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Appendix D

Flood Investigation Report Llandrillo 9 February 2020

Document Control Sheet

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Executive summary

Under Section 19 of the Flood and Water Management Act, the Lead Local Flood Authority (Local Authority) on becoming aware of a flood in its area must to the extent that it considers necessary or appropriate investigate:

(a) which risk management authorities have relevant flood risk management functions, *and*

(b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.

Natural Resources Wales (NRW) have agreed to investigate all main river flooding as part of this process.

Where a Local Authority carries out an investigation then the report must be published, and any relevant risk management authorities notified.

This investigation report is a best estimate of the flood incident at Llandrillo, written as a formal way for Natural Resources Wales to record the incident. It is based on evidence gathered by Natural Resources Wales' officers through several sources and is deemed as fit for purpose at the approved date.

It was considered appropriate to carry out an investigation as one residential property suffered from internal flooding.

Following heavy rainfall, the Afon Ceidiog overtopped its banks at various locations on the 9th February 2020 and flooded one residential property.

This report provides details of the investigation with conclusions.

2. Flooding History

Llandrillo was subject to severe flooding in October/November 2000. During a period of seven days, the banks of the Afon Ceidiog were overtopped twice.

The Environment Agency's Flooding in Wales report (EA, 2000) and the Llandrillo Modelling Report (JBA Consulting, 2006) identifies on the 30th October, the right bank was overtopped approximately 50-100 m south of the southern footbridge (note this footbridge no longer exists) and flowed north down Berwyn Street causing damage to a number of properties. The right bank was again overtopped on the 6th November and caused 24 properties to suffer internal flooding.

NRW's historic flood map shows a recorded flood outline from the 2000 flood event (reproduced in Figure 2). However, based on descriptions of the 2000 event from residents and information given regarding historical flooding in the two reports mentioned earlier, NRW's historic flood map does not show the full extent of flooding experienced in Llandrillo in 2000.

