HAZRUNOFF

PROJECT

Alerting and Detection – Novel Approaches

Public Health England
Cardiff Workshop
20th June 2019

Funded by
European Union
Civil Protection
and Humanitarian Aid

Public Health England - Who we are

Public Health England

Protecting and improving the nation's health

Part of the UK Department of Health leading on the protection and promotion of public health.

The Centre for Radiation, Chemical and Environmental Hazards (CRCE) provides advice on human health effects from chemicals and radiation in the environment.

CRCE Wales is based in Cardiff and provides specialist advice to Wales and Ireland.

Category 1 Responder to chemical incidents meaning that we have a core responsibility to plan, prepare and respond to emergencies.

Also a WHO Coordination Centre for chemical incidents worldwide and have been involved in European maritime research for several years.

World Health Organization

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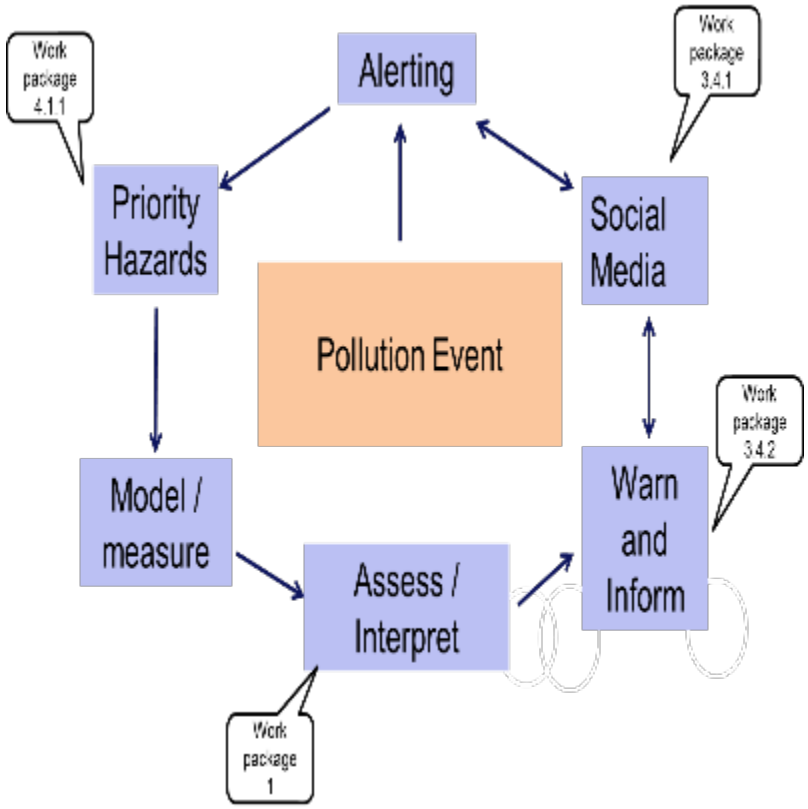
Planning, Alerting and Risk management

Development of tools and guides to aid risk management.

Hazard prioritisation for planning and preparedness (WP4)

Monitoring and data assessment (WP1)

Social media as an early alerting mechanism (WP3)



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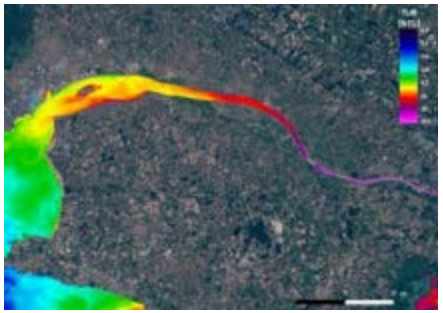
Planning and Preparedness - Hazard Prioritisation

Many coastal areas pose risks from former infrastructure such as landfills and industrial plant

Natural processes such as coastal erosion and flooding, can increase the potential for contaminants to impact health and the environment.

Not possible to provide contingencies for every eventuality.

Framework to prioritise chemical hazards, helping to focus resources on key pollutants



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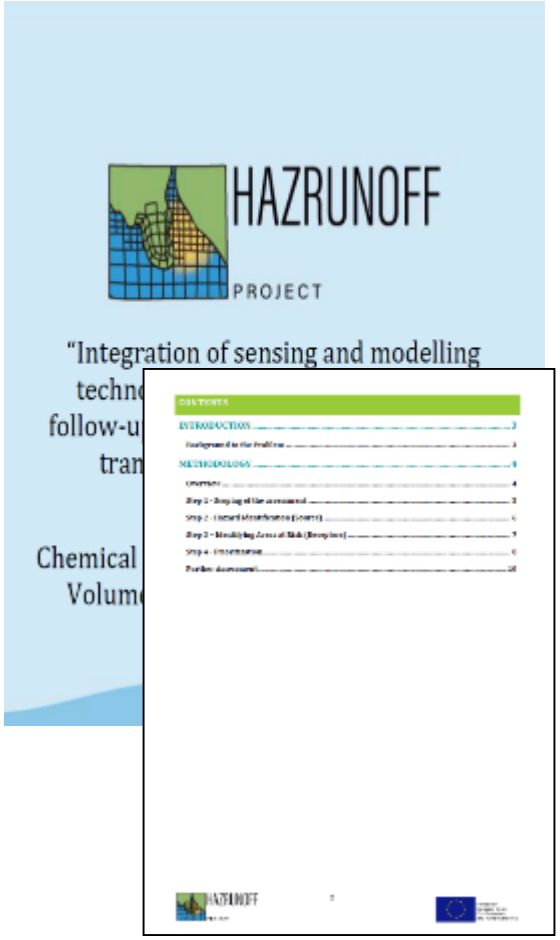
An approach comprising two main elements

1. **Desk based methodology to define**:
   - **Scope** – Temporal and geographical boundaries
   - **Sources** - key current and historical coastal activities / infrastructure:
   - **Pathways -** Incorporating behaviour of pollutants with geological and hydrogeological \ hydrological factors
   - **Receptors** – incorporating health, socio/economic and ecological factors
2. **Database of key pollutants** associated with industrial processes.



http://www.hazrunoff.eu/planning-training-and-exercising-for-response/

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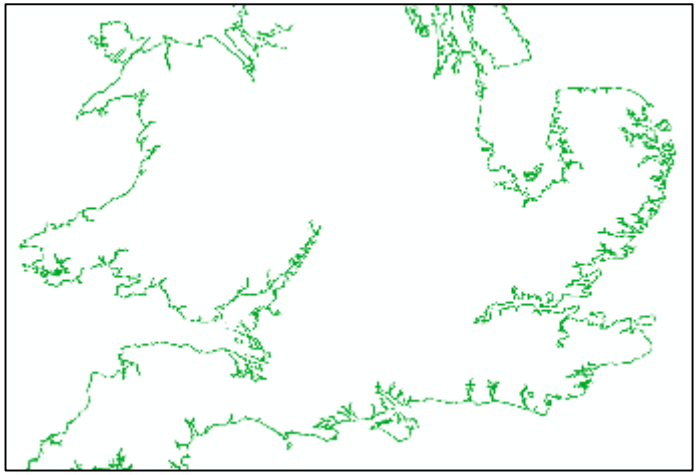
Scoping – Where are we looking and why?

