Appendix 8.4

Cumulative Impact Assessment

APPENDIX 8.4

8.4.1 Cumulative Impact Assessment

An evaluation of the potential for cumulative air quality effects as a result of the construction and operation of the proposed development and the relevant existing and proposed projects has been undertaken as outlined in **Chapter 8**, **Section 8.8**. Following on from this assessment, a detailed cumulative assessment of the facility and the relevant industrial emission sources has been carried out using the methodology outlined by the EPA[9] and the USEPA[1]. The relevant nearby air emission points sources identified were Janssen Biologics Ltd, Hovione Cork, ESB Aghada, Sterling Pharma. Ltd, Thermo Fisher Scientific Ltd, Pfizer Ireland Pharmaceuticals (Ballintaggart), BGE Whitegate and Recordati Ltd as outlined below.

In the context of the cumulative assessment, all significant sources should be taken into account. The USEPA has defined "significance" in the current context as an effect leading to a 1 $\mu g/m^3$ annual increase in the annual average concentration of the applicable criteria pollutant. However, no significant ambient effect levels have been established for non-criteria pollutants (defined as all pollutants except PM_{10}, NO_2, SO_2, CO and lead). The USEPA does not require a full cumulative assessment for a particular pollutant when emissions of that pollutant from a proposed source would not increase ambient levels by more than the significant ambient effect level (annual average of 1 $\mu g/m^3$). A similar approach has been applied in the current assessment. These releases consist of NO_2, SO_2, HCl, HF, Dioxins, Cd, PAHs, As and Ni. As emissions of Total Dust (as PM_{10}), CO and TOC are not significant, no cumulative assessment will be carried out for these pollutants. Furthermore, as there are no significant releases of HCl, HF, PAHs, Cd, As and Ni in the vicinity of the facility, no detailed cumulative assessment is necessary for these compounds. Table A8.10 outlines the significant releases from Indaver which also have a nearby facility which is releasing the same pollutants at significance levels.

The emission data used in the cumulative assessment is based on the maximum emission limits and volume flows contained in each facilities' IED Licence. For the facility, the only significant cumulative pollutant was NO_X emissions. For each significant nearby source, an assessment was made of the relevant NO_X emissions from each emission source based on a review of their IE Licence.

Table A8.10 Assessment of Significant Releases from Indaver

Pollutant	Significance Criteria ($\mu g/m^3$ annual average)	Indaver GLC ($\mu g/m^3$ annual average)	Significance
NO_2	1	0.49	√
SO_2	1	0.41	x
$PM_{10}/PM_{2.5}$	1	0.08	x
TOC	1	0.08	x
HCl	1	0.08	x
HF	1	0.01	x
Hg	1	0.40	x
Cd	1	0.40	x
As	1	0.03	x
Ni	1	0.50	x
Dioxins	-	0 .82 fg/m^3	x

8.4.2 Summary of Nearby Sources

A cumulative modelling study was undertaken for significant sources of NO_X emissions in the region. The assessment found that the following facilities had significant emissions of NO_X:

- Janssen Biologics Ltd, Hovione Cork, ESB Aghada, Sterling Pharma. Ltd, Thermo Fisher Scientific Ltd, Pfizer Ireland Pharmaceuticals (Ballintaggart), BGE Whitegate and Recordati Ltd.

The cumulative impact assessment has been carried out to assess the effect of emissions from Indaver on the surrounding environment. As such, several conservative approximations have been made in regards to the operating details and physical characteristics of the surrounding sources.

8.4.3 Cumulative Nitrogen Dioxide Emissions and Results

8.4.3.1 Source Information

Source information including emission release heights, volume flows, locations and stack diameters has been summarised in **Appendix 8.6**.

8.4.3.2 Modelling of Nitrogen Dioxide

Nitrogen oxides (NO_X), containing both nitrogen oxide (NO) and nitrogen dioxide (NO_2) are emitted from the combustion process on-site, although it is the latter which is considered the more harmful to human health. These combustion processes lead to emissions which are mainly in the form of nitrogen oxide (NO) (typically 95%) with small amounts of the more harmful nitrogen dioxide.

Ambient Ground Level Concentrations (GLCs) of Nitrogen Dioxide have been predicted for the following scenarios in Table A8.11.

Table A8.11 Emission Scenario for Nitrogen Oxides

Pollutant	Scenario	Concentration	Emission Rate (g/s)
NO_x	Maximum 1-Hr Operation	400 mg/m^3	23.4
	Maximum 24-Hr Operation, Annual Mean	200 mg/m^3	11.7

8.4.3.3 Concentration Contours

The geographical variation in NO_2 ground level concentrations beyond the facility boundary are illustrated as concentration contours in Figure A8.1 and Figure A8.2.

