



**Memorandum of Understanding**  
**between**  
**Met Éireann**  
**and the**  
**Environmental Protection Agency**  
**Version 1.0**  
**Revision Date: 1 July 2020**

The objective of this Memorandum of Understanding (MoU) is to set out areas of mutual responsibility and shared interest between the Environmental Protection Agency (EPA) and Met Éireann

Signed:

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Date: 30/7/2015

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## 1 Introduction

This Memorandum of Understanding (MoU) between the Irish National Meteorological Service, Met Éireann, and the Environmental Protection Agency (EPA) provides a framework for enhanced cooperation in areas of mutual interest, leading to greater efficiency and effectiveness in the delivery of the work programmes of both organisations.

### ***Environmental Protection Agency***

The EPA is an independent public body established under the Environmental Protection Agency Act 1992. The EPA has responsibilities for a wide range of licensing, enforcement, monitoring and assessment activities associated with environmental protection and protection of people from the harmful effects of ionising radiation, both natural and man-made. Primary responsibilities of the EPA include:

- Environmental licensing
- Enforcement of environmental law
- Environmental planning, education and guidance
- Monitoring, analysing and reporting on the environment
- Regulating & reporting Ireland's greenhouse gas emissions
- Regulating the use of ionising radiation in Ireland
- Monitoring, analysing and reporting on the environment under the Water Framework Directive and the Clean Air for Europe (CAFÉ) Directive
- Providing advice to the public and to Government on radiological protection issues
- Environmental research development
- Resource Use and Waste management
- Strategic environmental assessment

The EPA's mission is *“to protect and improve the environment as a valuable asset for the people of Ireland, to protect our people and the environment from harmful effects of radiation and pollution”*.

### ***Met Éireann***

Met Éireann, the Irish National Meteorological Service, is a line division of the Department of the Environment, Community and Local Government. It is the leading provider of weather information and related services for Ireland, and is the public service organisation responsible to the Irish state for

- The collection and production of high-quality meteorological data;
- The communication of authoritative weather and climate services to protect life and property, and to promote wider societal and economic well-being;
- Conducting research into weather and climate, to improve customer services and inform Government policy and decision-making.

In pursuit of this mission Met Éireann has the following strategic goals:-

- Ensuring the safety of the Irish public and contributing to societal well-being and economic development through the production and communication of weather forecasts, warnings of severe weather, and the provision of support to agencies responsible for public safety and emergency response.

- Contributing to safe and efficient air transport, in compliance with relevant international regulations, through the provision of high-quality meteorological services for aviation.
- Enabling the better management of meteorological risks by Irish society through the incorporation of science-based weather and climate information and advice into planning, policy and practice.
- Ensuring that Irish citizens derive maximum benefit from investments in scientific development and in the international meteorological infrastructure through active engagement with relevant international organisations.
- Maintaining and developing core scientific and technical competencies so as to ensure sustainable and resilient service provision.

## **2 Purpose of Memorandum of Understanding (Overview)**

The objective of this Memorandum of Understanding is to provide a framework for cooperation and assistance between the EPA and Met Éireann in areas of common interest concerning air quality, radiological protection, emergency planning and response, climate monitoring and climate change, environmental research, the national hydrometric monitoring programme, and environmental monitoring, modelling and assessment activities. In particular this MoU will facilitate cooperation between the EPA and Met Éireann in discharging their respective responsibilities with regard to the National Emergency Plan for Nuclear Accidents (NEPNA) in order to enhance the actions of both and to avoid duplication of effort and conflicting requirements. The adoption of this memorandum will:

- facilitate work in existing areas of shared interest and cooperation related to Climate Change and Environmental Assessment programmes
- with regard to relevant data policies, facilitate the free and timely exchange of available information and data
- promote best practice in areas of common interest;
- promote a focus on improved quality and of making the most effective use of resources,
- further improve the service delivery to members of the public from both agencies

The implementation of this memorandum will be without prejudice to the statutory responsibilities and obligations of both organisations. Cooperation should also lead to efficiencies for both organisations, as well as for third parties, in relation to the potential to maximise the use of available information, and avoidance of duplication of effort.

## **3 Areas of Cooperation**

The purpose of this Memorandum of Understanding is to record the agreement that has been reached by the Parties. In recognising each other's respective responsibilities and obligations and recognising constraints that may apply, the EPA and Met Éireann shall endeavour to liaise closely particularly in relation to the issues set out below.

### **3.1 National Emergency Preparedness including Radiological and Air Quality Incidents**

#### **3.1.1 Radiological Events**

The National Emergency Plan for Nuclear Accidents (NEPNA) provides a framework for the national response to a large scale radiation emergency. It is intended specifically to cater for an emergency or crisis involving widely dispersed radioactive material such as that arising from a major accident at a nuclear installation abroad resulting in radioactive contamination reaching Ireland. NEPNA is one of a number of complementary national and major emergency plans designed to cater for different types of emergency situations. All national authorities/agencies having responsibilities within the Plan are required to have written sub-plans showing how they will carry out their responsibilities. Lead responsibility for NEPNA lies with the Department of the Environment, Community and Local Government (DECLG).