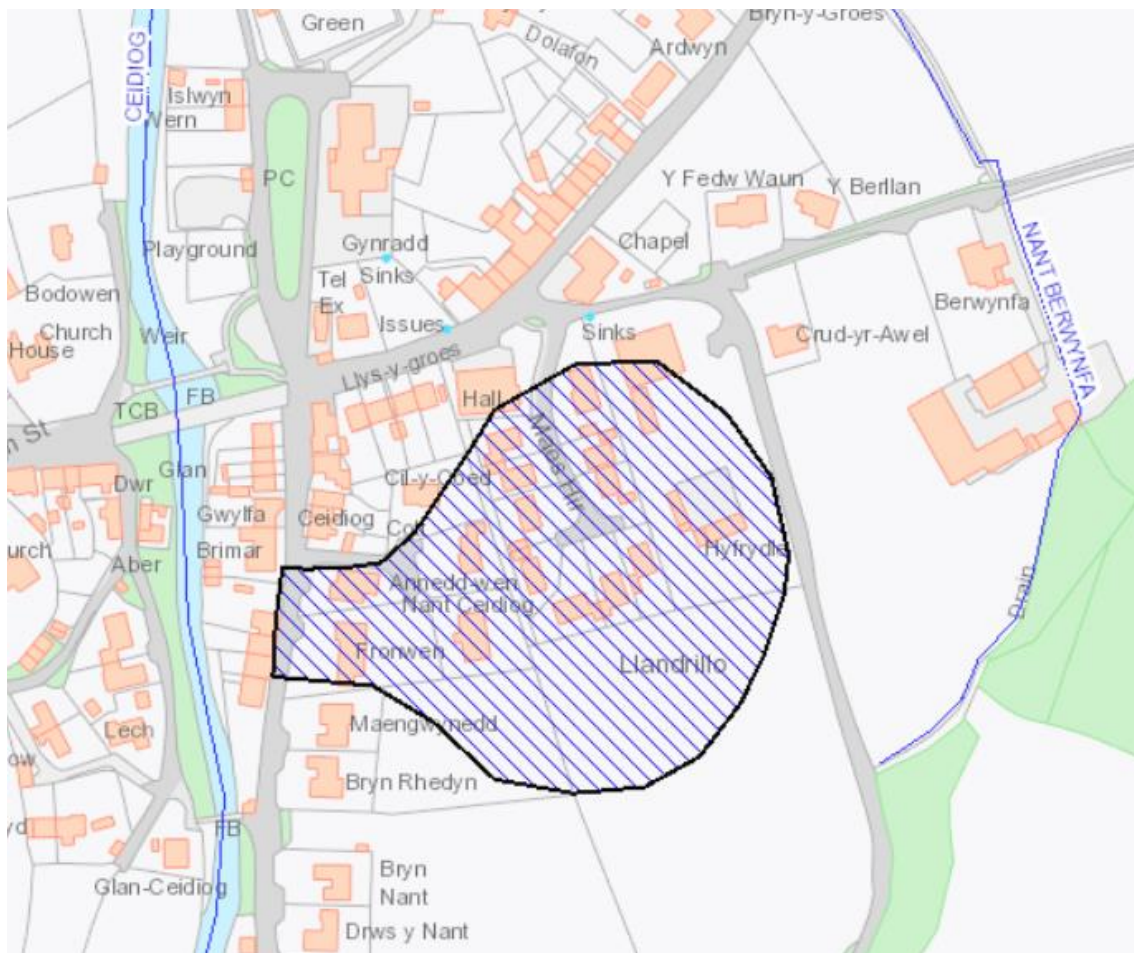


Figure 2: Historic flood outline (2000)

3. Flood Risk Assets / Property Level Protection

There are no NRW maintained or owned flood risk structures or raised defences along the Afon Ceidiog in Llandrillo. NRW maintain a small silt trap located approximately 200 m east of Afon Ceidiog on Nant Berwynfa.

Six of the properties along Afon Ceidiog upstream of the High Street road bridge over the Ceidiog have Individual Property Protection (IPP) supplied by NRW, other properties have their own IPP.

The properties identified as 'Aber Glanant', 'Tegfan', 'Plas Wern' and 'Minafon' all confirmed to have IPP installed during the event.

Sandbags and make-shift flood defences (corrugated iron sheets, plyboards, etc.) were also used during the event to protect properties and mitigate flows.