- Establishment of boundaries for proposed study area and time-frame for data searches.
- Determined by the assessor based upon the underlying objectives. No defined limits.
- Coastal erosion maps, flood zones, 5m contours are helpful indicators.
- Recommended to scope the area to a manageable size and if necessary use multiple assessments for large areas.



OS Map Series	Editions				
6 inch	1883	1900	1921	1948	1951
25 inch	1899		1918	1947	
1 inch	1883			1947	1960
1 :25000				1956	1961
1 :10000					1980

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Source – Pathway - Receptor

Past and current industrial infrastructure.

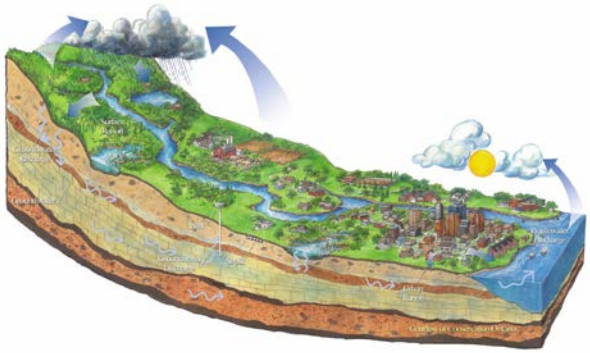
Human Health - populations, amenities

Socio-economic – transport, industry, agriculture / aquaculture

Environmental – rivers, aquifers

Ecological - habitats / species,

Determined from current and historical maps as well as records from regulatory bodies.



Tool can help identify pathways

No linkage = no risk

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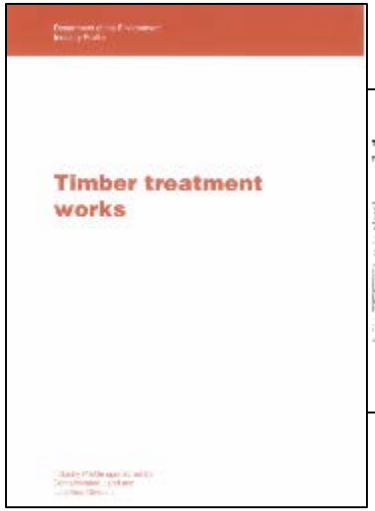
Prioritisation Tool

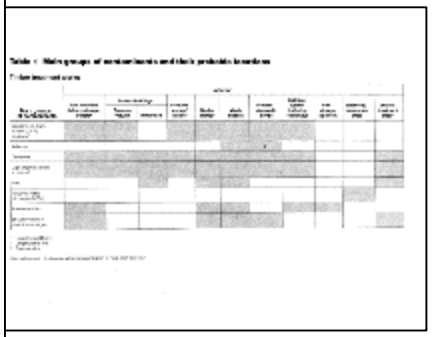
Industry profile database, listing key pollutants from major industrial processes

Chemical database with assigned hazard scores.

Toxicity based upon GESAMP (Group of Expert Scientists for the Assessment of Marine Pollution)

Behaviour based upon the standard European behaviour classifications (SEBC).





Behaviour	Human Health	Ecological
Gas / Evaporator	4	1
Floater	3	2
Dissolver	2	3
Sinker	1	4

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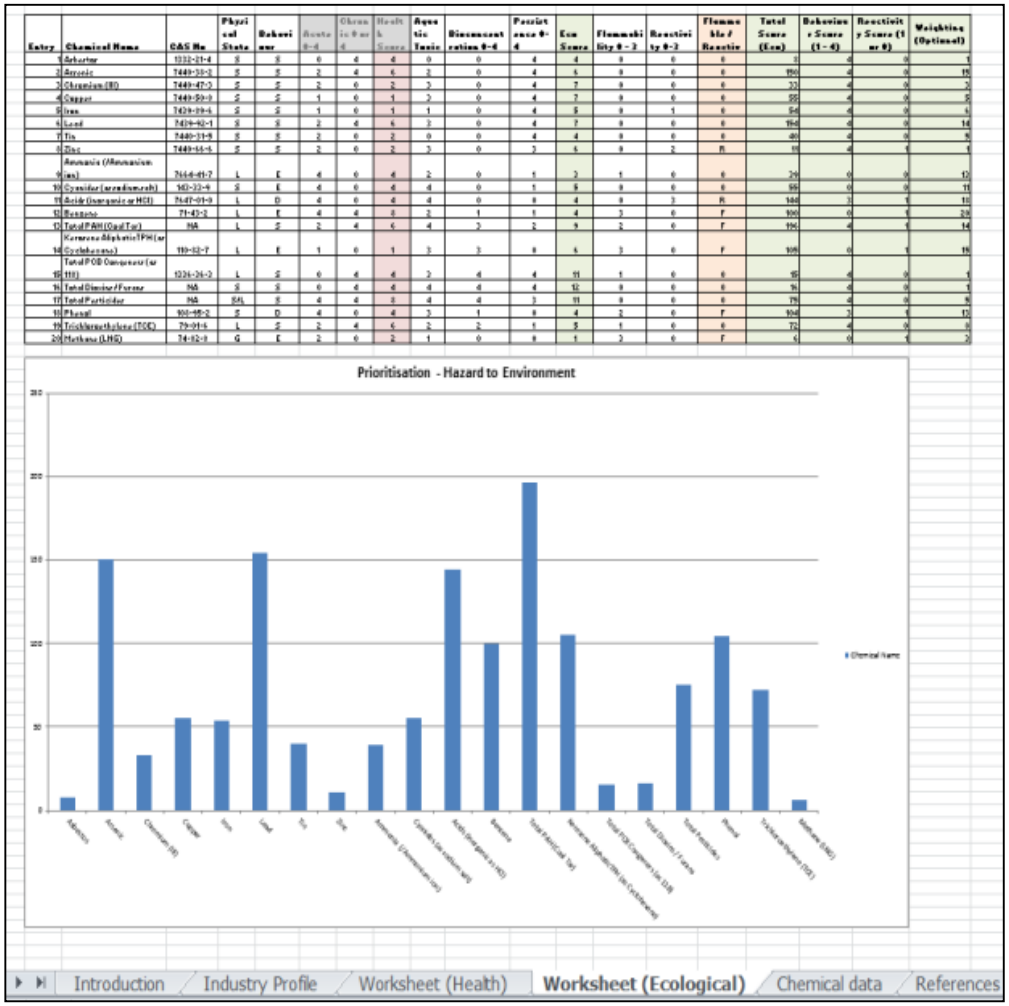
Prioritisation

Automated worksheets produce health and ecological prioritisations.

Can apply user defined weightings to reflect other considerations e.g. frequency of pollutant sources.