The EPA has been assigned particular functions under NEPNA covering early warning, technical assessment of the incident, provision of technical advice on countermeasures and monitoring of the environment and the food chain. The role of Met Éireann is to facilitate the use of an established dispersion modelling capability by making available the most up-to-date local and global atmospheric data; to provide expert advice aimed at assisting in the interpretation of dispersion model output, and also in the interpretation of output from relevant Regional Specialised Meteorological Centres (RSMCs), and to assist in the operation of the EPA radiation monitoring network. Primary responsibility for the provision of advice during a radiological event rests with the EPA.

#### ***Technical Assessment***

The EPA is responsible for the development and maintenance of the capability necessary to make technical assessments of potential accidents and their radiological consequences for Ireland. The EPA uses the ARGOS Nuclear Decision Support System (including the RIMPUFF model) and the HYSPLIT atmospheric dispersion model as primary tools for technical assessment and emergency preparedness.

#### ***Numerical Weather Prediction Data***

The mesoscale atmospheric dispersion model RIMPUFF, which enables prediction of the transport, dispersal and deposition of radioactive material after release to the atmosphere, is used by the EPA to fulfil an important component of this capability. RIMPUFF is currently driven by HIRLAM Numerical Weather Prediction (NWP) data provided by Met Éireann. The EPA use ARGOS to configure and initiate RIMPUFF model runs and to visualise and analyse RIMPUFF outputs.

To enable the operation of RIMPUFF by the EPA, Met Éireann shall extract a sub-set of the full operational NWP forecast covering Ireland and Britain after completion of each NWP model run (i.e. 00, 06, 12, 18 UTC), convert these data to the text format required for input to RIMPUFF and enable download of resulting files from ICHEC<sup>1</sup>. These data shall be archived for one week by Met Éireann.

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<sup>1</sup> Irish Centre for High End Computing (ICHEC)

It is noted that the EPA currently has full read access to the Met Éireann operational data at ICHEC. Met Éireann retains the right to alter the location and accessibility of the data at any time in the future. Usage of the data by EPA will be strictly in pursuance of its stated objectives; it undertakes not to release the data to any other party without the prior consent of Met Éireann.

### ***HYSPLIT System***

The EPA uses the HYSPLIT dispersion model to supplement and inter-compare the results generated by RIMPUFF. The HYSPLIT model has been modified by Met Éireann to accommodate the special requirements of EPA with regards to accessing high resolution Numerical Weather Prediction data. Following extensive development work, Met Éireann has installed a copy of this customised version in ICHEC where it is driven by NWP data currently produced by the HARMONIE model. The HARMONIE model provides high resolution meteorological data covering both UK and Ireland

Met Éireann has installed a second copy of the HYSPLIT model at the European Centre for Medium-Range Weather Forecasts (ECMWF). This version of the model uses the latest ECMWF global analyses/forecasts to track the movement of radioactive material in the atmosphere over the global scale.

Met Éireann will be responsible for maintaining both versions of the HYSPLIT model and for providing automatic access to operational (ECMWF and HARMONIE) datasets, thereby ensuring that the latest weather data is available at all time. The EPA will be responsible for the use of the system and outputs produced.

A separate Service Level Agreement is being prepared between EPA and ICHEC covering the ongoing operation of the HYSPLIT system, including a detail of the full range of services required by the EPA (i.e. back-ups, response times, data storage, login nodes etc.). The EPA has security token access to the ECMWF computing services and Archive Products. The EPA adheres to the ECMWF security token usage rules.

### ***Meteorological Advice***

To perform its technical assessment function effectively, the EPA may require the assistance of an expert meteorologist from Met Éireann. An assigned forecaster will be dispatched by Met Éireann to join the EPA technical assessment team (TAT) in the event of an emergency and/or take part in EPA technical assessment exercises as appropriate (approximately once per year). The Head of the TAT (normally the Manager of the EPA's Emergency Preparedness section) will lead and coordinate the work of the team members. The role of the assigned forecaster within the TAT shall be clearly defined at the earliest opportunity by Met Éireann's Forecast Division and the EPA's Emergency Preparedness section. The EPA shall ensure that all appropriate Met Éireann staff, including assigned forecasters, are kept up to date regarding the EPA's technical assessment capability and actions and information which might be expected from them in the event of a radiation emergency. Following exercises, the role of the assigned forecaster shall be reviewed and modified if necessary.

In the event of a radiation emergency, the TAT will operate by default at EPA offices in Clonskeagh Square, Dublin. The EPA is responsible for ensuring that appropriate communications infrastructure is available at this location to enable full access to meteorological data by Met Éireann's assigned forecaster. To facilitate this access, a communication link between EPA (Clonskeagh Square) and Met Éireann (Glasnevin) offices has been setup. This link is tested approximately twice per year and relies on the respective dedicated microwave links to the National Emergency Coordination Centre (NECC) of both agencies. If EPA offices are not viable, the TAT will operate from the NECC in Agriculture House (Kildare Street, Dublin 2). At this location each organisation shall be responsible for provision of required communications infrastructure for its own staff.