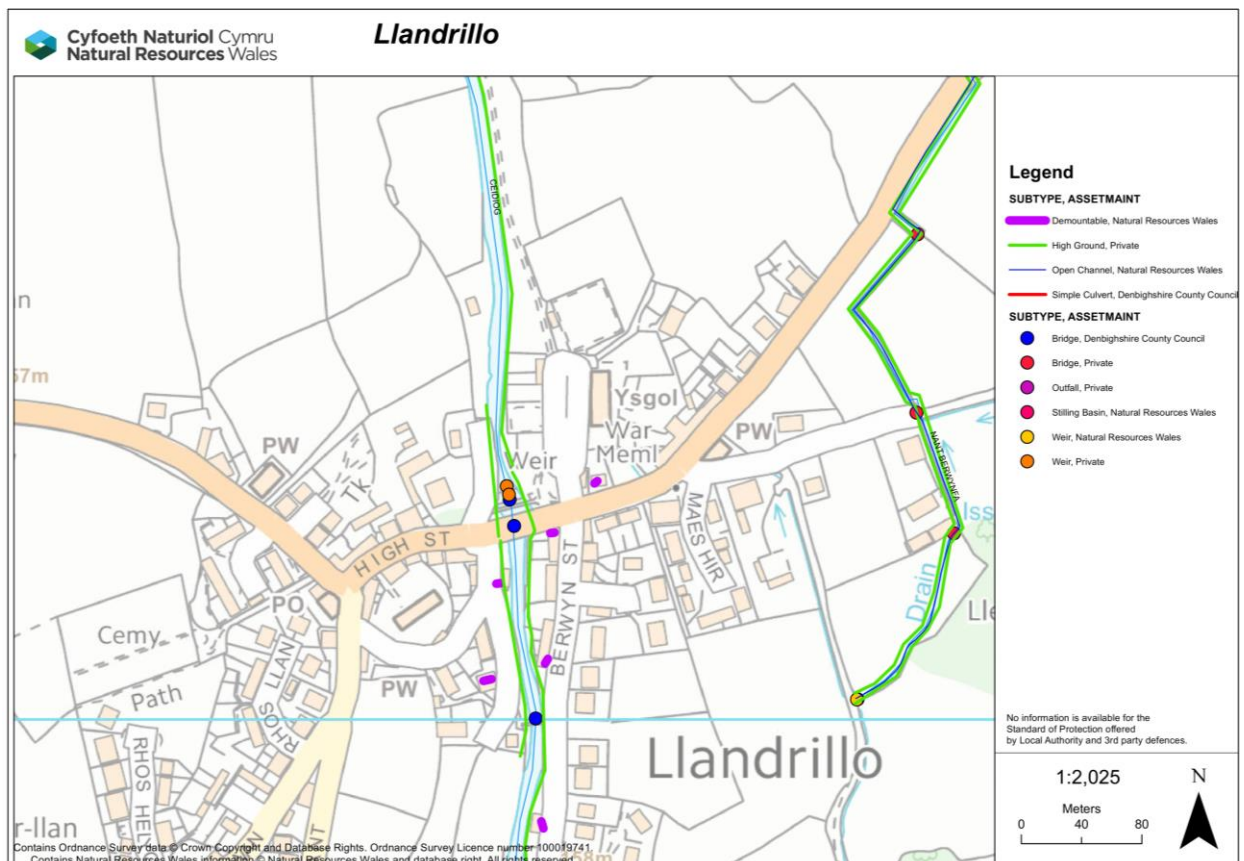


Figure 3: Llandrillo assets

4. Flood Event Information – 9th February 2020

On the 9th February 2020, a weather system formally named Storm Ciara by the Met Office, caused heavy rainfall to move across north Wales. The rainfall caused the Afon Ceidiog to overtop both its banks upstream of the High Street road bridge at Llandrillo.

A total of one residential property (Tegfan) was confirmed to have flooded internally from the main river.

During a site visit by NRW staff on the 17th February 2020, one resident confirmed that a rear room of their property (Tegfan) suffered internal flooding from the Afon Ceidiog. The resident stated water overtopped from the river into the garden (see Figure 4) and entered through the wall at the side of the house. Water did not enter through the door at the rear of the property as an IPP floodgate was deployed here.



Figure 4: Afon Ceidiog from Tegfan. Source: NRW staff

Several other properties reported floodwater from the Afon Ceidiog reaching either the front or rear steps of their houses including 'Plas Estyn', 'Brodawel', 'Bryn Nant' and 'Glan Ceidiog'.