Display results graphically for review



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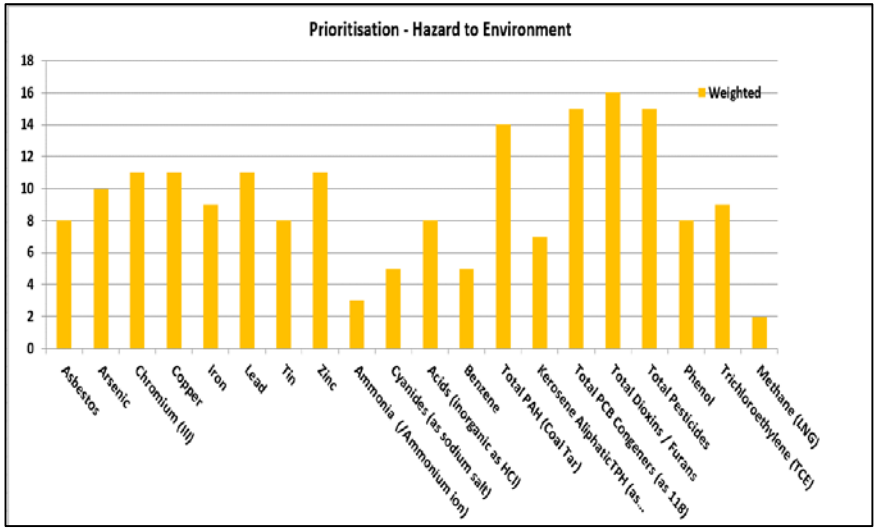
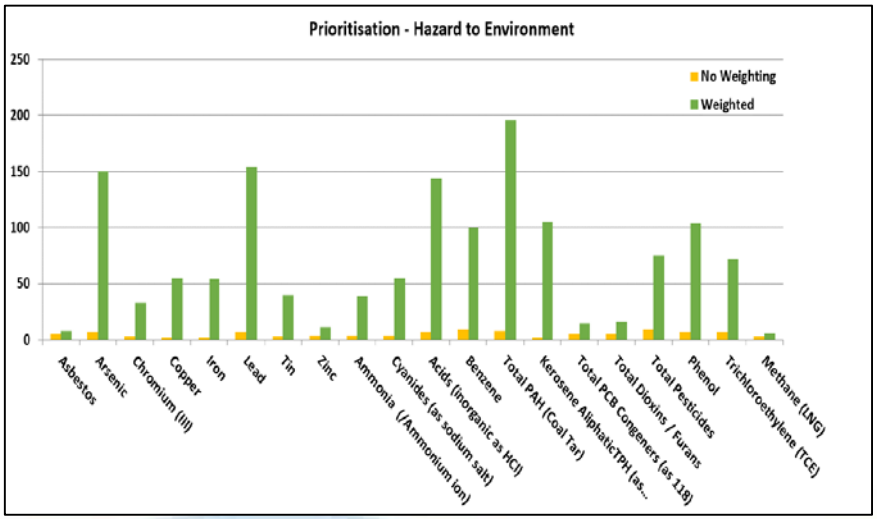
In Summary

Prioritises chemicals with highest relative risk when released into the environment.

Can aid planners - informing modelling, monitoring and chemical specific response strategies.

Can further help to inform longer-term management strategies e.g. coastal protection, land reclamation.





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Rapid Data Analysis

During incident response it is important to have knowledge of the chemicals that have been released to aid forecasting and inform the risk assessment.

Likewise it is important to be able to interpret data to assess potential impact on health and the environment.

A tool has been developed to aid this process

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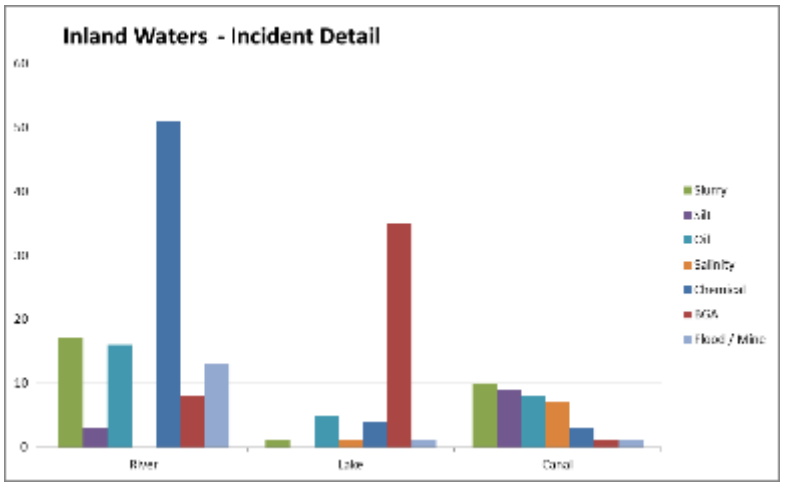
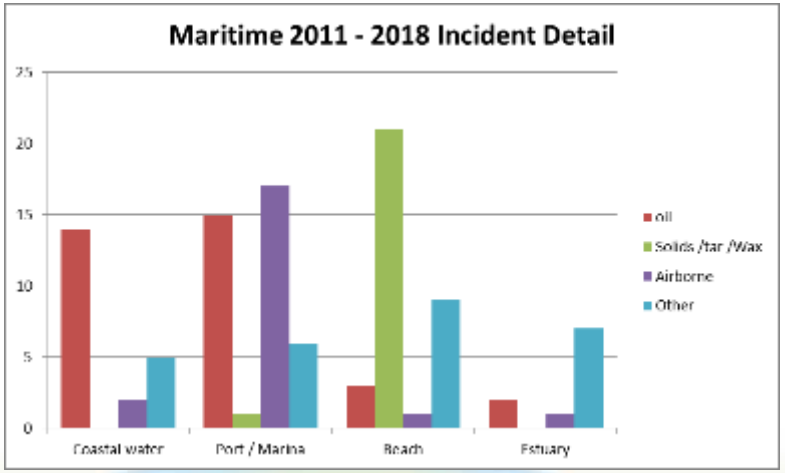
Method

Reviewed incidents for UK and Wales inland, estuarine and coastal waters (2011 - 2018)





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Identified Key Parameters

Pollutant incident type	Pollutant*	Indicators/proxies*	Monitors
Slurry / Sewage	Ammonia (Ammonium), TOC	BOD/COD, turbidity, cells	Electrochemical
Oil Spill	BTEX / PAH	VOC, BOD/COD, sulphide	Fluorescence / PID
Chemical	Various including Pesticides	pH, TOC, BOD/COD, conductivity	Fluorescence / PID
BGA	Toxin	Cells, N, P, BOD/COD	Fluorescence / Electrochemical
Airborne / Fire / Vapour	Particulates, gases, Dioxins and furans	PM_{10}, NO_2, SO_2, CO_2, CO, VOC and H_2S	None / Light scatter / PID / Electrochemical
Palm Oil / Wax	VFA, TPH	BOD, COD, Sulphide, TPH, pH	Electrochemical / Visual / PID
Flooding	TOC, salinity, metals	pH, TOC, BOD, cells, chloride, conductivity	Electrochemical

*(TOC – Total Organic Carbon, BOD – Biological Oxygen Demand, COD – Chemical Oxygen Demand, TPH – Total Petroleum Hydrocarbons, VOC – Volatile Organic Compounds, N – Nitrogenous compounds, P – phosphates, VFA – Volatile Fatty Acids).

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Reviewed Monitoring Options

Real-time (or near real-time) environmental monitoring offers;

- Rapid
- clear characterisation
- Inform detailed monitoring.

