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Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

29 April 2026

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1. Introduction

1.1 Context

Project Arctial is a 610,000 tonnes per annum low carbon greenfield primary aluminium smelter facility proposed for Kokkola and Kronoby, Finland. Arctial's aluminium smelter facility, utilising Rio Tinto's industry-leading AP60 aluminium reduction technology in combination with low-carbon electricity.

The aluminium smelter will have a carbon footprint which is 40% lower than the current European average and four times lower than the global average. Arctial's aluminium smelter facility will mark the first greenfield primary aluminium smelter development in continental Europe in over 30 years, significantly boosting the supply of domestic low-carbon aluminium.

1.2 Objective of the study

WSP Canada Inc. (WSP) was mandated to carry out atmospheric dispersion modelling in the context of an environmental impact assessment (EIA). The purpose of this study is to assess the impact of emissions from the operations of the future facilities on ambient air quality.

The following sections present the procedure used to model ambient air concentrations of the selected particulate and gaseous compounds. The ambient background levels considered, as well as the applicable ambient air quality standards, are also described. Finally, the detailed results are presented and interpreted considering the assumptions retained for the modelling.

1.3 Site location and surroundings

The site of the future Arctial complex is located midway between the municipalities of Kokkola and Kronoby, along Finnish National Road 8. The site is centred at latitude 63°47′12″ North and longitude 23°4′4″ East. The location of the site is shown on Map B-1-1.

As part of the present study, the modelling is carried out using the Universal Transverse Mercator (UTM) projection, with the WGS84 reference datum. In the UTM projection, the study site is in Zone 34N and has coordinates X = 601,900 m and Y = 7,074,900 m.

Unless otherwise stated, all coordinates provided in this report are given in the UTM coordinate system, Zone 34N.

2. Methodology

The modelling approach recommended in this study is developed by a Quebec-based team of air quality experts and is largely based on the methodology proposed by Quebec's ministry for the environment, the *ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs* (MELCCFP), in the *Guide de la modélisation de la dispersion atmosphérique* (MELCCFP, 2025). Additional recommendations published by other Canadian provinces such as Newfoundland and Labrador (NLDEC, 2012), Ontario (MOECC, 2017), Alberta (AEP, 2021), and British Columbia (BCMOE, 2022), as well as by the United States Environmental Protection Agency [US-EPA] (US-EPA, 2024b), were considered where relevant.

The WSP modelling approach is consistent with Finnish and European guidelines, as advised by a consulting team of Finnish environmental experts at Envineer. Furthermore, WSP has refined its modelling approach over decades of projects in the industrial and mining sectors, and especially in the context of aluminium smelting plants. The selected approach aims to provide an adapted and technically robust assessment of potential air-quality impacts in a Finnish context, suitable for review against Finnish and European air-quality criteria.

2.1 Modelling approach

The MELCCFP generally recommends AERMOD, the default regulatory model of the U.S. Environmental Protection Agency [US-EPA], for atmospheric dispersion modelling studies. However, aluminium smelting plants include a particular source type that is, at present, not adequately represented by AERMOD. The following sections aim to explain why an adapted modelling approach is justified.

2.1.1 History

Nearly 50 years ago, the *Buoyant Line and Point Source Dispersion Model* [BLP] was developed by Joseph S. Scire (1955-2024) for the modelling of aluminium smelting plant rooflines (Scire and Schulman, 1980).

Twenty years later, Scire was the author of the now widely used CALPUFF model (Scire et al., 2000). CALPUFF includes specialized algorithms for modelling emissions from buoyant line sources, building upon the older algorithms from BLP

Around the same time, US-EPA was developing a competing atmospheric dispersion model called AERMOD. Unlike CALPUFF, this model does not include a native algorithm for buoyant

line source types. Between 2003 and 2017, AERMOD and CALPUFF were both recommended by US-EPA as preferred models for regulatory applications.

In 2015, US-EPA directly integrated the BLP (1980) model code into AERMOD in order to address this key limitation relative to CALPUFF (US-EPA, 2015). Before this, it was common practice to combine AERMOD and BLP modelling results, synchronized in time and space.

In Canada, aluminium smelting plants are predominantly located in Quebec, with a limited presence in British Columbia. Atmospheric dispersion modelling studies for aluminium smelting plants in Quebec were historically carried out using CALPUFF. Recently, US-EPA removed CALPUFF from its list of preferred dispersion models and Quebec followed suit without evaluating the impact on modelling studies, especially for aluminium smelting plants. However, other jurisdictions in Canada, such as British Columbia, continue to recommend CALPUFF for atmospheric dispersion modelling studies.