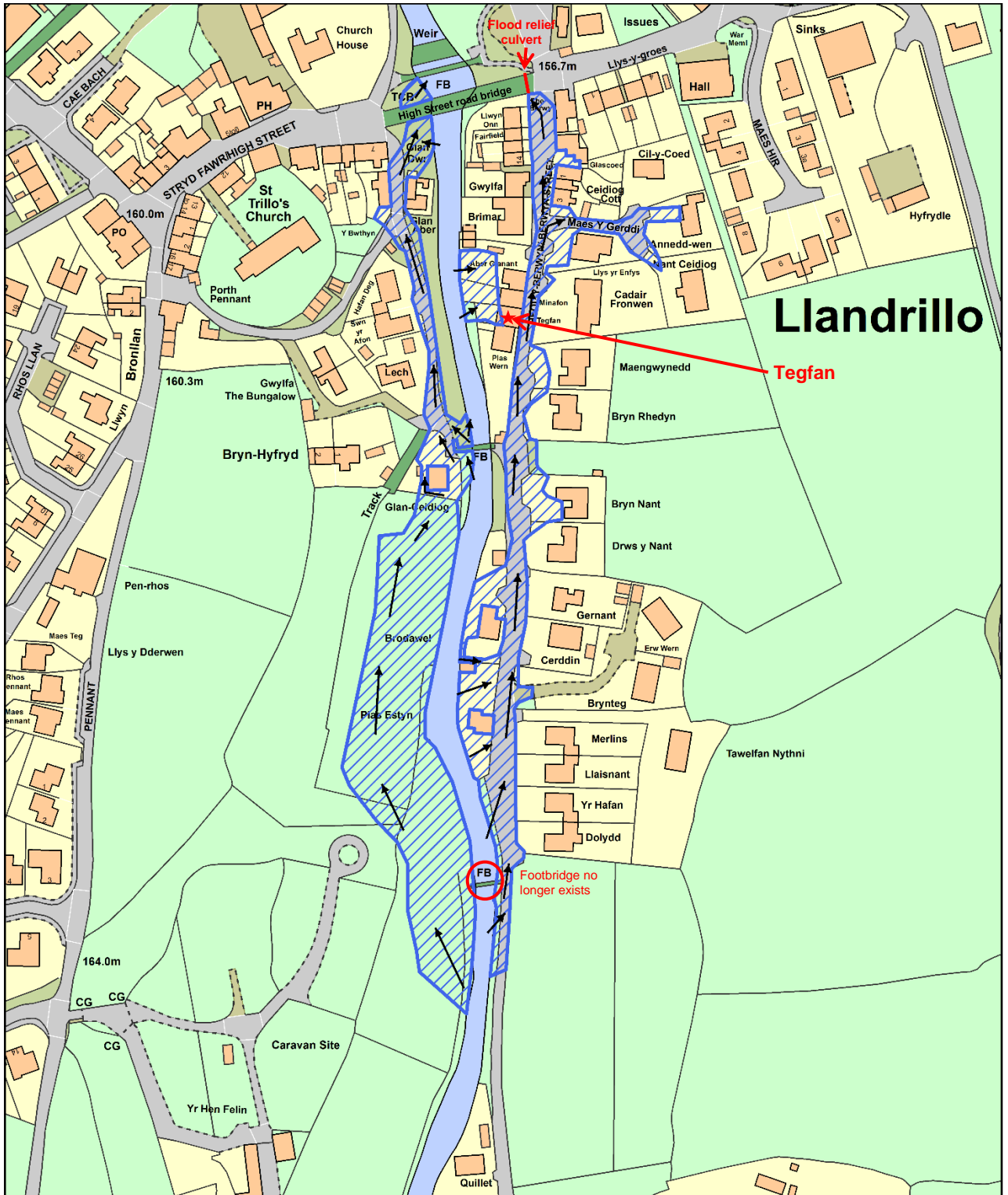


Figure 5: Outline and Route

Afon Ceidiog right bank

Between 8:30am and 8:44am on 9th February, the Afon Ceidiog overtopped its right bank near the property named 'Plas Estyn' (Figure 6). As the Ceidiog continued to rise, the extent of overtopping of the bank extended further upstream. The floodwater flowed north along Berwyn Street.

The most significant overtopping occurred over the gabion baskets, approximately 80m upstream (south) of 'Plas Estyn' (Figure 7).

The depth of floodwater on Berwyn Street peaked at about 150-200mm at about 11am to 12pm following the heaviest period of rain. However, the Ceidiog continued to overtop to Berwyn Street for most of the day.

Residents implemented makeshift flood defences across drives and at strategic locations along the flood's flow path to mitigate internal flooding including across the entrance to Maes Y Gerddi (Figures 8 and 9).

The flow along Berwyn Street drained to a flood relief culvert (a single 450 mm diameter pipe, see Figure 10) adjacent 'Llwyn Onn' which drains under Llys-y-Groes, to the east of the High Street road bridge.

According to the Senior Flood Warden for the local community, once the flood relief culvert was cleared, it worked effectively to relieve the flooding on Berwyn Street.