Met Éireann shall also make available to the EPA products, interpretation and any other outputs from the World Meteorological Organization's Regional Specialized Meteorological Centre (RSMC) during exercises and in the event of an emergency. The Met Éireann assigned forecaster shall assist the EPA in their interpretation.

### ***Radar Rainfall Data***

In assessing the consequences of a release of radioactive material to the atmosphere, precipitation measurements can help to identify and evaluate areas of enhanced contamination on the ground resulting from wet deposition. Radar rainfall images and data are used by the EPA for this purpose.

Met Éireann shall make available high resolution radar data from its own rainfall radars on the island of Ireland, and also composite rainfall radar data files covering both Ireland and Britain, (as created by the UK Met Office) on a FTP server for download by the EPA. The files shall be in an agreed format (BUFR). They shall be uploaded without unnecessary delays and remain available for download for a period of at least 48 hours.

In order to facilitate visualisation of radar images at EPA or NECC for use in relation to NEPNA matters, Met Éireann shall provide access to full resolution radar images through its website [radar.meteireann.ie](http://radar.meteireann.ie) or equivalent.

## **3.1.2 Air Pollution Events**

### ***Modelling of Incidents/Accidents with a Potential Air Quality Impact***

The details of the HYSPLIT dispersion model are outlined in Section 3.1.1 in relation to radiological events. The same model (using both HARMONIE and ECMWF forecast data) will also be used by the EPA for the purposes of modelling air quality incidents such as fires or chemical spills which have the potential to impact on air quality at a local/regional/national/transboundary level.

The ADMS5<sup>2</sup> modelling package is also used for modelling emergency and non-emergency releases to the atmosphere. This model requires hourly meteorological data

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<sup>2</sup> See [www.cerc.co.uk](http://www.cerc.co.uk)

(typically wind speed, wind direction, temperature, cloud cover, rainfall) and Met Éireann shall make historical data from appropriate Met Éireann meteorological monitoring stations available to the EPA (in excel readable format) for use in the ADMS5 model.

As part of this incident response function the EPA may require meteorological forecast information from Met Éireann (via phone/email) via the Met Éireann duty forecaster.

#### ***Exceedances of Air Quality Information and Alert Thresholds***

The EPA and Met Éireann will continue to jointly operate a system to inform the public if an air quality information or alert threshold is exceeded, or if any operational air quality model of the EPA predicts such threshold exceedence. Upon receipt of monitoring data and/or advice from the EPA, Met Éireann will publicise, through weather broadcasts and otherwise, any exceedance or predicted exceedence of the air quality information or alert thresholds specified in the Air Quality Standards Regulations SI 180 of 2011 and agreed by the Air Quality Health Information Working Group. A mutually satisfactory system to fulfil this requirement will be maintained by both organisations. Refer to Annex 1 – Air Quality Information and Alert Thresholds.

#### ***Air Quality Modelling and Forecasting***

Met Éireann note the ongoing work within the EPA on the development of ambient air quality analyses and air quality forecasts. Met Éireann will support, on a best-efforts basis, this initiative through the provision of available meteorological data as required, and expert advice for matters within its competence. The development of an ambient air quality forecast model is ongoing as of December 2014. When the forecast model is approved and made operational, the necessary interactions between EPA and Met Éireann in response to modelled, forecast exceedance of thresholds as laid out in EU regulation will be defined in a protocol to be agreed between both bodies.

#### ***Air Quality Dispersion Modelling Meteorological Information***

Met Éireann will support the EPA by providing a dispersion modelling capability linked to an operational database of atmospheric analyses and up-to-date meteorological forecasts, to enable the EPA to track the movement of noxious materials in the atmosphere both for routine work and in emergency response situations.



***Air Quality Health Information Working Group***

The EPA currently interacts with Met Éireann through the Air Quality Health Information Working Group, which also includes the HSE and the DECLG, in relation to issues such as air quality forecasting, developing an air quality index for Ireland and emergency response modelling. The EPA and Met Éireann will support this group and continue to work together on these areas of mutual interest.

**3.2 Radioactivity Monitoring and Air Quality Monitoring****3.2.1 Radioactivity Monitoring**

The EPA with support from Met Éireann, Local Authorities and the Defence Forces operates a National Radioactivity Monitoring Network of permanent monitoring stations comprising gamma dose rate monitors, aerosol samplers and rainwater samplers. A list of all monitoring sites and an inventory of the type of equipment hosted at each is provided in Annex 2. It should be noted that the operation of all fifteen gamma dose rate monitors and five of a total of eleven aerosol monitors is fully automated.

In order to assist the EPA in the operation of its radioactivity monitoring network Met Éireann shall:

- Host gamma dose rate monitors, aerosol samplers and rainwater samplers at agreed locations (current locations are listed in Annex 2).
- At manned sites, undertake basic maintenance of this equipment.
- At manned sites, undertake limited intervention in the event of faults to this equipment occurring.

