

A Flood Forecasting and Warning Performance Measure



Flood & Coast 2017 Telford
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Objective

- ➔ In one number - capture the accuracy and lead time performance of the flood forecasting and warning service for England.



Background

➔ Many inter-dependent components:

- ➔ Detection elements
- ➔ Forecasting elements
- ➔ Warning elements
- ➔ Some from 3rd parties

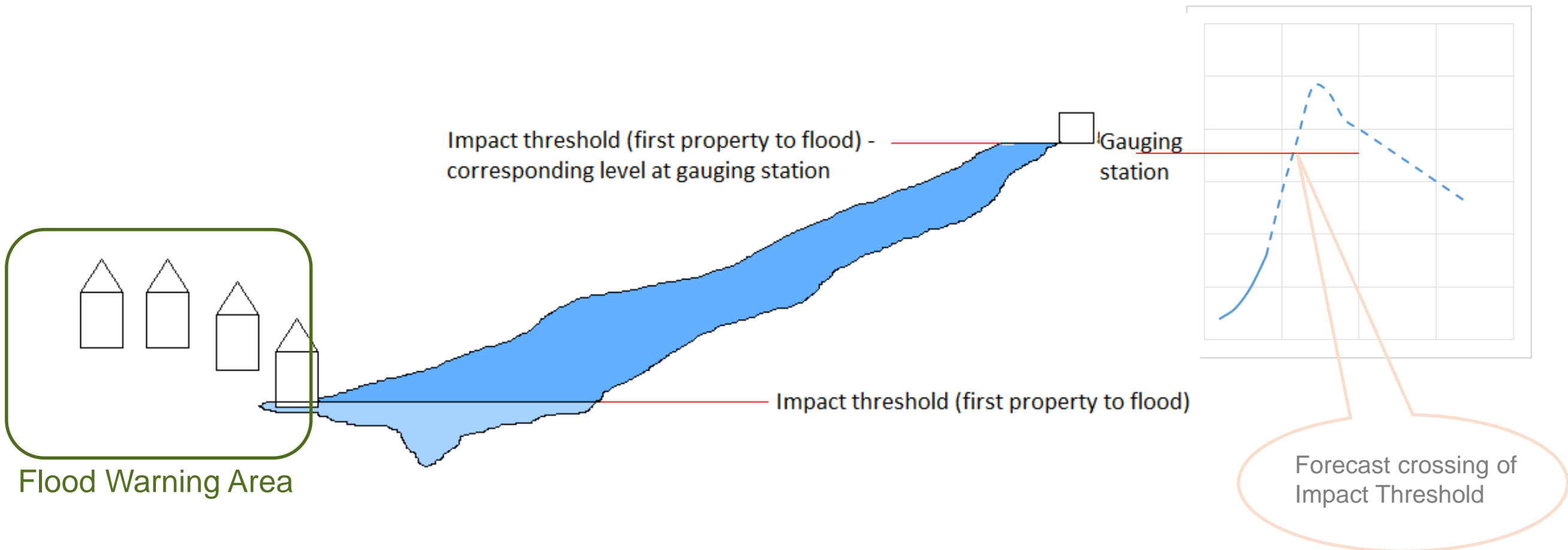


➔ Service is not just about issuing warnings:

- ➔ Long lead time low probability warnings
- ➔ deploy temporary defences, pumps, staff, structures

➔ Paper focuses on outcome of the core service - “are we issuing flood warnings in time to the public and responders?”

Develop Impact Thresholds



- ➔ Impact threshold defined and implemented (~2400 communities)
- ➔ Defined as level when first significant thing floods (i.e. 1st property)
- ➔ Could be defensive embankment over-topped, significant infrastructure such as major road, access road flooded that isolates the community
- ➔ No freeboard
- ➔ Local Area team to set the thresholds

All communities have a Target Lead Time (TLT)

