. It would also help us advise North Cornwall District Council on planning applications for the rivers' floodplains – particularly from owners wanting to rebuild properties that had been badly damaged or washed away.

We commissioned consultants HR Wallingford to make an initial assessment of how severe the floods were and the chances of a repeat.

Their initial findings, published in January 2005, were that while the Boscastle flood was among the most extreme experienced in Britain, the risk of a similar or worse flood was one in 400 in any given year.

With these findings, we were able to advise the district council that rebuilding properties would be possible. We also worked with them to achieve improvements to rebuilding plans, including better flood-proofing of properties.

We are working with the council on a strategic flood risk assessment for the Boscastle floodplain. This will look at what development should take place where there's a



Apex

After the flood - cars piled on top of each other

risk of flooding, and give developers and the council information to help them reach the decisions that will benefit the whole community in Boscastle.

Following the initial assessment, we asked HR Wallingford to carry out a full investigation into the storms, rainfall and rivers in the Boscastle and Crackington Haven catchments on 16 August 2004.

They were helped by experts from the Met Office, engineering consultants Halcrow and Royal Haskoning in a detailed study of the meteorology, hydrology and hydraulics of the event on the Valency and Crackington Stream catchments.

- Much of this report is based on the detailed study by HR Wallingford. To obtain a copy, see 'Further reading' inside back cover.



George Findlay, former parish council chairman

Team effort

Rebuilding Boscastle has been a team effort involving residents, businesses and organisations with an interest in the village.

It's been co-ordinated by the Boscastle Regeneration Steering Group whose members include parish, district and county councils, the Environment Agency, Government Office South West, Business Link and the National Trust.

The Steering Group has:

- co-ordinated actions on regenerating the business community, tourism promotion and restoring public services;
- surveyed 800 households on priorities for regeneration;
- drawn up a framework plan for the regeneration.



David Mansell

2. New relief culvert for the Jordan

Before the floods, we had planned to start work in September 2004 on improving the old culvert which runs under the Wellington Hotel.

We reviewed this scheme after the floods and saw that the culvert could not cope with high flows and the stones, rocks and boulders washed down the valley. Its entrance quickly became blocked, and by the time the water subsided it was buried under 1.5 metres (4.9ft) of silt and stone debris. Our emergency workforce started work the next day and spent two weeks clearing the culvert and surrounding area.

So we decided to lay a larger relief culvert that would carry excess water after heavy rain. It is 1.2m (4ft) square while the old culvert is 0.9m (3ft) square.

We contracted Mowlem to do the work, and they completed most of it by Easter 2005, despite having to work in confined spaces and overcome other challenges.

Fast work on Jordan

- Our contractors Mowlem and their sub-contractors worked seven days a week so the new culvert would be finished before the tourism season started at Easter.
- Our emergency workforce built stone walls behind Marine Terrace to help get the culvert done on time.
- We got BT and other utility companies to lay their new cables and pipes in our trenches to minimise disruption to the village.
- We built an artificial holt for otters when installing a debris screen on the Jordan.

Opposite: New relief culvert for the Jordan

Praise from PM

Representatives of the Environment Agency, North Cornwall District Council and other organisations involved in the floods attended a reception held at 10 Downing Street to recognise the work of the emergency services and wider public sector.

The Prime Minister cited the August 2004 floods as an example of good co-ordination between the emergency services and public sector organisations.

Awards for 'posties'

Boscastle 'posties' Tracey Smith (pictured) and Karen Cowling were named UK Postman and Postwoman of the Year after their strenuous efforts to help people affected by the floods.

Residents were astonished to see the mail get through the day after the floods. Tracey used a borrowed Royal Mail Land Rover to deliver bottled water, food parcels, clothes, tools and cleaning materials as well as mail.

Karen delivered as much mail as she could on foot through the village but many houses were inaccessible and roads had been closed by the police.



Creating a better future

Like other organisations involved on 16 August 2004, the Environment Agency held de-briefing sessions for our staff and looked at what we did so we could learn lessons from the floods.

We also talked to local residents, parish and district councils, the National Trust and landowners about what we were doing and our options in reducing the risk from flooding.

One of the lessons we've learned is the need for better information about vulnerable catchments. We're compiling a national register of catchments where heavy rainfall is likely to make river levels rise very rapidly and the depth and speed of floodwaters could endanger lives.

The register of vulnerable catchments will help us to:

- review and adapt our flood warning systems;
- focus our public awareness campaigns;
- influence local authorities' planning decisions and emergency response plans.



David Mansell

Still smiling: Boscastle Harbourmaster Fred Sifford, whose garden was washed away, with National Trust shop assistant Pauline Biscombe whose car was swept away, outside the Trust's Forge Shop

Options for the future

We are looking at what we can do to manage flood risk on the River Valency at Boscastle in the long term.

We outlined options at a public exhibition held in the village in January 2005 by the Boscastle Regeneration Steering Group.

The options are a combination of:

- lowering the river bed;
- widening the river;
- installing a two-stage channel between the two bridges;
- building raised flood walls or banks;
- dealing with obstructions to flow, such as the lower bridge which could be removed or redesigned in keeping with the village;
- lay an overflow culvert under the road from the car park to the harbour;
- measures to reduce the risk of blockage of the channel and bridges.

Digging a tunnel from the car park northwards to a cliff outfall was considered, but the high cost means it's unlikely to be viable. Floodwater storage was also looked at but would be impractical because of the location.

We are still in the early stages of thinking about the options, and will need to carry out more investigations into those that might be feasible. The investigation will need to assess the benefits and costs of improvements to see if national funding can be obtained for the work.

In particular, we will seek to ensure that any works we propose are co-ordinated within the overall regeneration plan for Boscastle.

Where to get more information

Floodline 0845 988 1188 www.environment-agency.gov.uk/floodline

Environment Agency 08708 506 506 www.environment-agency.gov.uk

North Cornwall District Council 01208 893333 www.ncdc.gov.uk

Boscastle website www.boscastlecornwall.org.uk

Boscastle Visitor Centre 01840 250010 www.visitboscastleandtintagel.com

National Trust, Boscastle 01840 250036 www.nationaltrust.org.uk

Met Office 0870 9000 100 www.met-office.gov.uk

Further reading

Flooding in Boscastle & North Cornwall, August 2004

Technical study by the Environment Agency's consultants, HR Wallingford Ltd – to obtain a copy, visit www.hrwallingford.co.uk or contact HR Wallingford on 01491 835381.

Boscastle: 16 August 2004 – the day of the flood

Book by David Rowe; published by Truran (£4.99); available from Boscastle Visitor Centre – a donation from each copy sold goes to the North Cornwall Flood Appeal.

Boscastle – The Flood 16.8.2004

Leaflet by North Cornwall District Council; available from Boscastle Visitor Centre.

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