In the case of non-automated aerosol monitors:

- On a weekly basis or, in the event of an emergency on instruction from the EPA, collect filters and return to the EPA offices in Clonskeagh.
- On instruction from the EPA, insert charcoal filters for the measurement of radioactive iodine into this equipment, and collect and return to the EPA offices in Clonskeagh.

In the case of water samplers at non-automated sites:

- On a fortnightly basis, collect samples. The sample shall be retained for a period of 14 days. After this period the sample shall be disposed of, unless otherwise instructed by EPA.
- In the event of an emergency, return samples to the EPA offices in Clonskeagh.

Requirements in relation to the maintenance, interventions and other undertakings mentioned above are listed in Annex 3. The EPA shall provide Met Éireann site managers and other personnel as appropriate with all necessary detailed procedures for supporting the operation of gamma dose rate, aerosol monitoring and rainwater sampling equipment. The EPA shall have responsibility for all other required maintenance, repairs and upgrades. The EPA shall ensure an adequate supply of aerosol filters and pre-addressed envelopes for their return at each aerosol monitoring site.

It is noted that Met Éireann has an ongoing programme of automation of its manned stations. Many of these stations will be relocated to non-Met Éireann sites. At such sites, hosting of equipment requires the agreement of site owners. At unmanned sites, the maintenance, interventions and undertakings by Met Éireann mentioned above will not normally be possible. Met Éireann shall inform the EPA at the earliest possible instance of changes which may compromise monitoring activities at any site. The EPA shall in turn advise Met Éireann of any planned modifications to monitoring equipment at Met Éireann sites. When new sites are being considered, both organisations shall interact with a view to optimising the use of their respective resources.

### **3.2.2 National Ambient Air Quality Monitoring Network**

Met Éireann will continue to operate a ground-level ozone monitor at Valentia in accordance with the requirements of the national ambient air quality network including QA/QC and real-time reporting. As manager of the network, the EPA will include the station in all relevant national QA/QC procedures and will include the results in national reporting.

### **3.2.3 OSPAR-Comprehensive Atmospheric Monitoring Programme (CAMP)**

Met Éireann will continue to measure nitrate and ammonium at Valentia and report the annual results along with rainfall measurements to the EPA before 31 July each year. Met Éireann will collect monthly deposition samples and despatch them to the EPA. The EPA will analyse these samples for metals and report all results to the OSPAR-CAMP programme annually.

### **3.2.4 Transboundary Air Quality Monitoring (EMEP Network)**

The EPA will continue their partnership with Met Éireann on the Transboundary Air Quality Monitoring Network which is Ireland's contribution to the European Monitoring and Evaluation Programme (EMEP) under the Convention on Long Range Transboundary Air Pollution (CLRTAP).

Samples will be collected by EPA on a weekly basis and analysed by Met Éireann for submission to EMEP. See Annex 4 for a more detailed list of monitoring and analytical tasks. Where feasible, liaison will also continue on the use of Met Éireann site infrastructure to further advance the national transboundary and greenhouse gas monitoring capacity. In particular, a current proposal to improve EMEP and greenhouse gas monitoring activities at the Malin Head site will be reviewed. The key elements of this proposal include;

- a plan to move equipment from the Balloon Shed to the Old Anemo Room,
- the installation of inlet lines from the Anemo room onto the Met Éireann met mast,
- the installation of an aerosol inlet above the Balloon Shed and
- refurbishment of the Balloon Shed.

The EPA undertakes to address, to Met Éireann's satisfaction, the issue of ambient noise from the EPA equipment, and the provision of a separately metered power supply for the EPA equipment. The EPA also undertakes to ensure that access to equipment located on the anemo mast will only be carried out by staff with appropriate safety training and equipment and in full compliance with the relevant Health and Safety regulations.

### 3.3 Land Use and Inventory Development

Data is required for process based modelling of GHG emissions from soils associated with agricultural practices and land use management. In general, process based soil models require;

- daily min, max and mean temperature
- daily rainfall

Research in this area is on-going regarding the specific data requirements and other data needs may be identified. It is envisaged that fully QA/QC data, in digital format for synoptic stations and for the previous year, would be delivered by Met Éireann to the EPA on or before 30 June each year (See Annex 5).

### 3.4 Hydrometrics and Water Quality

Precipitation is an important component in hydrological assessments. Under the Water Framework Directive, data is required for reporting water availability to the EU on a River Basin District basis at monthly and annual time scales and as Long Term Annual Averages for Areal Precipitation and Potential Evapotranspiration. It is beneficial for catchment analysis and integrated assessment of catchments to receive in digital format the following data sets:

- Hourly rainfall data at synoptic stations
- Rainfall data at specific rainfall stations, at the highest available temporal resolution, if requested
- Evaporation and evapotranspiration data
- Soil moisture deficient data

Under the annual WISE-SOE Reporting: Water Quantity dataset request, Ireland is required to provide water balance data. The Hydro-meteorological parameters required to support this request are presented in Annex 6. Extreme weather events (particularly periods of elevated or prolonged rainfall) can also impact on EPA work areas such as drinking water quality and bathing water quality. Met Éireann and the EPA will investigate future exchange of forecast information to assist in preparing for such incidents. Met Éireann and the EPA may also cooperate in the siting of rain gauges in specific areas or catchments to provide real-time information.