8.4.3.4 Result Findings

In relation to the maximum one-hour limit value, cumulative modelling results indicate that the ambient ground level concentrations are below the 2030 ambient standards for the protection of human health under cumulative operation of the facility as outlined in Table A8.12. Emissions at maximum operations equate to ambient NO_2 concentrations (including background concentrations) which are 81% of the maximum ambient 1-hour limit value (measured as a 99.97th%ile) at the worst-case receptor. However, the maximum ambient 24-hour limit value (measured as a 95.1th%ile) at the worst-case receptor peaks at 124% of the 2030 limit value and the annual average NO_2 concentration (including background concentration) is also above the limit value for the protection of human health accounting for 123% of the 2030 annual limit value at the worst-case receptor.

Shown in Table A8.13 is the results for the cumulative modelling scenario with the facility not in operation. Results are also identical with emissions at maximum operations equate to ambient NO_2 concentrations (including background concentrations) which are 81% of the maximum ambient 1-hour limit value (measured as a 99.97th%ile) at the worst-case receptor. The maximum ambient 24-hour limit value (measured as a 95.1th%ile) at the worst-case receptor peaks at 124% of the 2030 limit value and the annual average NO_2 concentration (including background concentration) is also above the limit value for the protection of human health accounting for 122% of the 2030 annual limit value at the worst-case receptor. Contour plots shown in Figure A8.1 and Figure A8.2 show the peak concentrations occur at the boundary of other facilities in the region.

Thus, as a worst-case the operation of the facility will increase the cumulative ambient NO_2 concentration by no more than 0.5% of the 2030 limit value and thus will not lead to a significant contribution to the cumulative modelling concentrations in the region. It should also be borne in mind that the cumulative modelling assessment is based on worst-case assumptions that all emission points in the region are operating at their current level in Year 2030 (when the 2030 ambient standards apply) and also that these emission points are operating at their maximum volume flow and maximum emission concentration for 8,760 hours per year.

Table A8.12 Cumulative Dispersion Model Results – Nitrogen Dioxide

Pollutant / Year	Averaging Period	Worst Case Receptor		PC (µg/m³)	Back-ground Conc. (µg/m³)	PEC (µg/m³)	Limit Values (µg/Nm³)	PEC as a % of Limit Value
		Type	X,Y (UTM Zone 29 N)					
NO_2 / Onsite Met Data 2007	Annual Mean	Boundary	545581, 5742825	14.5	10	24.5	20	123%
	1-hr Mean (as 99.97th%ile)	Grid	545604, 5742835	131.4	20	151.4	200	76%
	24-hr Mean (as 95.1st%ile)	Grid	545581, 5742826	36.6	20	56.6	50	113%
NO_2 / 2020	Annual Mean	Boundary	545581, 5742825	12.1	10	22.1	20	110%
	1-hr Mean (as 99.97th%ile)	Grid	545604, 5742835	141.5	20	161.5	200	81%
	24-hr Mean (as 95.1st%ile)	Grid	545604, 5742835	38.5	20	58.5	50	117%
NO_2 / 2021	Annual Mean	Boundary	545581, 5742825	13.1	10	23.1	20	116%
	1-hr Mean (as 99.97th%ile)	Grid	545604, 5742835	141.8	20	161.8	200	81%
	24-hr Mean (as 95.1st%ile)	Grid	545604, 5742835	39.4	20	59.4	50	119%
NO_2 / 2022	Annual Mean	Boundary	545581, 5742825	13.3	10	23.3	20	116%
	1-hr Mean (as 99.97th%ile)	Grid	545604, 5742835	136.5	20	156.5	200	78%
	24-hr Mean (as 95.1st%ile)	Grid	545604, 5742835	41.8	20	61.8	50	124%
NO_2 / 2023	Annual Mean	Boundary	545581, 5742825	11.3	10	21.3	20	107%
	1-hr Mean (as 99.97th%ile)	Grid	545604, 5742835	131.3	20	151.3	200	76%
	24-hr Mean (as 95.1st%ile)	Grid	545230, 5743161	37.5	20	57.5	50	115%
NO_2 / 2024	Annual Mean	Boundary	545581, 5742825	13.7	10	23.7	20	118%
	1-hr Mean (as 99.97th%ile)	Grid	545604, 5742835	134.4	20	154.4	200	77%
	24-hr Mean (as 95.1st%ile)	Grid	545604, 5742835	40.1	20	60.1	50	120%

Figure A8.1 Cumulative Operations: Predicted 24-hr NO_2 95.1th Percentile Concentration