2.1.2 Comparison of BLP, CALPUFF and AERMOD

First, it should be noted that the BLP model has remained largely unchanged since its publication in 1980.

As mentioned above, CALPUFF was later developed by the same author. He has noted that the BLP model is “outdated,” while by promoting CALPUFF’s “modern state of the science framework” that is better adapted to aluminium smelting plants (Barclay and Scire, 2011).

By contrast, the introduction of the buoyant line source type in AERMOD is essentially a direct implementation of BLP as a distinct dispersion model; according to US-EPA documentation, “The buoyant line algorithms were ported unchanged from BLP to AERMOD” (US-EPA, 2016). As a result, AERMOD does not consider the micrometeorological parameters or the more advanced dispersion algorithms that are enabled for its other source types.

While CALPUFF and AERMOD both include such enhancements for point sources, BLP does not include them for buoyant line sources, and consequently this missing element of BLP is also missing in AERMOD.

Indeed, WSP has observed abnormal dispersion patterns in previous modelling studies that used AERMOD’s integrated BLP code. While AERMOD performs satisfactorily for point sources, WSP judges that CALPUFF is the best fit-for-purpose model for buoyant line sources.

2.1.3 Justification for an alternative model for buoyant line sources

There is growing proof that AERMOD is not the best model for buoyant line sources, which US-EPA has itself acknowledged. Multiple state agencies have contacted US-EPA regarding its

recommendation to use AERMOD for buoyant line sources, noting that impacts from buoyant line sources are overpredicted.

In 2018, the health department for Allegheny County, Pennsylvania, and the Arizona Department of Environmental Quality separately requested exceptions to the US-EPA recommendation to use AERMOD for buoyant line sources, and both requests were approved (ACHD, 2018; US-EPA, 2018a). In 2022 and 2024, the New York State Department of Conservation made similar requests, which were also approved by US-EPA (NYSDEC, 2022; US-EPA, 2022; US-EPA, 2024a).

In all cases, it was demonstrated quantitatively that impacts from buoyant line sources are excessively overpredicted by AERMOD. All three agencies proposed using alternative “hybrid” models that include code modifications to AERMOD. In all cases, these projects possessed hourly air quality measurements that they could directly compare with the modelling results. US-EPA reviewed these comparisons and agreed in all cases that AERMOD overpredicted to an excessive degree.

Meanwhile, CALPUFF continues to be recommended as a regulatory model in Canada. Notably, it continues to be used for at least one aluminium smelting plant in Kitimat, British Columbia, where it was noted to produce conservative results (ESSA Technologies et al., 2020).

In summary:

- AERMOD is well documented and approved in Canada, but its treatment for buoyant line sources is outdated and inadequate.
- There are multiple documented cases where agencies have successfully sought an alternative to AERMOD for this reason, demonstrated on a site-specific, case-by-case basis.
- CALPUFF is already well established, documented, and approved in Canada. This model is fit-to-purpose for buoyant line sources and is compliant with the European Commission Ambient Air Quality Directive (EC, 2025).

In the next section, WSP proposes an approach that is the equivalent of using two regulatory methods that are approved in Canada and combining the results, without modifying the model code. The modelled concentrations from the two models are added together in time and space, which is the same type of calculation that would be used to estimate cumulative air quality impacts of two nearby projects.

2.1.4 Composite AERMOD-CALPUFF model approach

In light of the preceding analysis, particularly with respect to the algorithms used by the models for buoyant line sources, the following composite model approach is proposed:

1. Point sources are modelled using AERMOD version 24142 (US-EPA, 2024c).
2. Buoyant line sources are modelled using CALPUFF version 7.2.1 (Scire et al., 2000).

This composite model approach retains the most recent, most fit-for-purpose model for all source types, including buoyant line sources. Crucially, this approach does not modify either model's source code. Instead, AERMOD and CALPUFF are run separately, and the resulting modelled concentrations are simply added together.

Furthermore, the same meteorological data set is used for the two models, ensuring spatial and temporal consistency in the combined results. This AERMET data set, prepared by a third-party consultant, is compatible with both AERMOD and CALPUFF.

This approach synthesizes modelling methods used across Canada and represents a minimal but justified change to the US-EPA preferred method for atmospheric dispersion modelling.

2.2 Description of integrated modelling software

2.2.1 AERMOD (Point sources)

AERMOD is a Gaussian dispersion model used to calculate concentrations of gaseous compounds or particulate matter resulting from emissions from point, area, or volume sources in urban or rural environments. The program includes the following features:

- use of hourly meteorological data;
- generation of temperature, wind, and turbulence profiles to determine mechanical and convective mixing heights;
- probability distribution functions adapted to atmospheric stability conditions (Gaussian or non-Gaussian);
- integration of surface characteristics such as terrain roughness, albedo, and the Bowen ratio;
- a flexible grid of calculation points (receptors);
- incorporation of adjustment terms to account for physicochemical properties that may affect the behavior of certain compounds.

