

**Why the best preparation for flooding
happens on dry days**

Andrew Nixon

Senior Advisor

Environment Agency



PREPARE ACT SURVIVE

**FLOODS
DESTROY
BE PREPARED**



Environment
Agency



Environment
Agency



Cyfoeth Naturiol Cymru
Natural Resources Wales



Office for
Nuclear Regulation

Catastrophic flooding at an industrial site



Source: New York Times Archives 1994
www.nytimes.com



Cyfoeth Naturiol Cymru
Natural Resources Wales



Office for
Nuclear Regulation



Source: Business Insider India website

A vision for the future



- UK plc more resilient to flooding
- Partnership working to ensure local impacts and options considered to achieve goals
- Guidance jointly developed with industry experience and knowledge.



Environment
Agency



Cyfoeth Naturiol Cymru
Natural Resources Wales



Office for
Nuclear Regulation

- Is guidance available to ensure all operators can improve resilience to flooding and prevent major accidents?
- Do we understand the impacts from flooding at all at risk sites
 - MAH's
 - potential impacts to people and the environment
 - common mode failure
- How do we ensure that all at risk sites have appropriately prepared to prevent major accidents from flooding?



Preparing for flooding

A guide for sites regulated under EPR and COMAH (June 2015)

Flooding is the most common and widespread natural disaster in the UK. While we do everything we can to reduce the chance of flooding, it is a natural process and can never be completely eliminated. By preparing in advance you can minimise the impact that flooding could have on your activities. Flood planning will help you comply with your Environmental Permit and the COMAH regulations where they apply.

1. Find out if your site is in an area at risk of flooding

It is quick and easy to find out if you're at risk:

- Call Floodline on 0345 988 1188 24 hours a day. By taking your postcode, our staff will check if your site is in a flood risk area.
- Look at our website www.gov.uk/prepare-for-a-flood/find-out-if-youre-at-risk and check if your site's postcode is at risk from flooding from rivers, the sea, surface water or reservoirs.
- You should also consider the risk of flooding from other sources such as overloaded drainage systems and from rising groundwater. Your local authority and water company may be able to provide advice on flooding from public sewers.

Floods can happen anywhere at anytime. Even where your site is protected by flood defences you should not be complacent, defences can be overtopped by severe flooding.

2. Be aware - know when flooding is imminent

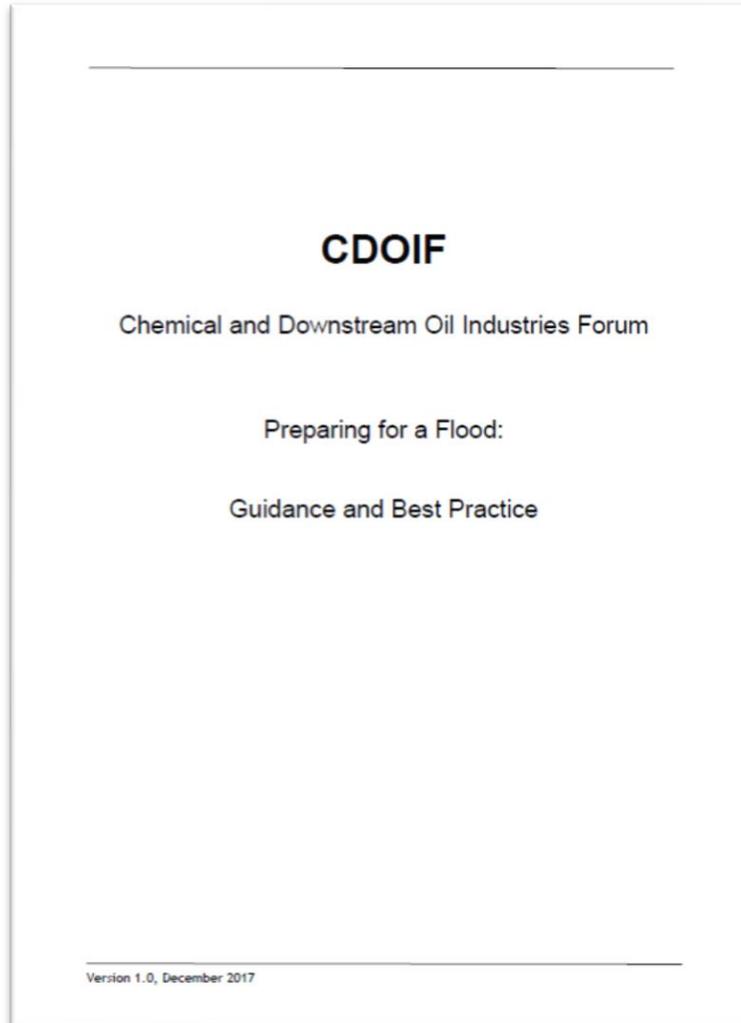
- Floodline Warnings Direct: sign up for our free flood warning service by calling Floodline or visiting our website. Once registered for the service, flood warnings will be sent to you by phone, text, email or fax. Remember to register all vulnerable sites not just your head office.
- Our website: view [up-to-date flood warning information](#), monitor the [river or sea levels](#) for your local river or coastline and check out the 3 day [flood risk forecast](#) for your county.
- Call Floodline: listen to recorded information on the latest warnings and predictions or speak to our staff for more general information 24 hours a day.
- Tune in: you may see or hear our warnings on television and in radio broadcasts.
- Using our live data: contact us if you are interested in using our data to develop a targeted warning service for a network of assets at risk of flooding.