#### ***Bathing water quality***

The Splash website ([www.splash.ie](http://www.splash.ie)) was developed by the EPA to provide the public with bathing water quality information and other information related to bathing waters. Splash has a national overview home page but the main information is provided at bathing water level. This includes weather information approximated to the bathing water location which is currently provided by a third party (Yahoo).

Recognising that the current weather information is not of sufficient accuracy for individual bathing water locations, the EPA requires more specific weather information. Within resources, Met Éireann will liaise with the EPA on the provision of the most accurate weather information for bathing water locations. Met Éireann will review the requirements for the incorporation of county level weather information for bathing water locations.

***Modelling of flows from daily rainfall and evapotranspiration***

Daily rainfall values are useful for calculating material fluxes in rivers e.g. nutrient loading to lakes when combined with water chemistry results. Combining rainfall with evapotranspiration estimates (or soil moisture deficit) and observed flow measurements can allow for modelling of flows in rivers especially in rivers where continuous flow measurements are not available. Modelled river flow data can also be used to estimate lake residence time if the volume of the lake is known.

In support of the above activities Met Éireann will supply a full suite of hourly weather data (in addition to the information requested in Annex 6) for each of the 25 synoptic stations including;

- Temperature including degree days
- Rainfall
- Wind
- Radiation
- Humidity
- Pressure

**3.5 Environmental Research Programme**

Both parties agree to consolidate and enhance existing collaborations and to explore new opportunities in relevant areas including;

- The provision of climate services including linkages to EU initiatives in this area e.g. under Copernicus and JPI Climate
- Climate research e.g. regional downscaling
- The establishment of a Climate Ireland Portal and/or a national portal for the storage of and enabling access to key meteorological datasets.

The need for meteorological datasets may arise on an ad-hoc basis due to the EPA's core work areas or due to involvement in a research project requiring access to data. Where such data requests are not covered under pre-existing agreements within this MoU a request will be made through the relevant contact on the contact list held by both organisations. Should this data request become a recurring request, consideration of its inclusion in the MoU will be undertaken in the annual MoU meeting.

**4 Memorandum of Understanding Review**

The Term of this Memorandum is five years from the date of signing, and may be reviewed by agreement of both parties from time to time during the term in order to ensure the greatest efficacy of its implementation. The memorandum shall in any event be reviewed on an annual basis by agreed representatives of both agencies as outlined below.

**5 Continuity of Arrangements**

Met Éireann will offer support for radioactivity and EMEP air quality monitoring activities at manned sites for as long as existing staff members remain available.

## **6 Confidentiality**

Notwithstanding the expiry or early termination of this Memorandum of Understanding for any cause, the provisions of confidentiality shall survive such expiry or early termination.

Each Party possesses valuable information, technical knowledge, experience and data of a confidential nature that it regards as assets of considerable value. Each Party may disclose such information to the other Party on the condition that the recipient of the information does not disclose it to any third party or make use of it in any manner except insofar as is necessary to achieve the purposes of this Agreement.

This Memorandum does not provide for the transfer of personal data as defined in the Data Protection Acts 1988 and 2003 and the parties agree to adhere to the provisions of those Acts.

## **7 Operational Liaison**

An up to date list of the contact details and areas of responsibility of key personnel involved in the work covered by this Memorandum of Understanding shall be maintained and held by both organisations.

An MoU liaison group will be set up to include representatives from Met Éireann and EPA. Staff from each organisation will through their representatives on the liaison group make contributions and liaise with their relevant counterparts and maintain an effective exchange of information. Items for implementation can be addressed by the person(s) responsible in each organisation on an informal basis between both parties.

An annual MoU meeting between staff, including senior representatives of both organisations will be held where activities in the areas of shared responsibility and practical cooperative measures as set out in the MoU will be reviewed. This review shall encompass suggestions for improvements in these areas as technological systems and expertise develop.

Minutes of these meetings will be agreed and held by both organisations. The liaison group may decide to refer certain matters of cooperation to technical sub-groups. This liaison group, or its designates, will also review as necessary any of the specific detail of cooperation specified in the Annexes to this MoU. Additional technical meetings covering more specific areas in detail shall also be arranged when required.

The EPA and Met Éireann may agree to establish working groups or make other arrangements to examine matters of common interest. Such groups may examine matters of a technical, legal or administrative nature where co-operation may provide opportunities for more effective operations between both organisations. Such working groups as may be established from time to time will operate as may be necessary under agreed Terms of Reference and report to the Liaison group. Such agreements will be included as appendices to the Memorandum of Understanding.

## **8 Costs**

There is an agreed financial contribution from the EPA to Met Éireann towards costs incurred for the following areas;

- Analysis of rainfall and filter samples from the EMEP – Transboundary Air Quality Monitoring Network (Annex 4)
- Maintenance of Eigenbrodt rainfall collectors (Annex 4)

These costs may be reviewed annually and any amendments to be jointly agreed by the relevant budget holder. Each Party shall be responsible for any other costs incurred by it in connection with this Memorandum of Understanding.