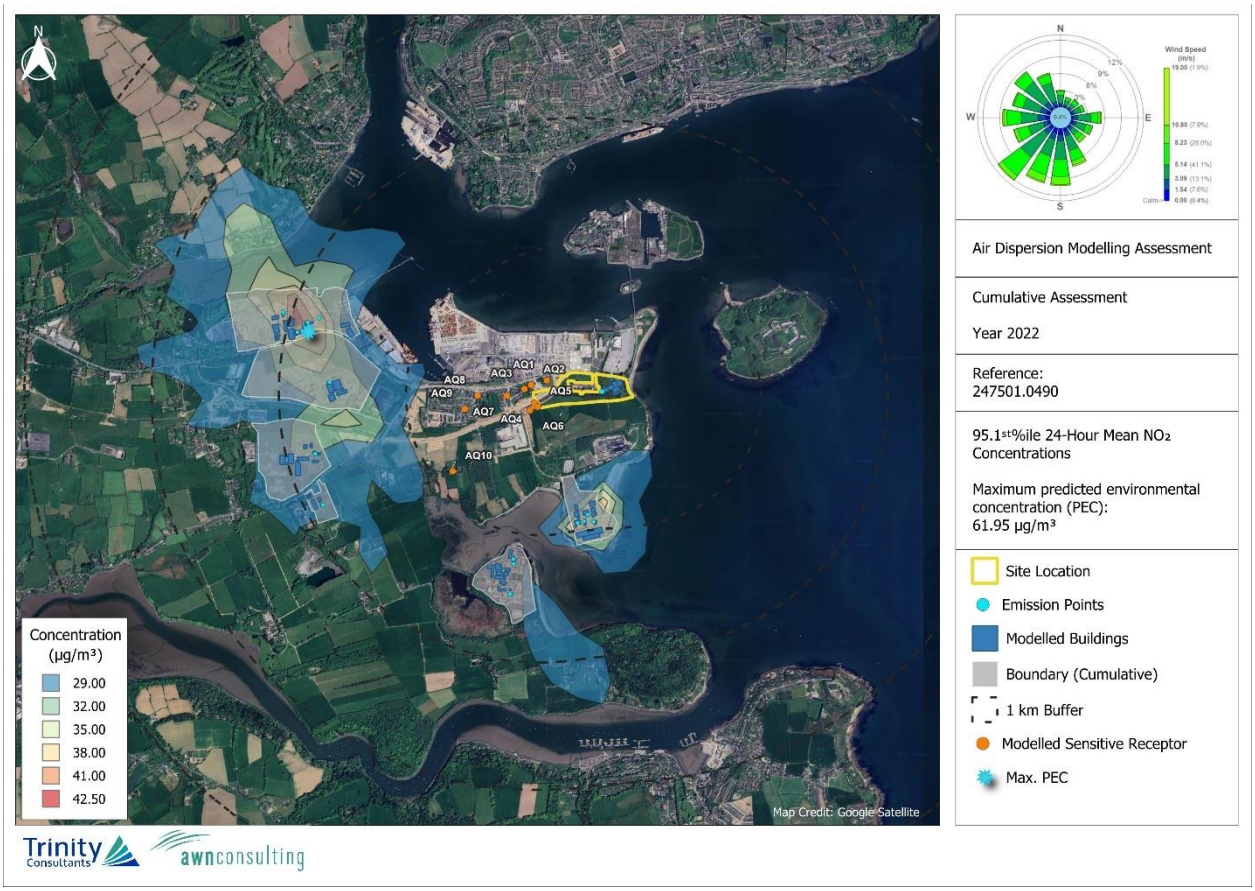

Figure A8.2 Cumulative Operations: Predicted Annual Mean NO_2 Concentration

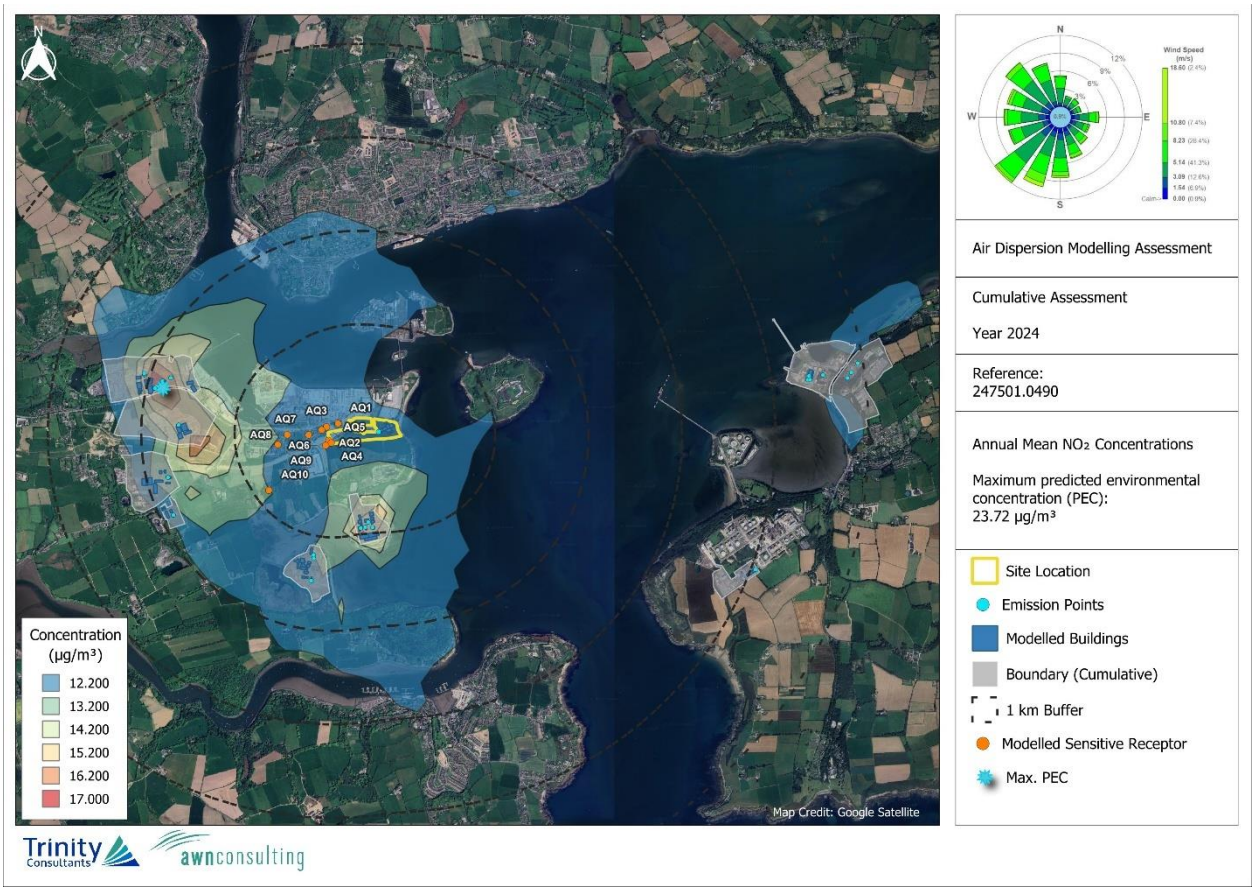

Table A8.13 Cumulative Dispersion Model Results – Nitrogen Dioxide Without The Proposed Development

Pollutant / Year	Averaging Period	Worst Case Receptor		PC ($\mu g/m^3$)	Back-ground Conc. ($\mu g/m^3$)	PEC ($\mu g/m^3$)	Limit Values ($\mu g/Nm^3$)	PEC as a % of Limit Value
		Type	X,Y (UTM Zone 29 N)					
NO_2 / Onsite Met Data 2007	Annual Mean	Boundary	545581, 5742825	14.4	10	24.4	20	122%
	1-hr Mean (as 99.97th%ile)	Grid	545604, 5742835	131.2	20	151.2	200	76%
	24-hr Mean (as 95.1st%ile)	Grid	545581, 5742826	36.5	20	56.5	50	113%
NO_2 / 2020	Annual Mean	Boundary	545581, 5742825	12.0	10	22.0	20	110%
	1-hr Mean (as 99.97th%ile)	Grid	545604, 5742835	141.5	20	161.5	200	81%
	24-hr Mean (as 95.1st%ile)	Grid	545604, 5742835	38.5	20	58.5	50	117%
