Atmospheric Dispersion Modelling
Liaison Committee (ADMLC)

Dry Deposition and Surface Chemical Reactivity

ADMLC Seminar, Wednesday 4 October 2023

Simon Gant (ADMLC Chair, Health and Safety Executive)

Public Health England

Protecting and improving the nation's health

Safety and Local Information

Centre for Radiation, Chemical and Environmental Hazards

Public Health England

IF YOU HEAR AN ALARM YOU MUST TAKE IMMEDIATE ACTION

FIRE ALARM

A Warbling Sound –
Leave the building and follow the signs to the assembly point at the front of the Training Centre

SITE INCIDENT ALARM

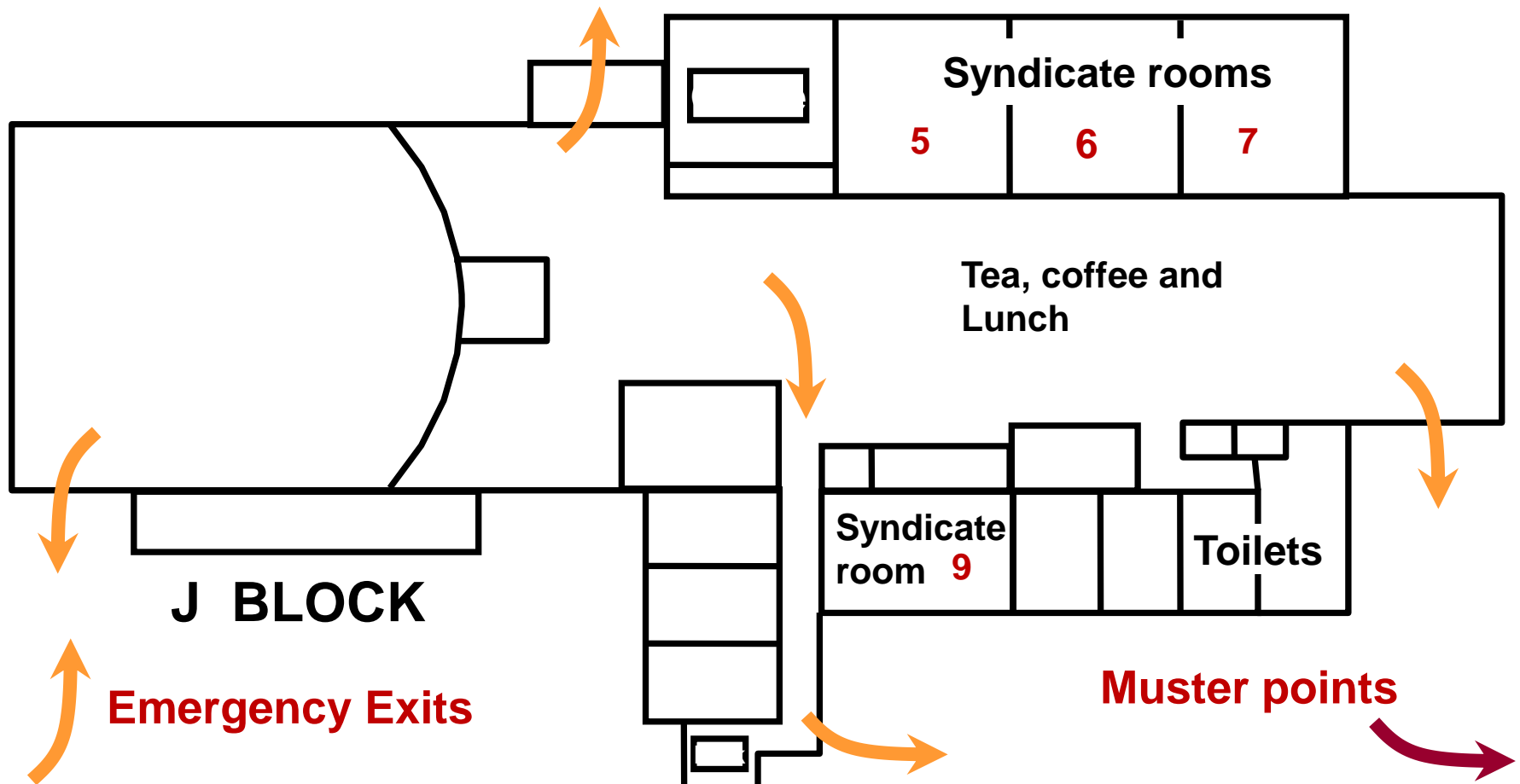An intermittent noise from the klaxons like harsh car hooters. This requires no action from our building occupants