Marketplace review to identify gaps in the current industry capability to provide real-time, in-situ monitoring of the indicator/proxy substances.

Identifying gaps in capability assisted in the selection of proxies to be used in the Rapid Assessment Tool.

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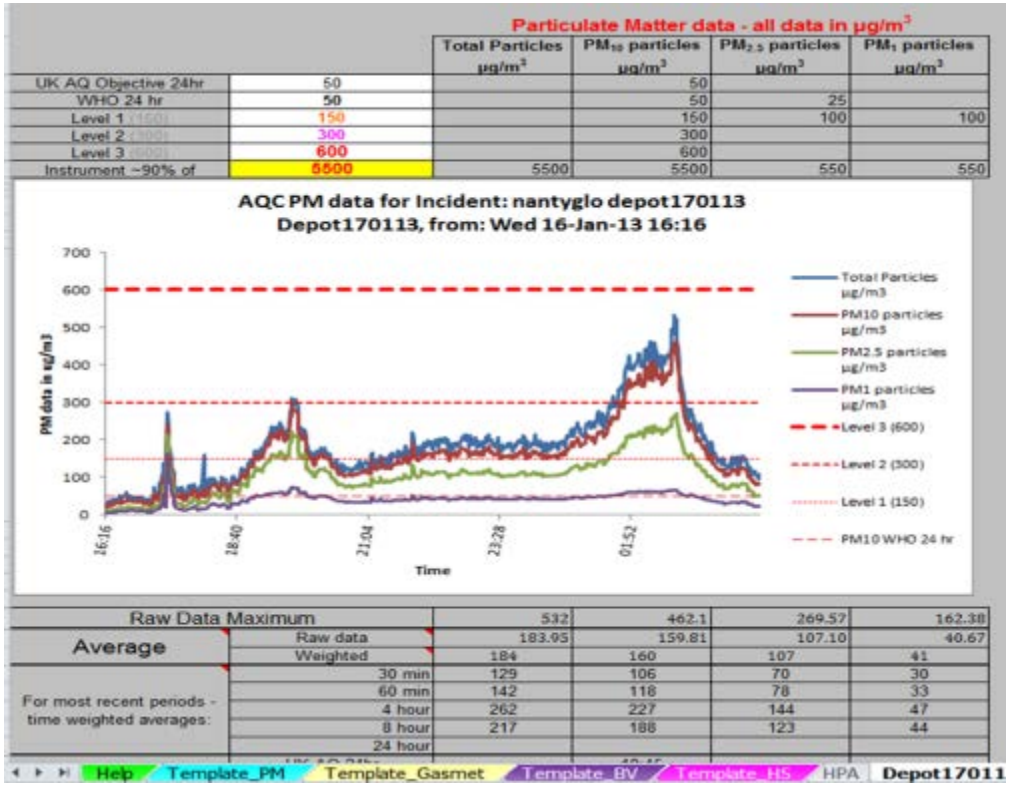
Designed the Tool

- Automated Excel Tool based on approach used for air quality incidents
- Accepts raw data from monitors (.txt, .xls and .csv)
- Presents in graphical and numerical output
- Displays against relevant risk based thresholds / standards
  - Drinking Water Standards
  - Environmental Quality Standards
  - Site specific limits
- Indicates potential risks



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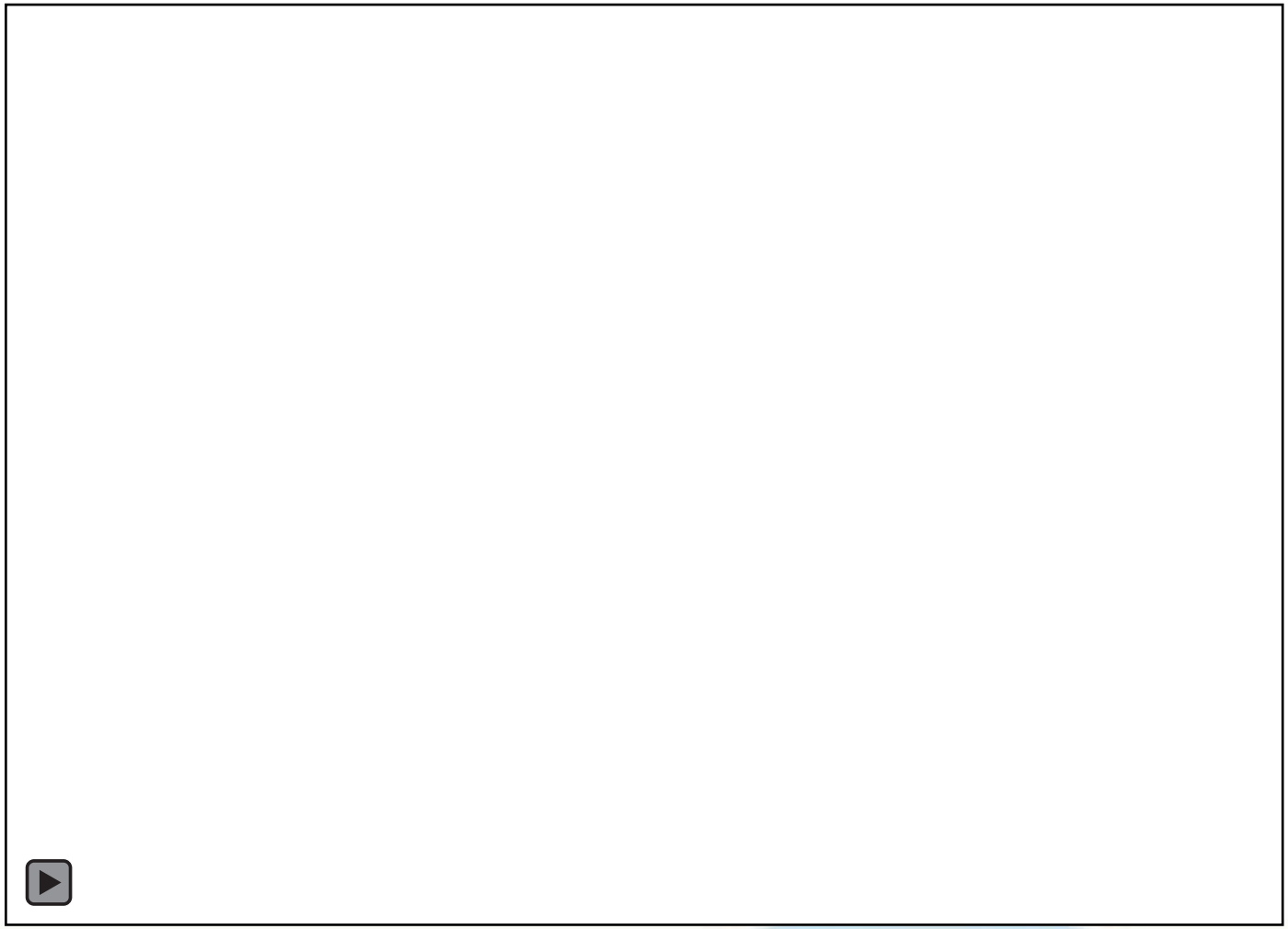
Water-RAT