Residents reported that had the depth of flooding been an inch higher on Berwyn Street, the floodwater would have overtopped Llys-y-Groes and flowed down towards Tyn Y Groes, potentially impacting more properties.

It is unknown if the property 'Quillet' was affected by floodwaters from the Ceidiog during this event. This property is known to have been impacted by the Ceidiog in the past, however, the Senior Flood Warden identified only the one property was flooded internally (Tegfan) on the 9th February 2020.



Figure 6: Initial floodwater overtopping from Afon Ceidiog near Plas Estyn. Source: Resident



Figure 7: Overtopping between Plas Estyn and Quillet. Source: Resident



Figure 8: Floodwater at the south end of Berwyn Street. Source: Llandrillo Facebook group



Figure 9: Flooding on Maes Y Gerddi, looking towards Berwyn Street. Source: Resident



Figure 10: Flood relief culvert at the High Street road bridge. Source: NRW staff

Afon Ceidiog left bank

The Afon Ceidiog overtopped the left bank, later in the day than the right bank. The Ceidiog overtopped near to the caravan park and flowed north along the road between the property named 'Glan Ceidiog' and the High Street road bridge. Overtopping also occurred at the footbridge near 'Glan Ceidiog' (Figure 11).

The floodwater along the left bank floodplain drains through the high-flow arch under the road bridge and back into the Ceidiog.

There was no reported internal flooding on the left bank floodplain. Both 'Glan Ceidiog' (Figure 12) and 'Glan Dwr' (Figure 13) were surrounded by water but did not report any internal flooding.



Figure 11: Floodwater overtopping the left bank, nearby Glan Ceidiog and the adjacent footbridge. Source: Llandrillo Facebook group



Figure 12: Floodwater at the rear (south) of Glan Ceidiog. Source: Llandrillo Facebook group



Figure 13: Floodwater around the Glan Dwr property, immediately upstream of the High Street road bridge. Source: Llandrillo Facebook group

Nant Berwynfa

While it is expected that the Nant Berwynfa experienced high flows during the event, there was no reported impacts to property or infrastructure, nor was there any evidence of damage noted from Nant Berwynfa during the site visit by NRW staff following the event.

5. Details of Warnings and Alerts issued

Llandrillo has no specific Flood Warning Service.

The Senior Flood Warden stated that he received a flood warning at about 12pm on the 9th February for the Upper Dee Valley (for flood risk from the River Dee), however this does not cover Llandrillo and was after the flooding in Llandrillo had occurred.

6. Response

NRW has no formal operational response procedure for Llandrillo. Attendance by NRW was not requested during the event.

A member of the local community flood warden team raised the alarm just before 9am when the Ceidiog started to overtop its banks. The flood warden team immediately implemented their flood plan which included door knocking to warn residents, barricading doorways/drives and installing IPP equipment.

A resident did call the Local Authority, but only received a recorded message.

The flood warden team were prepared to evacuate residents to the Village Hall if required.

7. Conclusion

On the 9th February 2020, the Afon Ceidiog exceeded its capacity upstream of Llandrillo and overtopped the riverbank, causing shallow internal flooding to a single room in one property (Tegfan) in Llandrillo.

The IPP measures used at 'Tegfan' during this event were effective to the extent that they reduced the flood depth but failed to keep the property dry as water evidently entered through a wall.

8. Recommendations

Due to the extent of floodwater flowing through Llandrillo, it may be appropriate to review and update the existing flood modelling study (2008) including the underlying hydrology. This review should look at the severity of this event, the effects of structures along the system (road and foot bridges, flood relief culvert and existing defences), effectiveness of current private defences and flood warning options.

Following the flood modelling review, the initial assessment completed in 2009 on potential flood alleviation measures for Llandrillo should also be reviewed.

NRW will continue to work closely with the community of Llandrillo to further understand flooding mechanisms and where appropriate, liaise with Denbighshire County Council to identify options for flood defence for the village.

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