**Annex 1 Air Quality Information and Alert Thresholds*****Alert thresholds for pollutants other than ozone***

To be measured over three consecutive hours at locations representative of air quality over at least 100 km<sup>2</sup> or an entire zone or agglomeration, whichever is the smaller.

**Table 1 Alert Thresholds**

| <b>Pollutant</b> | <b>Alert threshold</b> |
|------------------|------------------------|
| Sulphur dioxide  | 500 µg/m <sup>3</sup>  |
| Nitrogen dioxide | 400 µg/m <sup>3</sup>  |

**Table 2 Information and alert thresholds for ozone**

| <b>Purpose</b> | <b>Averaging period</b> | <b>Threshold</b>      |
|----------------|-------------------------|-----------------------|
| Information    | 1 hour                  | 180 µg/m <sup>3</sup> |
| Alert          | 1 hour <sup>(1)</sup>   | 240 µg/m <sup>3</sup> |

<sup>(1)</sup> For the implementation of Article 24, of S.I. No. 180 of 2011, the exceedance of the threshold is to be measured or predicted for three consecutive hours.

**Annex 2 National Radioactivity Monitoring Network - Sites and Equipment****Table 3 Met Éireann Sites**

| Station Name               | Site Address  | Staffing       | Equipment |                |                 |
|----------------------------|---|----------------|-----------|----------------|-----------------|
|                            |   |                | Gamma     | Aerosol        | Precipitation   |
| Belmullet <sup>1</sup>     | Belmullet, Ballina, Co Mayo                                       | Business Hours |           | No air sampler | Yes             |
| Casement Aerodrome         | Casement Aerodrome, Baldonnell, Co. Dublin                        | 24 hours       | DLM       | No air sampler | Yes             |
| Clones <sup>2</sup>        | O'Neill Park, Clones, Co. Monaghan                                | OPO            | DLM       | No air sampler | No rain sampler |
| Cork Airport <sup>3</sup>  | Cork Airport, Co. Cork  | 24 hours       | AGS       | Off-line       | Yes             |
| Dublin Airport             | Level 3, Old Central Terminal Building, Dublin Airport            | 24 hours       |           | No air sampler | Yes             |
| Glasnevin                  | Met HQ, Glasnevin Hill, Dublin 9                                  | 24 hours       |           | Off-line       | No rain sampler |
| Knock Airport <sup>3</sup> | Knock Airport, Co. Mayo   | 0600 - 1900    | DLM       | Off-line       | Yes             |
| Gurteen                    | Gurteen Agricultural College, Ballingarry, Roscrea, Co. Tipperary | Not manned     | AGS       | No air sampler | No rain sampler |



| Station Name                 | Site Address                                    | Staffing       | Equipment |                |                 |
|------------------------------|---|----------------|-----------|----------------|-----------------|
|                              |   |                | Gamma     | Aerosol        | Precipitation   |
| Malin Head <sup>4</sup>      | Malin Head, Co. Donegal                         | OPO            | DLM       | No air sampler | No rain sampler |
| Mullingar                    | Met Éireann, Irishtown, Mullingar, Co Westmeath | Not manned     | AGS       | No air sampler | No rain sampler |
| Shannon Airport <sup>3</sup> | Shannon Airport, Co. Clare                      | 24 hours       | AGS       | Off-line       | Yes             |
| Valentia                     | Valentia Observatory, Cahirciveen , Co. Kerry   | Business Hours | DLM       | Off-line       | Yes             |

DLM: Landline and mains powered

AGS: GSM and solar powered

OPO: One Person Operation

**Note:** The following are the actual and proposed dates after which manned observations may not be available.

1. No short term closure date. Automated 2012, two staff members remain but cannot guarantee continuous business hours availability.
2. Closed in April 2008. One fulltime staff member remains on site but cannot guarantee business hours availability.
3. Scheduled to be automated by 2018. Staff will remain on site at Dublin Airport but may not have site access. Staffing levels matches the flight schedules
4. Automated end 2010. One full time staff member remains on site but cannot guarantee business hours availability.

**Table 4 Other Host Organisations**

| Station Name | Host Organisation | Site Address  | Staffing     | Equipment |                   |               |
|--------------|-------------------|---|--------------|-----------|-------------------|---------------|
|              |                   |   |              | Gamma     | Aerosol           | Precipitation |
| Clonskeagh   | EPA               | 3 Clonskeagh Square, Dublin 14  | Business hrs | DLM       | Off-line, On-Line | Yes           |
| Coolgreany   | Wexford CC        | Coolgreany WWTW, Co Wexford   | Not Manned   | AGS       | On-Line           |               |
| Drogheda     | Drogheda UDC      | Newtown Cemetery, Termonfeckin Road, Newtonstalaban, Drogheda, Co Louth | Not Manned   |           | On-line           |               |
| Dundalk      | Defence Forces    | Aiken Barracks, Dundalk, Co. Louth                                      | 24 hours     | DLM       |                   |               |
| Dundalk      | Dundalk CC        | Cavan Hill Water Treatment Plant, Dundalk                               | Business hrs |           | On-line           |               |
| Kilmeadan    | Waterford CC      | Adamstown Water Treatment Plant, Kilmeadan, Co. Waterford               | 24 hours     | AGS       | On-line           |               |
| Kiltrough    | Meath CC          | Kiltrough Water Tower, Co. Meath  | Not manned   | AGS       |                   |               |
| Rosslare     | OPW               | Rosslare Harbour, Co. Wexford   | Not manned   | DLM       |                   |               |