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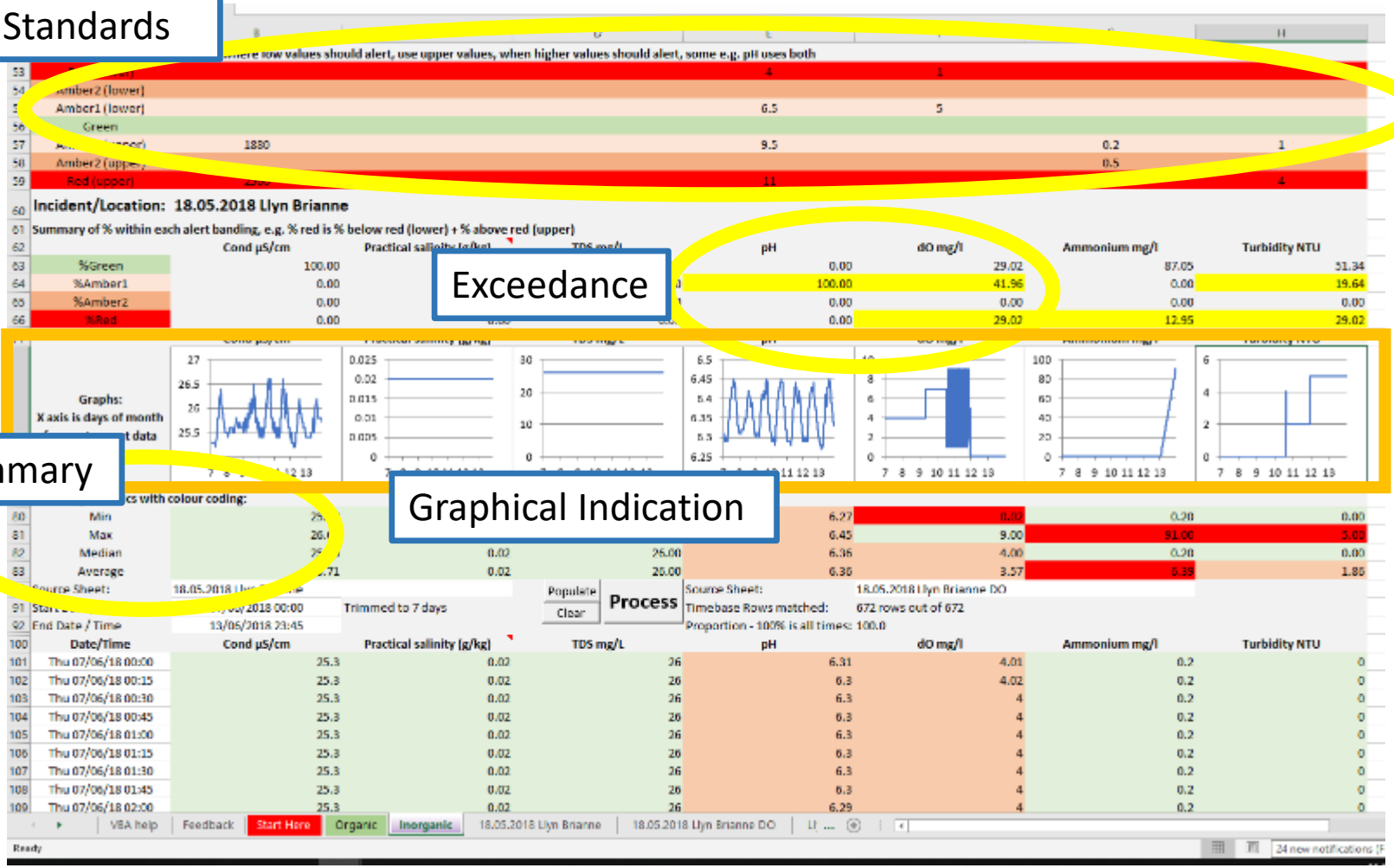
Results



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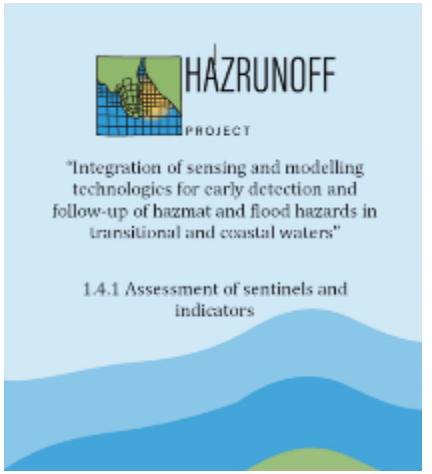
Next steps

- *Current Tool is "proof of concept"*
- *Operates for specific monitors*
- *Trial the current tool with stakeholders*
- *Use feedback to finalise design / functionality*
  - *Identify operational problems / errors*
  - *Finalise data input options*
  - *Allow input from wider range of monitors*
  - *Consider including further parameters*



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Social Media as an Alerting Tool?

- Evaluation of social media and internet systems for early alerting of incidents
  - An algorithm with potential application in social media platforms
  - Search terms relevant to Hazmat and Flooding incidents
  - Assessment using web and social media platforms

- Response communication protocols
  - Drafting of warning and informing messages
  - Assess impact during incident or exercise.

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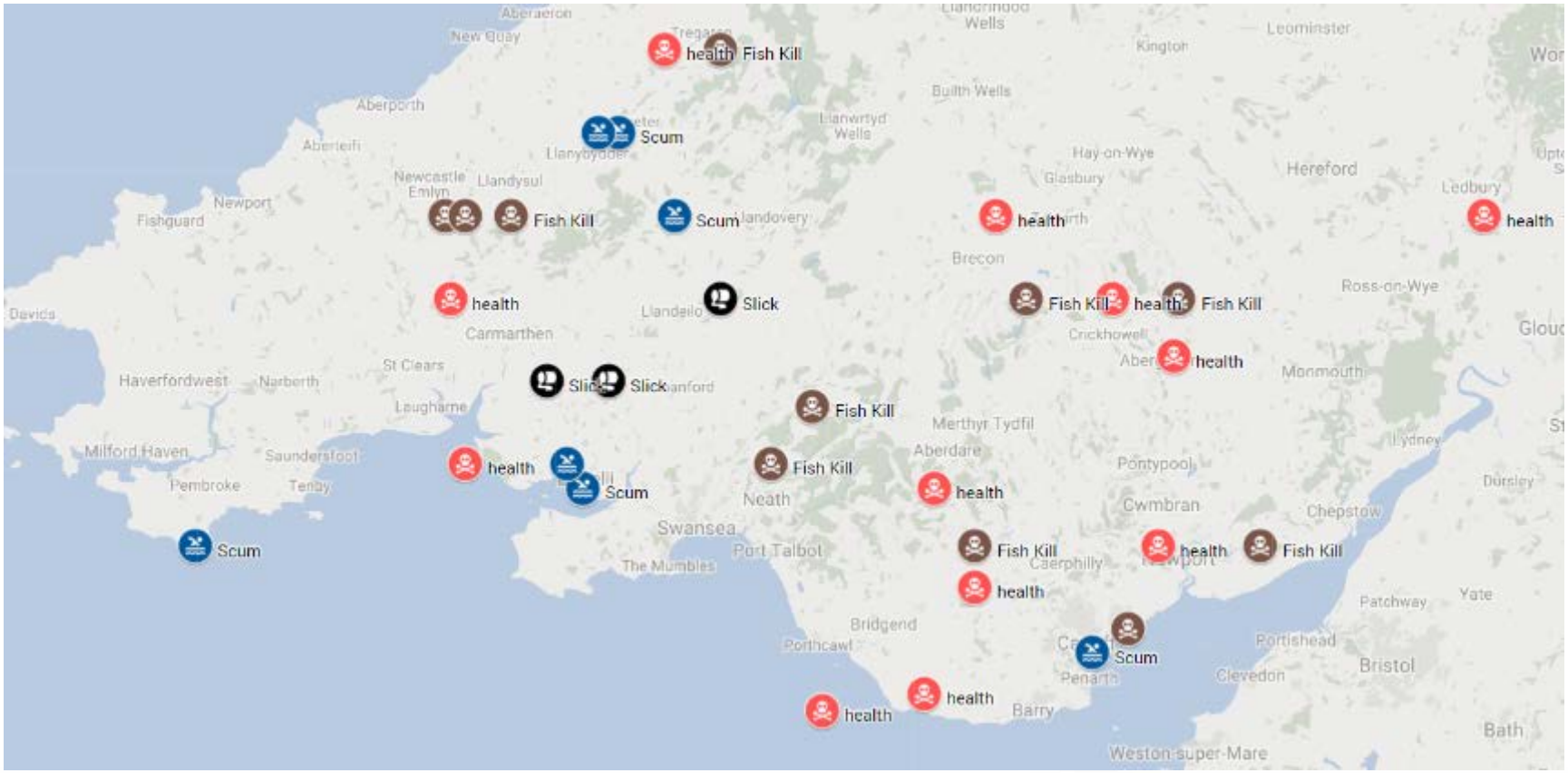
Identification of Key Search Terms