www.gov.uk/environment-agency

LIT 7176, Version 2, Issued: 30/06/2015

- v2 published June 2015
 - Updated following East Coast surge
- Outlines good practice for identifying risk and risk reduction measures (technical, emergency preparedness, SMS etc).

<https://www.gov.uk/government/publications/preparing-for-flooding-a-guide-for-regulated-sites> and http://www.floodlinescotland.org.uk/media/4141/regulated_sites_guide.pdf



- Commissioned by COMAH Strategic Forum as part of the Strategic Topic
- Prepared by the Chemicals and Downstream Oil Industry Forum (CDOIF), flood preparedness working group
- Signposts guidance and best practice to support improvements in flood preparedness

- **Safety Alert 012 – Coastal Flooding**

- <http://www.p-s-f2.org.uk/?p=537>

Process Safety Forum

Safety Alert #12 – Issued on 11/10/2017

Site flooding event

This safety alert is shared in order to promote learning and improve safety. You should seek appropriate guidance regarding the relevance, accuracy, and completeness of this alert to your circumstances prior to implementation.

Issue

A North Sea tidal surge partly flooded a regulated site. The site involved was a lower tier COMAH site storing and blending hazardous wastes (potentially flammable, toxic and dangerous to the environment). The issue and learning are equally relevant to any industrial site that has a potential flood risk.



Above - Picture of the damaged wave guard (photographed from the seaward side)



Left – Picture of the repaired wave guard (photographed with the site behind the camera)

The site was identified as being at 'high' risk from coastal flooding but was protected by a sea wall and wave guard.

Arkema Inc. Chemical Plant Fire



Source: US CSB website
www.uscsb.gov



Arkema Inc. Chemical Plant Fire



Source: US CSB website
www.uscsb.gov



Arkema Inc. Chemical Plant Fire: US CSB Investigation



Organic Peroxide Decomposition, Release, and Fire at Arkema Crosby Following Hurricane Harvey Flooding
Crosby, Texas

Incident Date: August 31, 2017
Exposures to Emergency Responders, Community Evacuation, and Property Damage

KEY ISSUES:

- Understand Site Flood Vulnerability
- Conduct a Flood Risk Assessment
- Strengthen Flood Resiliency
- Improve Emergency Response

Report Number: 2017-08-I-TX
May 2018

companies within areas that are susceptible to extreme weather including flooding:

- should perform an analysis to determine susceptibility to potential extreme natural events— such as flooding
- should evaluate the potential risk of extreme weather events and the adequacy of safeguards when analysing process hazards or facility location
- should strive to apply a sufficiently conservative risk management approach when evaluating and mitigating the risk from extreme weather events such as flooding
- **MUST** ensure that critical safeguards and equipment are not susceptible to failure by a common cause and that independent layers of protection are available in the event of flooding

US CSB May 24, 2018

Arkema Flood and Fire

- <https://youtu.be/jtWyBMwRt-A>



Source: US CSB website
www.uscsb.gov

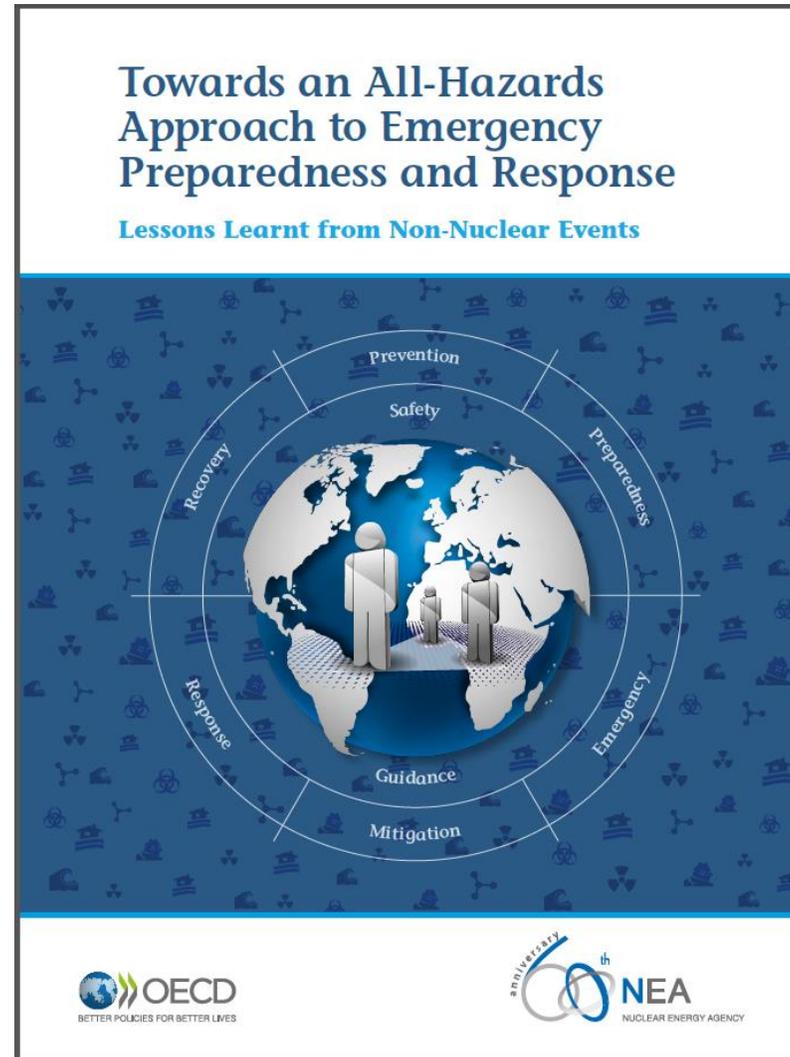
Translating the Important Lessons Learned...

- understanding your site and its surroundings
 - topography; drainage & effluent treatment, storage, access routes if flooding occurs
- understanding flood risk at your site and wider
 - mechanism(s), levels, velocity, impacts including Major Accident risk
- review flood based risk assessments
 - employ LOPA or bow tie if appropriate
 - remember common mode/cause failures, and flood defences can fail!



