Title	**ATMOSPHERIC DISPERSION MODELLING DESCRIPTION FOR MPR (PHASE II SITE SELECTION)**
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APPROVAL & DISTRIBUTION

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REVISION HISTORY

This document has been revised in accordance with the following schedule:

Rev. No.	Date approved	Nature of Revision	Prepared
1.0	See title page	First issue.	L Cawood

1 PURPOSE

The purpose of this document is to capture the project descriptions and tasks required for the dispersion modelling evaluation of the potential sites identified in Phase 1 of the siting process of the Multi-Purpose Research Reactor (MPR). The impact on the public (up to 50 km from the point of release) and other Necsa facilities must be evaluated.

2 DEFINITIONS

Term	Description
Atmospheric Dispersion Factor, X/Q	X/Q, also referred to in the literature as the relative atmospheric concentration, has the unit of s/m^3 as derived from radioactivity concentration represented by X, the Greek capital letter Chi, in units of Bq/m^3 at a specific location, divided by the radioactivity release rate from a source and represented by Q in units of Bq/s.
Gaussian Plume Model	A basic atmospheric dispersion model that assumes that the plume spread has a Gaussian distribution in both the horizontal and vertical directions and therefore uses the standard deviations of plume concentration distribution in the horizontal (σy) and vertical (σz) planes.

3 JUSTIFICATION

During Phase 2 of the MPR site selection process the potential identified sites are to be evaluated on their airborne release impact on the public and other Necsa facilities, with dispersion modelling. This information, establishes site related design basis used in design of the reactor and is required for the site safety report that will be issued to the NNR and for the Environmental Impact Assessment documentation required to obtain an Environmental Authorisation.

4 PROJECT DESCRIPTION

A complex terrain such as the one at Necsa and its environs can lead to highly complicated meteorological features in the vicinity of the point of discharge to the atmosphere. These include slope-valley flows and internal boundary layers (with associated fumigation effects), which may cause complex patterns of pollution dispersion.

4.1 Software

The rules for choosing of an advanced atmospheric dispersion model/s should be used include the following:

(a) Short range predictions of up to 50 km with a steady-state Gaussian dispersion model to yield a good match between modeled and observed results in the near-field;

(b) Sources or receptors are located in complex terrain, which affects the meteorological as well as the plume-dispersion characteristics;

(c) Pollutants accumulate in calm conditions or are re-circulated as the wind changes direction;

(d) Frequent periods of low wind speed or calms are experienced in the area;

(e) Chemical transformations between pollutant species are important;

(f) Appropriate meteorological data are available to drive them; and

(g) The Validation and Verification quality assessments are available and current.

4.2 Model Inputs

The pseudo source term used for assessing each site location is as follows:

(a) Point source;

(b) Stack of 3 m diameter;

(c)   Source strength 1E6 Bq/s at 0.5 m/s exit velocity and temperature of 300 K.

(d)   No building wake effects or influence of other buildings on the Necsa site taken into account.

(e)   Hourly weather data will be provided by the Necsa weather station for a representative year;

(f)   Isopleths representing the dispersion factor X/Q must be calculated for each site location using the same source term, release characteristics and meteorological data.

4.3   Output Results

A report must be produced clearly stating the Dispersion model, input files and results. The outputs calculated must be graphically displayed for each dispersion site for easy comparison.

The report must include a recommendation on the site best suited (lowest impact to the public and other Necsa facilities) for the Phase 2 siting selection