Reviewed incidents for inland, estuarine and coastal waters (2014 - 2018)



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Initial assessment using The Europe Media Monitor (EMM)

(EC Joint Research Centre)

- Web based media monitoring system
- Search terms tested for sensitivity and specificity

- **Slurry** - Fish Kill / Foam / Odour - River / Lake / beach
- **Oil** - Sheen / Odour / Slick / river / lake / canal / beach
- **Chemical** - Discoloration / Gas cloud / Haze / Odour / River / Lake / Health
- **BGA** - Algal Bloom / Scum / Lake / Dock / canal / Health / Pets
- **Veg Oils** - Fats / wax / Tar / Beaches / Dogs

Lake District 'toxic' blue-green algae warning

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Boolean search string using key words from incident review piloted for 1 month.

Manual daily review of results

Assessment of results for key statistics using recognised diagnostic methodology

	Alert trigger met	Alert trigger not met	
Alert issued	18 True Positive	272 False Positive	290
No alert issued	11 False Negative	139,728 True Negative	139739
	19	140000	140019

Sensitivity – proportion of incidents identified = 62% (95% CI=42% to 79%)

Specificity– articles screened out = 99.8% (95% CI=99.78% to 99.83%)

Positive Predictive Value - proportion of incidents identified **correctly** = 6.2% (95% CI = 4.64% to 8.26%) .

Conclusions

- Limited use at identifying and predicting incidents.
- Many incidents too small for national / international coverage
- News sources generic and exclude many industry publications,
- Language / translation a problem
- More bespoke system could improve performance – social media

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Evaluation of social media – Initial Trials - COSMOS

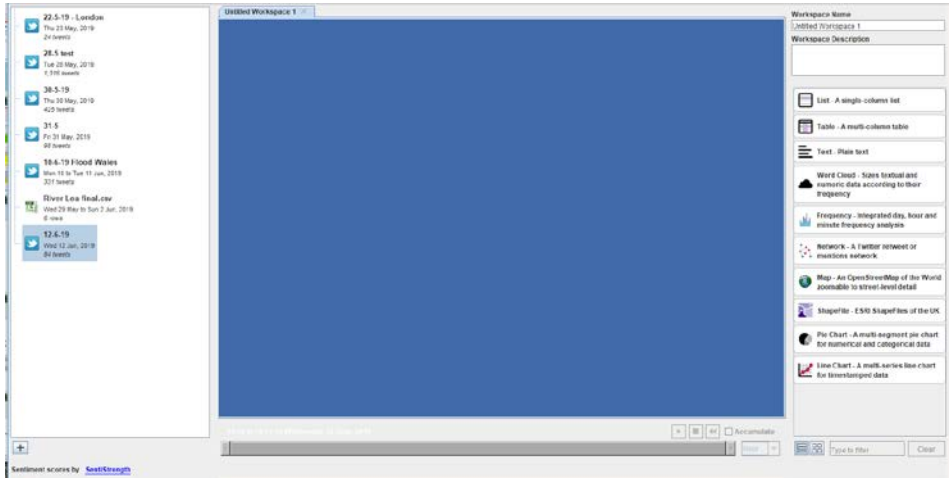
Cardiff University Social Science Department.

Runs in real-time but gives retrospective data at timed intervals.

Displays frequency, key words, location (where geotagged), demographics, sentiment.

Data can be imported and exported as Excel and .csv files.

Useful but not designed for real time alerting.



Research Only!!