### **Annex 3      Maintenance of the national radioactivity monitoring network equipment**

#### ***Technidata AGS Gamma Monitors*** (solar powered and self-contained monitor)

- Cleaning of solar panel, rainfall detector and GSM antennae annually or when required
- Regular visual inspection for damage and reporting to EPA where appropriate.

#### ***Technidata DLM Gamma Monitors*** (mains powered indoor data logger connected to outdoor sensor)

- Cleaning of rainfall detector annually or when required
- Replacement of detector tube when required
- Assist with troubleshooting telephone line problems
- Assist with instrument power problems (mains, battery or fuses) where possible
- Regular visual inspection for damage and reporting to EPA where appropriate.

#### ***Precipitation Collectors***

- Continue precipitation sampling routine
- Regular cleaning of funnel and collection bottle
- Regular visual inspection for damage, request for spares and reporting to EPA where appropriate.

#### ***Off-Line Berthold Aerosol Samplers***

- Continue weekly exchange of filters
- Fitting new sampling heads
- Assist with instrument power problems (mains or fuses) where possible
- Regular visual inspection for damage, request for spares and reporting to EPA where appropriate.

**Annex 4 EMEP Network Support*****Monitoring Support by Met Éireann Staff (EMEP Transboundary Air Quality Monitoring Network)******Malin Head, Donegal***

As part of their routine duties Met Éireann staff based at Malin Head currently provide servicing and maintenance support for TXB measurements carried out at the station. These activities at Malin Head are detailed in Table 5 and will be maintained by Met Éireann on a best effort basis.

**Table 5 Monitoring Support Activities at Malin Head, Donegal.**

| <b>Instrument / Task</b>   | <b>Frequency</b>    | <b>Task</b>                              | <b>Time required<br/>&gt;month</b> | <b>Month</b> | <b>Week</b> |
|----------------------------|---------------------|--|------------------------------------|--------------|-------------|
| <b>High Volume Sampler</b> | Weekly (Wednesdays) | Filter changes                           |                                    |              | 15 mins     |
|                            | Monthly             | Clean Impaction plate                    |                                    | 20 mins      |             |
| <b>CPC</b>                 | Weekly              | Check/Fill Butanol                       |                                    |              | 5 mins      |
|                            | Sometimes           | Clean Nozzle                             | 1 hour                             |              |             |
| <b>Aethelometer</b>        | Weekly (Wednesdays) | Check if reporting: Restart if necessary |                                    |              | 10 mins     |
| <b>Ozone Instrument</b>    | Weekly              | Check if working properly                |                                    |              | 5 mins      |
|                            | Monthly             | Change Filters                           |                                    | 20 mins      |             |
| <b>Sample preparation</b>  | Weekly              | Prepare samples for courier              |                                    |              | 15 mins     |

***Equipment maintenance support by Met Éireann Staff (Eigenbrodt Rainfall Samplers - EMEP Transboundary Air Quality Monitoring Network)***

Met Éireann will assist the EPA in the maintenance of the Eigenbrodt rainfall samplers on the EMEP Transboundary Air Quality Monitoring Network.

Met Éireann has acquired expertise in the maintenance of Eigenbrodt automatic rainfall samplers over the last number of years and is prepared to consider putting this expertise to use on behalf of the EPA in performing regular preventative maintenance checks on site, if the EPA is prepared to cover the expenses associated with this undertaking. The costs will be agreed between both organisations.

***Laboratory analytical support by Met Éireann Staff (EMEP Transboundary Air Quality Monitoring Network)***

The EPA Transboundary monitoring network has been in operation since 2005. These sites are part of the European Monitoring and Evaluation Programme (EMEP). EMEP sites are presented in Figure 1.



**Figure 1: EMEP Monitoring Sites (2014)**

The key monitoring sites are;

- Carnsore Point, Wexford (EPA)
- Malin Head, Donegal (Met Éireann/EPA)
- Mace Head, Co Galway (NUIG/EPA)
- Valentia, Co Kerry (Met Éireann)

Ancillary monitoring sites include;

- Oak Park, Carlow (Teagasc/EPA)
- Johnstown Castle, Wexford (Met Éireann/EPA)

Instrumentation at these sites is presented in Table 6.