OECD Guiding Principals

- OECD safety continuum
- Amendments to cover natural hazards such as flooding
- Importance of leadership in preparation and response



Strategic Topic Development: Ensuring preparedness



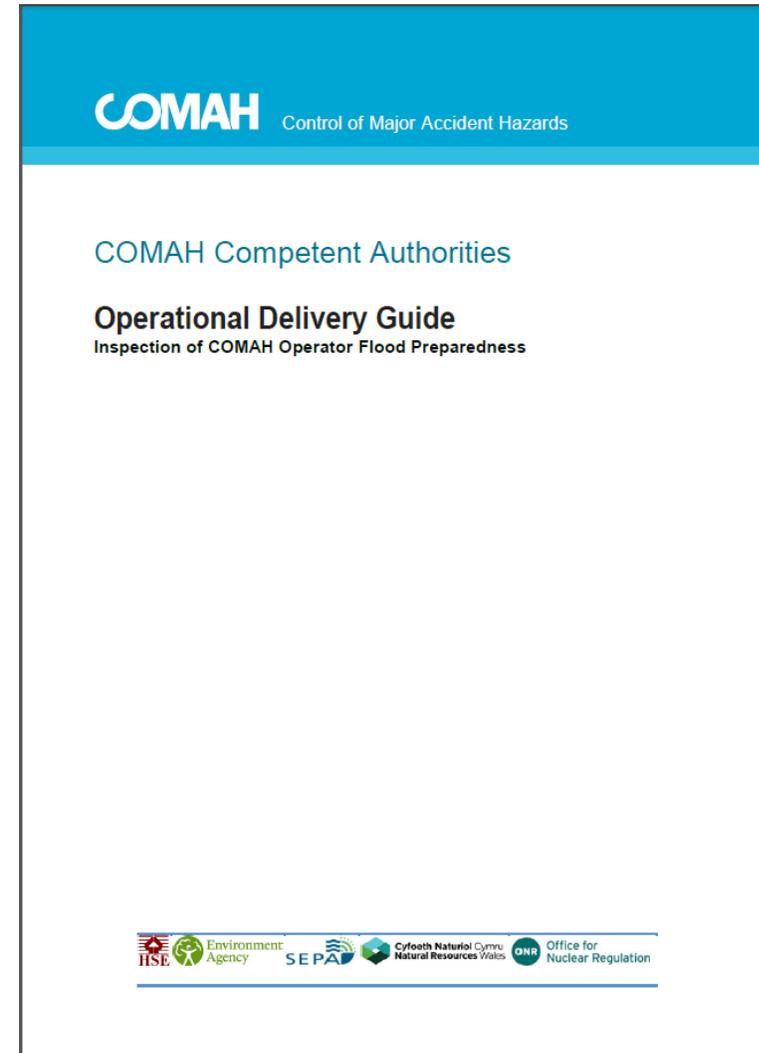
- Using the experience of the CDOIF working group including CA leads
- Covering all of the key areas linked to the lessons learned
- Applies to COMAH establishments that have been assessed as either being directly at risk of flooding or where indirect flooding may aggravate the response to a major accident on site



Strategic Topic Development: Operational Delivery Guide



- Delivery Guide now published
- Delivery time frame outlined
- Provide assurance that sites are prepared
- Ongoing joint working with industry to ensure appropriate use of tools and sharing best practice



Flood preparedness work will ensure:

- Flood risk is better understood with improved preparedness
 - Early alert is key (preparations on a dry day)
- Consistency of approach
- Sharing best practice
- Broader thinking
 - Direct effects and indirect effects
 - Recovery plans

- Looking back to key lessons and examples
 - Preparation on a dry day is key!
- Need to ensure defense in depth using multiple protection layers
 - preventing common cause failure.
- What position represents inherent safety?
- If you are at risk from the impacts of flooding what position would you rather be in?

Questions?

FLOODS DESTROY DESTROY BE PREPARED

#floodaware

TWEETS	FOLLOWING	FOLLOWERS	FAVORITES	LISTS
16.8K	2,988	247K	115	7

Environment Agency @EnvAgency
It's our job to look after your environment. Follow staff. twitter.com/EnvAgency/tst
England
gov.uk/environment-ag...
Joined June 2009

Environment Agency @EnvAgency · Jan 10
Floodline is open 24/7 ready to provide advice on 0345 988 1188
Flood risk updated here: ow.ly/H39zo