NO_2 / 2021	Annual Mean	Boundary	545581, 5742825	13.0	10	23.0	20	115%
	1-hr Mean (as 99.97th%ile)	Grid	545604, 5742835	141.8	20	161.8	200	81%
	24-hr Mean (as 95.1st%ile)	Grid	545604, 5742835	39.3	20	59.3	50	119%
NO_2 / 2022	Annual Mean	Boundary	545581, 5742825	13.2	10	23.2	20	116%
	1-hr Mean (as 99.97th%ile)	Grid	545604, 5742835	136.5	20	156.5	200	78%
	24-hr Mean (as 95.1st%ile)	Grid	545604, 5742835	41.8	20	61.8	50	124%
NO_2 / 2023	Annual Mean	Boundary	545581, 5742825	11.2	10	21.2	20	106%
	1-hr Mean (as 99.97th%ile)	Grid	545604, 5742835	131.3	20	151.3	200	76%
	24-hr Mean (as 95.1st%ile)	Grid	545230, 5743161	37.5	20	57.5	50	115%
NO_2 / 2024	Annual Mean	Boundary	545581, 5742825	13.6	10	23.6	20	118%
	1-hr Mean (as 99.97th%ile)	Grid	545604, 5742835	134.3	20	154.3	200	77%
	24-hr Mean (as 95.1st%ile)	Grid	545604, 5742835	40.1	20	60.1	50	120%