CAR PARKING

All vehicles are parked at owners risk. Normal precautions should be taken against loss or theft. Your vehicle registration number should be logged with Reception

BADGES

Badges should be worn at all times and returned to Reception when you leave

The Chilton Training Centre

Syndicate rooms

5   6   7

Tea, coffee and Lunch

J BLOCK

Syndicate room 9

Toilets

Emergency Exits

Muster points

Supplementary Information For Visitors

PLEASE TURN OFF ALL MOBILE PHONES & PAGERS
Messages can be left with Reception - 01235 825313. Messages for you will be pinned on the board adjacent to the servery

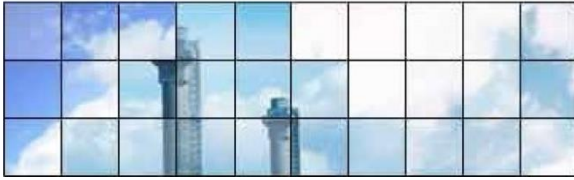**PLEASE NOTIFY RECEPTION BEFORE LEAVING** (even temporarily)

In the event of an emergency we need to know who is still in attendance

PLEASE DO NOT BRING FOOD OR DRINK INTO THE LECTURE THEATRE
This is for cleaning & hygiene reasons

SMOKING IS NOT PERMITTED ON PHE PROPERTY

PLEASE NOTE, NO PHOTOGRAPHY IS ALLOWED ON THE PREMISES

ADMLC Membership

ADMLC Recent Work

- **January 2021**: **"**Guidelines for the Preparation of Short Range Dispersion Modelling Assessments for Compliance with Regulatory Requirements" – An Update to the ADMLC 2004 Guidance https://admlc.com/model-guidelines/

- **July 2021**: Report published on "Dense-gas dispersion for industrial regulation and emergency response" by Rachel Batt (HSE)
  - Spreadsheet of datasets for model validation
  - Spreadsheet of previous incidents
  - https://admlc.com/publications/

- **September 2021**: Report published on "A Review of Approaches to Dispersion Modelling of Odour Emissions and Intercomparison of Models and Odour Nuisance Assessment Criteria" by CERC and ELLE https://admlc.com/publications/

ADMLC Ongoing Work

- **Investigating the impact of applying different grid resolutions of numerical weather prediction met data in atmospheric dispersion modelling**

- Scope:
  - Review of NWP models
  - Comparison of model endpoints for NWP datasets
  - Comparison studies for regulatory atmospheric dispersion modelling
  - Potential for double counting of the impact of terrain
  - Use of NWP met data for probabilistic accident consequence assessments

- Project commissioned with CERC and UKHSA

- Feedback from ADMLC committee provided to contractors

- Thanks to external peer reviewer Jonathan Vogel (DTRA)

- Final report edits currently in progress

- Report to be published on ADMLC website soon (October 2023?)
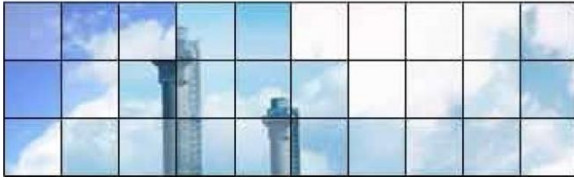
ADMLC Future Work

- **Review of methods used to assess the performance of atmospheric dispersion models**
- Scope:
  - Literature review
  - Case studies
  - Guidance on application of model evaluation methods to different scenarios
- Contract recently awarded to CERC and Steven Hanna
- Timeline: kick-off 17 October 2023, project duration 12 months
- Ron Meris (DTRA) kindly offered to provide external peer review

    ADMLC welcomes partnerships with other funding agencies or self-funding research organisations on topics of mutual interest

ADMLC Website Updates

- **H1 Tool**
  - H1 (formerly D1) was the Environment Agency's software tool to calculate the stack height for satisfactory dispersion of various substances
  - Withdrawn in 2016 and not Environment Agency current guidance
  - Still a useful method for calculating effective stack heights
  - ADMLC webpage currently down but should be online again soon