**Table 6 List of Instrumentation at Transboundary Monitoring Sites**

| Site   | Instrumentation   |
|--|---|
| <b>Carnsore Point</b>  | Particle number concentration (CPC)<br>Particle scattering (Nephelometer)<br>Black Carbon, [BC] (Aethelometer)<br>PM <sub>10</sub> mass (TEOM)<br>Daily PM <sub>10</sub> chemistry (HVS)<br>CO <sub>2</sub> (Picarro, ICOS)                               |
| <b>Johnstown Castle</b>  | Daily Precipitation (wet only)  |
| <b>Oak Park</b>  | Daily Precipitation (wet only)<br>Daily PM10 chemistry (HVS)  |
| <b>Malin Head</b>  | Particle number concentration (CPC) – Ozone (2012)<br>Black Carbon, [BC] (Aethelometer)<br>PM <sub>10</sub> chemistry (HVS)<br>CO <sub>2</sub> (Picarro, ICOS)  |
| <b>Mace Head</b><br><br>Range of measurements carried out by NUI Galway research team. | Particle number concentration (CPC) - Mercury<br>Particle scattering (Nephelometer) - Industrial Gases<br>Black Carbon, [BC] (Aethelometer) - ....<br>PM <sub>10</sub> mass (TEOM)<br>PM <sub>10</sub> chemistry (HVS)<br>CO <sub>2</sub> (Picarro, ICOS) |
| <b>Valentia</b><br>Met Éireann   | Precipitation (wet only)<br>NO <sub>2</sub> , SO <sub>2</sub> , Metals  |

The Met Éireann laboratory based in Glasnevin has provided essential analytical support to the Transboundary Air Quality Monitoring network since its start-up. Rainfall and filter samples are collected daily by instrumentation on sites. EPA and Met Éireann personnel collect the samples on weekly basis and courier the samples to Met Éireann Glasnevin for analysis for a range of anions and cations. Analytical data is compiled and

QA/QC checked by Met Éireann Lab staff. Results of analyses are submitted electronically by Met Éireann to EMEP.

***Contribution to analytical Costs:***

An agreed annual contribution towards the costs incurred by this analysis will be paid by the EPA to Met Éireann.

**Annex 5 Data requirements for Land Use and Inventory Development**

| <b>Parameter</b>                            | <b>Definition</b>           | <b>Scale</b>      |
|---|-----------------------------|-------------------|
| Daily minimum, maximum and mean temperature | Standard Met Éireann values | Synoptic stations |
| Daily Rainfall                              | Standard Met Éireann values | Synoptic stations |

## Annex 6 Hydro-meteorological Parameters Required for WISE-SOE Annual Reporting

**Table 7 Hydro-meteorological Parameters**

| Parameter                          | Definition   | Temporal Scale   | Spatial Scale                           | Unit               |
|------------------------------------|--|--|---|--------------------|
| Areal Precipitation (P)            | Total volume of atmospheric wet precipitation (rain, snow, hail etc.).   | Monthly <sup>M</sup> ,<br>Seasonal,<br>Annual <sup>M, 1</sup> ,<br>LTAA <sup>M</sup> | Irish National Grid on a 1km resolution | millimetres (mm)   |
| Potential Evapotranspiration (PET) | The maximum quantity of water capable of being evaporated in a given climate from a continuous stretch of vegetation covering the whole ground and well supplied with water. | Monthly <sup>M</sup> ,<br>Seasonal,<br>Annual <sup>M, 1</sup> ,<br>LTAA <sup>M</sup> | Synoptic stations                       | millimetres (mm) ) |
| Actual Evapotranspiration (ETa)    | Actual evapotranspiration as calculated from the Met Éireann/Teagasc hybrid model.   | Monthly <sup>M</sup> ,<br>Seasonal,<br>Annual <sup>M, 1</sup> ,<br>LTAA <sup>M</sup> | Synoptic stations                       | millimetres (mm)   |

<sup>M</sup> This field is mandatory.

<sup>1</sup> LTAA = Long Term Annual Average - based on annual values averaged over a period of at least 20 consecutive years. The time period used to calculate the LTAA should also be provided.

Ireland is also required to report stream flow, reservoir inflows and outflows and groundwater levels at specified monitoring points. Included in this data set are data from rain gauge stations as set out in Table 8.



**Table 8 Hydrometeorological Point measurements**

| Variable            | Definition   | Spatial Scale  |
|---------------------|--|--|
| Rain gauge stations | Only basic information on the characteristics of the raingauge stations which are located within the reporting unit (e.g. latitude, longitude, period of available record etc.) is requested (precipitation measurements are not requested). It is assumed that these stations were used to calculate the Areal Precipitation requested in the above Water Balance Table (Table 1) | Raingauge Station <sup>M</sup><br>RBD <sup>M</sup><br>RB<br>Sub-units<br>Administrative Region<br>Country <sup>M</sup> |

<sup>M</sup> This field is mandatory.

The current requested information has been scaled down to each particular RBD and sub-unit. Additionally, the minimum proposed time step is monthly to allow distinguishing seasonal patterns and assessing dry periods within a hydrological year. There is the flexibility to report at different scales: River Basin District (RBD), sub-unit (SU), River Basin (RB), Administrative Region (ADR). The smallest available spatial scale is the default requirement for reporting. There is also flexibility regarding the temporal resolution for which the data can be reported, Monthly, Seasonal, Annual. Again the lowest available temporal scale possible is required. Data is requested annually in arrears at the end of October.