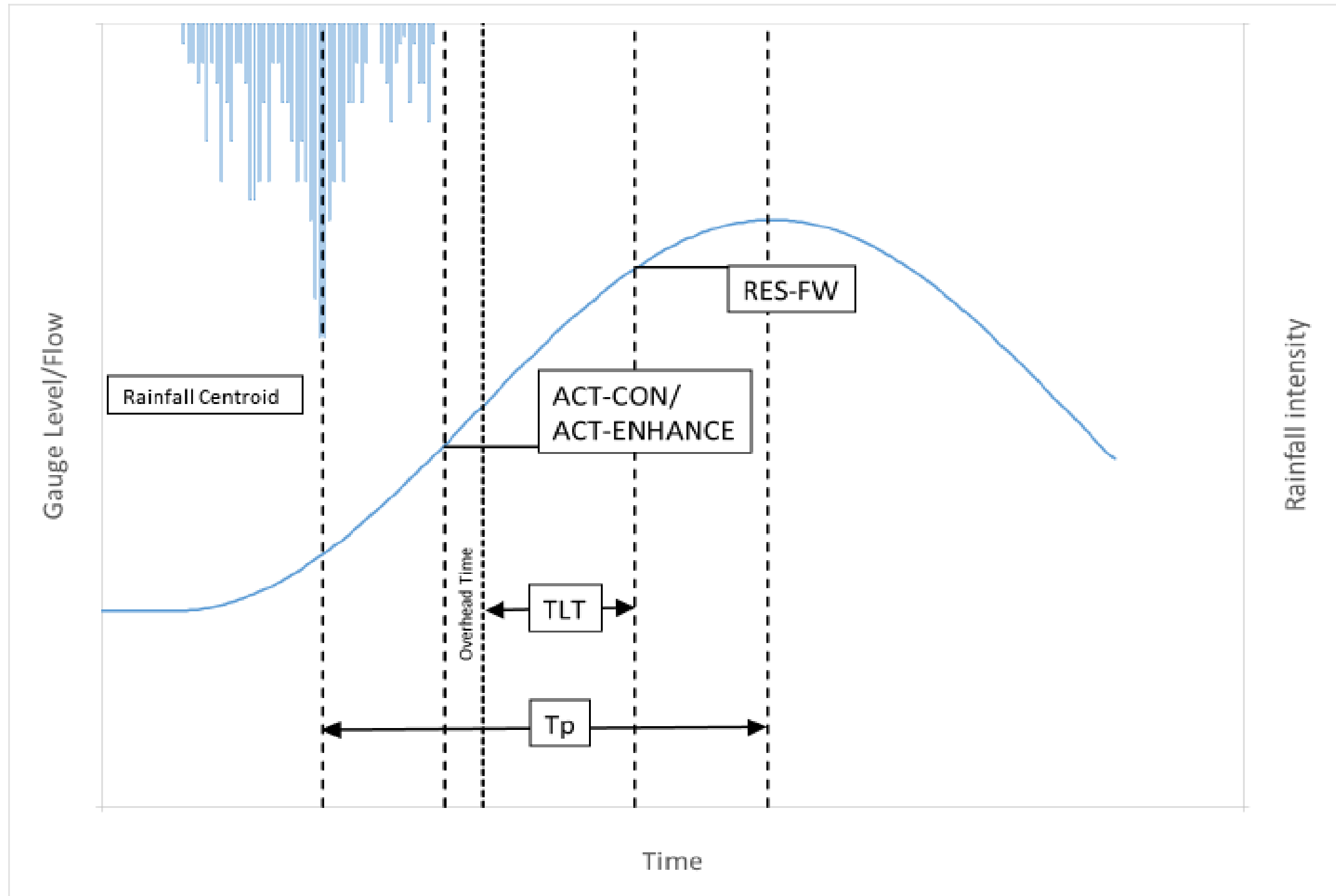


Figure 5 - Theoretical illustration of TLT compared to T_p , including relevant flood warning thresholds

$$\text{Target Lead Time (TLT)} = \frac{\text{Time to Peak (Tp)}}{1.8} - 1 \text{ hour}$$

- 1 hour - overhead time:
 - ½ hour for Forecaster
 - ½ hour for Warner
- Round down to nearest ½ hour
- Set minimum TLT to ½ hour for RRC's
- TLT's range from ½ hour to 16 hours
- All steps were sense tested



Lead time & accuracy

	Impact threshold exceeded (flooding occurs)	Impact threshold not exceeded (no flooding occurs)
Flood warning is issued	A correct warning (hit)	A false alarm
Flood warning is not issued	A missed event (miss)	A correct negative

1. FW issued within Target Lead Time (Correct & Timely)
2. Issued after Target Lead Time (Late)

Correct&Timely + 0.75 x Late

$$\text{Performance Score} = \frac{\text{Correct\&Timely} + 0.75 \times \text{Late}}{\text{Correct\&Timely} + \text{Late} + \text{Miss} + (0.1 \times \text{False alarms})}$$

- Critical Success Index equation
 - Late warnings - still issued before flooding starts – apply a 75% weight
 - False Alarms - apply a 10% weight – don't want to discourage local team not to issue
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- Each Flood Warning is validated – Timestamp of when issued and if/when threshold crossed
 - Tested on a 3 month period of intense flooding



Nov 2015 – Jan 2016 Storms Desmond, Eva & Frank – back calculation of results

Zone	Warnings Issued	Warnings issued ahead of flooding		Issued after flooding started	False Alarm (warning issued threshold not crossed)	Couldn't score (no Impact threshold)	Performance Score
		Met or exceeded lead time target	Missed lead time target (late)				
National	859	193	133	85	201	247	67.9%

- Canned data
- Over quarter warnings unable to score
- Duty Officers didn't know they would be judged to new TLT standards!
- Extreme rainfall in Desmond – difficult to get warnings out fast enough
- Many false alarms were coastal – additional dimension is needed.

Conclusions

- ➔ The Performance Measure is implemented (JBA) – currently capturing performance of flood warnings in last 6 months:
 - ➔ Minor issues/training/automation
- ➔ Works for river flooding
- ➔ Works for coastal flooding
 - ➔ but less meaningful – needs more work
- ➔ Collect data for 2017/18 & baseline
- ➔ Set Targets for 2018/19 and beyond
- ➔ Evidence that service is delivering an effective forecast led flood warning service to the public, businesses and responders