- **Safety and Reliability Directorate (SRD) Reports**
  - Historical reports produced by SRD (UK Atomic Energy Authority)
  - Examples:
    - The accidental release of anhydrous ammonia to the atmosphere – a systematic study of factors influencing cloud density and dispersion.
    - Discharge rate calculation methods for use in plant safety assessments.
    - Discharge of liquid ammonia to moist atmospheres – survey of experimental data and model for estimating initial conditions for dispersion calculations.
  - https://admlc.com/safety-and-reliability-directorate-srd-series-reports/
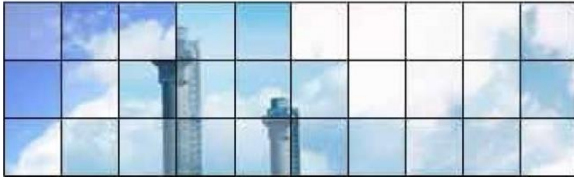
ADMLC Webinars

- **May 2021**: "Dispersion modelling and satellites"

- **February 2022**: "Use of dispersion modelling for sensor network design to facilitate source attribution, emissions estimation and incident response"

- **March 2023**: "Dense gas dispersion modelling in complex terrain, with a focus on carbon dioxide pipelines"

- **December 2023**: "Modelling katabatic flows"

- **TBC**: "Modelling wildfires?"

- Recordings available: http://www.admlc.com/events

Dry deposition and surface chemical reactivity

Motivation

- Jack Rabbit chlorine and ammonia trials
  - Initial modelling studies indicated that dry deposition could significantly reduce airborne concentrations
  - Recent deposition measurements in University of Arkansas laboratory
  - How can we measure dry deposition in JRIII field experiments?
- Nitrogen deposition to the environment
  - Studies by RIVM and potential impact on farming and industry
  - UK restrictions on land-use due to potential emissions
  - Useful to discuss basis of models, validation etc.
- Meeting aims: bring together experts from environmental, defence and industrial safety sectors
  - Model developers, test engineers, measurement specialists and users of atmospheric dispersion modelling outputs influenced by dry deposition

Seminar Programme

10:00	Simon Gant (HSE)	ADMLC Chair welcome
10:20	Steve Hanna (Hanna Consultants)	"Time variability in ammonia deposition and re-evaporation as a cloud from a one-minute accidental release passes by"
10:45	Jon Pleim (US EPA)	"Bidirectional ammonia flux modelling in the CMAQ-EPIC system"
11:10	Tom Spicer (University of Arkansas)	"Chlorine and ammonia environmental surface reactivity and adsorption/desorption modelled as dry deposition for large-scale release consequence assessment"
11:35	Benjamin Loubet (INRAE)	"Modelling ammonia deposition near large agricultural sources with a coupled Lagrangian stochastic, k-ε, and diffusion resistance approach"
12:00	Lunch	

Seminar Programme

13:00	Nebila Lichiheb (NOAA)	"Processes of ammonia surface-atmosphere exchange in different ecosystems across the U.S."
13:25	Marsailidh Twigg (UKCEH)	"Measurement and modelling concentrations and dry deposition of ammonia: methods and challenges"
13:50	Roy Wichink Kruit (RIVM)	"Measurement-model fusion techniques to quantify nitrogen deposition in the Netherlands"
14:15	Tea & Coffee	
14:35	Oscar Björnham (FOI)	"An exploration of dry deposition research by FOI - with emphases on winter conditions"
15:00	Helen Webster (Met Office)	"Modelling dry deposition in an operational Lagrangian model"
15:25	David Carruthers (CERC)	"Description and evaluation of particulate deposition modelling in ADMS"
15:50	Simon Gant (HSE)	Closing remarks

Thank you

Dry deposition and surface chemical reactivity

Speakers:
- Steven Hanna (Hanna Consultants)
- Jon Pleim (US EPA)
- Tom Spicer (University of Arkansas)
- Benjamin Loubet (INRAE)
- Nebila Lichiheb (NOAA)
- Marsailidh Twigg (UKCEH)
- Roy Wichink Kruit (RIVM)
- Oscar Björnham (FOI)
- Helen Webster (Met Office)
- David Carruthers (CERC)

Thank you

Thanks to ADMLC Secretariat for organising this webinar

- Justin Smith and Peter Bedwell (UKHSA)

We would welcome feedback: admlc@ukhsa.gov.uk

- What worked well?
- What could we improve?
- Future ideas for ADMLC webinars and seminars?