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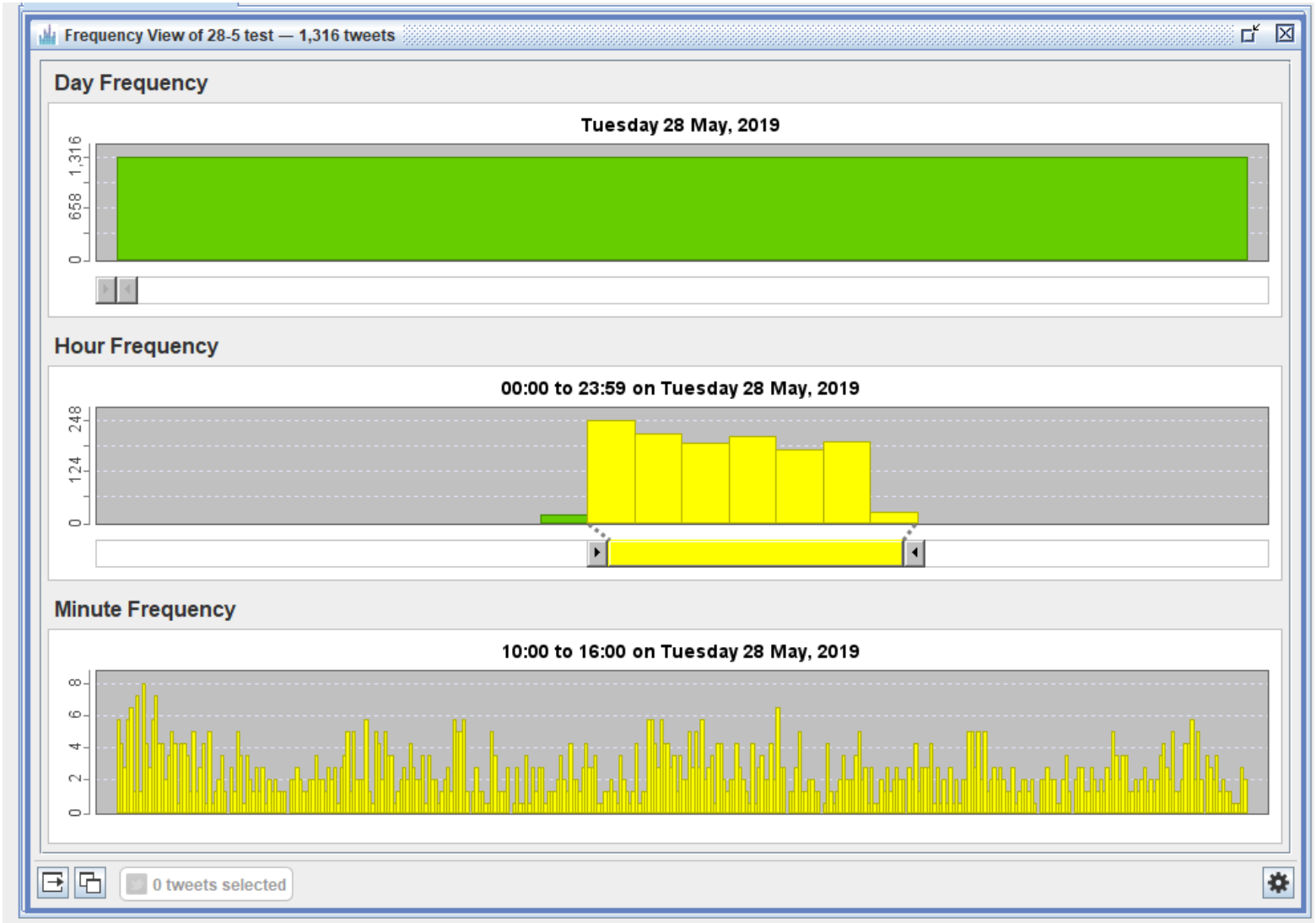

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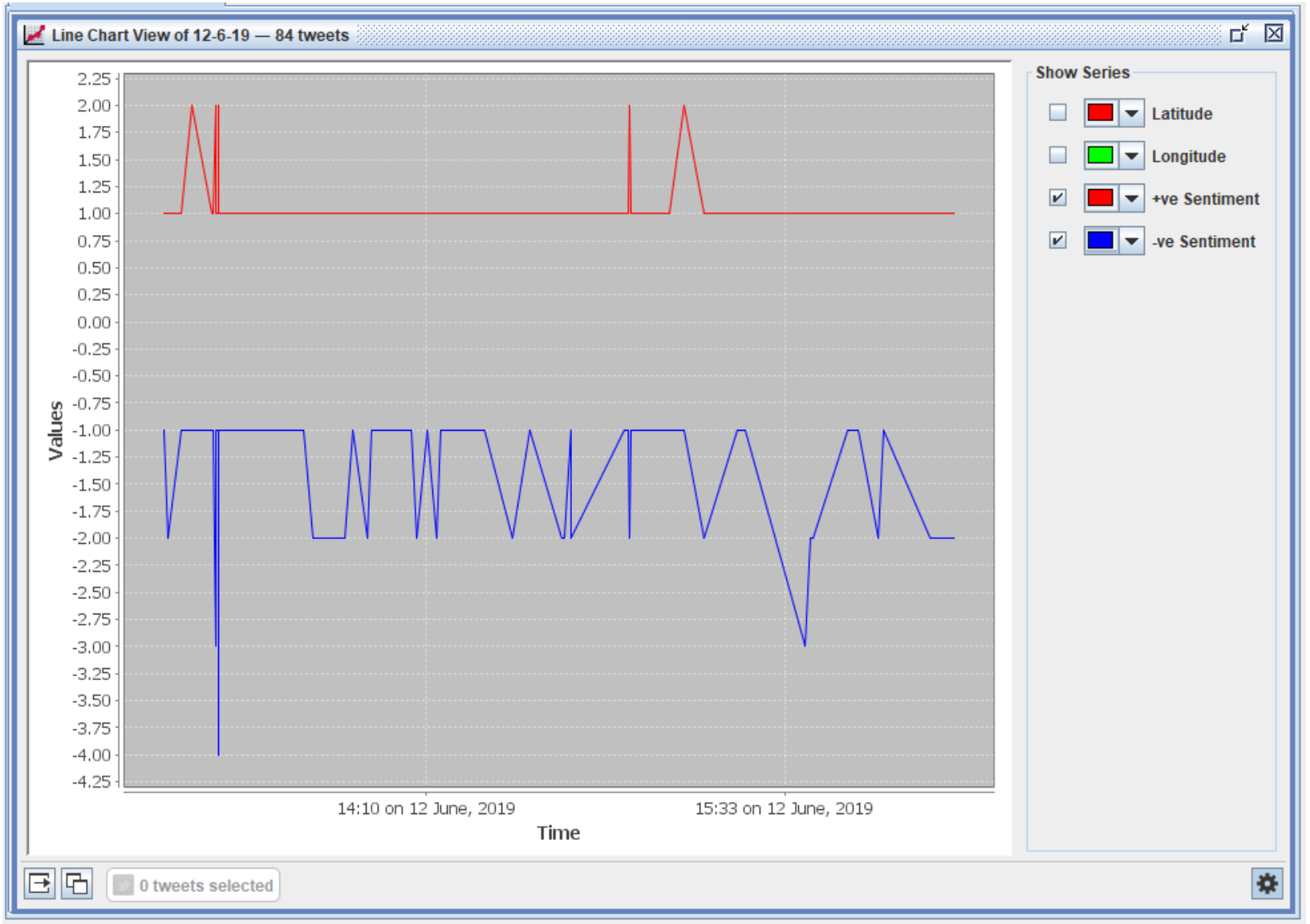

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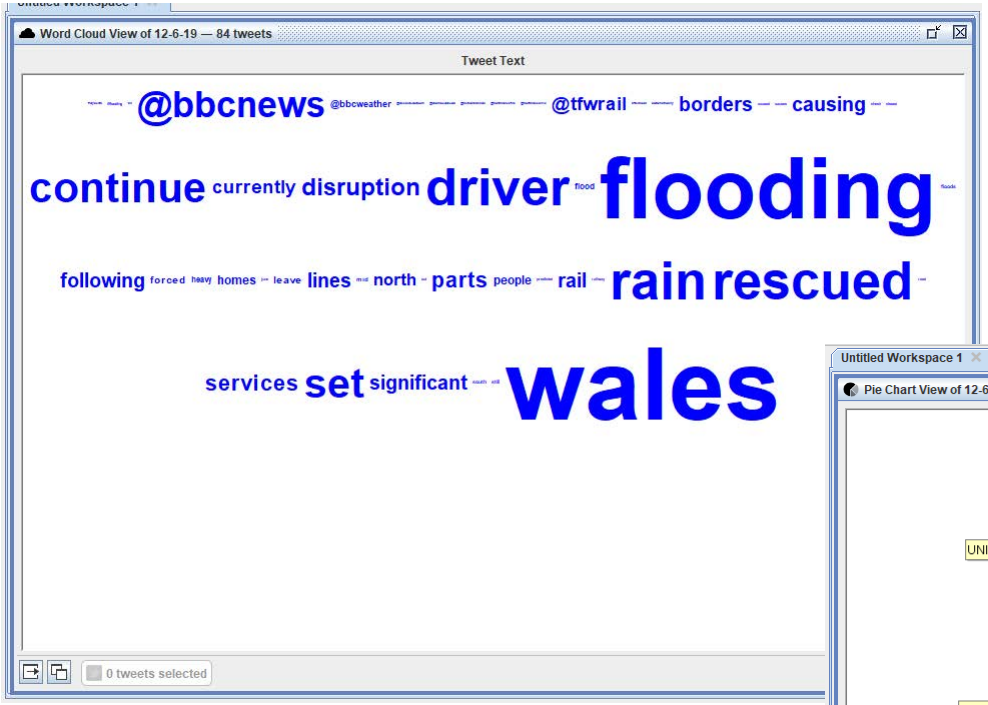

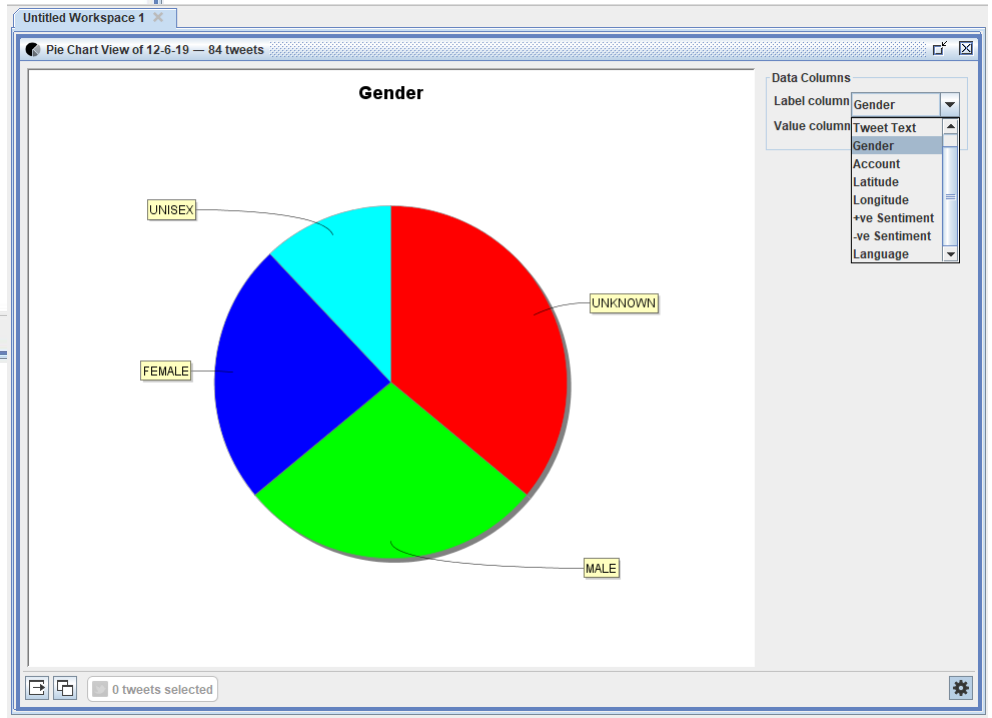

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COSMOS – Initial Findings

Can identify incidents but is “clunky”

- Not real-time
- Cannot define search areas
- Terms must be very specific to avoid “noise” but broad enough to pick up incidents

An interesting example

Tottenham Fire 22nd May

- Large fire in mattress warehouse
- Searched and some Twitter activity
- Fairly positive comments

- Nothing unusual?.....

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A few days later…..

A search for “river pollution”

- Large numbers of dead fish in River Lea
- Downstream of Warehouse
- Source - fire run-off?
- Public not too happy

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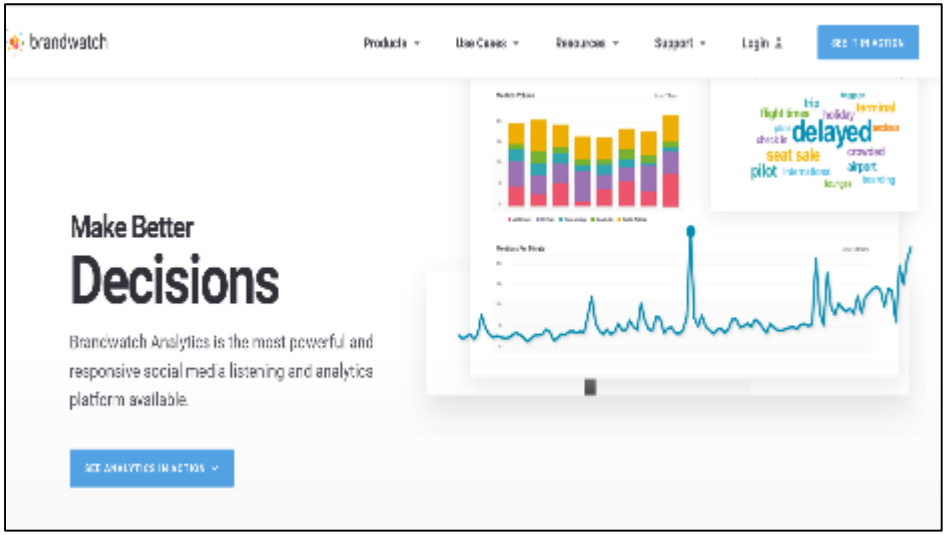
Next steps – Pilot 3 Months

Software called Brandwatch
https://www.brandwatch.com/



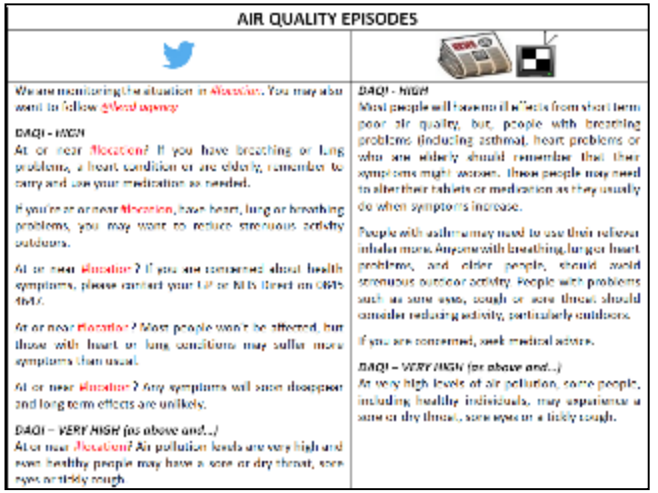
Commercial - annual subscription.

Collects across several platforms.

Dashboard provides real time data.
Can share display with multiple users

User defined search terms and geographical area.

Sentiment analysis to assess Warning & Informing using current or historical incident


AIR QUALITY EPISODES

DAQI - HIGH

DAQI – VERY HIGH (or above and...)

Results to be reported by end 2019

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