The program uses hourly meteorological data to estimate concentrations of particulate matter or gaseous substances in ambient air at various calculation points for different averaging periods (e.g., hourly, 8-hour, 24-hour, annual, etc.). It also integrates the PRIME module (US-EPA, 1993), which accounts for building downwash effects (turbulence) induced by the presence of

structures. This option is particularly important when buildings likely to alter airflow are located near point emission sources.

2.2.2 CALPUFF (Buoyant line sources)

The CALPUFF program was developed by scientists from the firm Exponent Inc. It is currently maintained and distributed by Lakes Software.

CALPUFF is a Lagrangian model that tracks, step by step, the evolution of an air parcel (“puff”) along its trajectory in a turbulent atmosphere under non-steady-state conditions. The model consists of various algorithms that account for the chemical transformation of contaminants as well as wet and dry deposition of particles. It is generally used to model the atmospheric dispersion of particulate matter and gases from multiple sources using time- and space-varying meteorological parameters.

More specifically, the CALPUFF model has the following characteristics:

- considers point, line, area, and volume sources whose emission rates may vary in time and space;
- estimates the dispersion of contaminants in ambient air over distances ranging from a few tens of meters up to 200 kilometres;
- calculates the atmospheric dispersion of contaminants with specific linear transport behaviour (particles);
- can account for chemical transformations of contaminants;
- incorporates regional topography into dispersion modelling.

One of the key features of the CALPUFF model is its flexibility in meteorological input, generally relying on the CALMET pre-processing model while remaining compatible with alternative meteorological data formats such as AERMET.

Unlike models that assume a linear plume trajectory and independence of meteorological conditions between two consecutive hours, the CALPUFF model follows the trajectory of air puffs emitted from a source while accounting for the dynamic evolution of wind flow over time. The contaminant concentrations estimated at a given location and time are therefore closer to reality, as dispersion in the air is simulated while accounting for the spatial and temporal variability of meteorological conditions. This characteristic leads to better representativeness of estimated concentrations over long distances.

Finally, analysis of CALPUFF output files is performed using the CALPOST software, which retrieves the calculations performed by CALPUFF and compiles them according to the

modeller's specifications in terms of modelled air concentrations at each receptor for various averaging periods (e.g., hourly, 24-hour, annual).

2.3 Modelling domain

The modelling domain defines the geographic boundaries within which atmospheric dispersion modelling is carried out.

As part of the present study, the modelling domain is defined in UTM Zone 34 of the Northern Hemisphere and covers an extent of 12 km by 12 km. The southwest corner of the domain is located at coordinates X = 596,900 m and Y = 7,070,600 m. The domain therefore covers a sufficiently large area to include all initial land-use zones that may be exposed to atmospheric emissions. This domain and the property limit are shown on Map B-1-2.

In addition, for CALPUFF modelling, the modelling domain is expanded by one kilometre in each direction to account for the recirculation of air parcels (see Section 2.6.1), and a horizontal spatial resolution of 100 m is used. Vertically, the domain extends from ground level (0 m) up to 2,500 m, as it is assumed that emissions reaching altitudes above 2,500 m have no effect at ground level across the entire modelling domain.

2.4 Topography

The topographic base used for the present mandate is derived from the 10-m elevation model available on the National Land Survey of Finland's Open Data platform. This product provides elevation values relative to mean sea level with a spatial resolution of 10 m.

2.5 Meteorological data set

The meteorological dataset used for the modelling was prepared by a third-party consultant using the US-EPA AERMET module (version 18081). The AERMET module generates an hourly meteorological file format compatible with dispersion model execution by combining meteorological data with land-use characterization (US-EPA, 2018b).

The dataset was prepared for the years 2020 to 2022, based on data from the Kokkola Santahaka weather station, located in the vicinity of the plant. The meteorological dataset therefore covers three recent years representative of the site area, in accordance with US-EPA guidelines. The model option "ADJ_U*," which adjusts the surface friction velocity (u*) under low-wind, stable conditions, was applied.

Wind roses for the meteorological dataset are presented by year in Figure 1, and in Figure 2 for the May-to-October growing season. Summary statistics are presented in Table 1.

Prevailing winds blow predominantly from the south, southwest and north-northeast, and the mean wind speed is 13.1 km/h. Finally, the average percentage of calm winds over the three-year period is 1.27%.

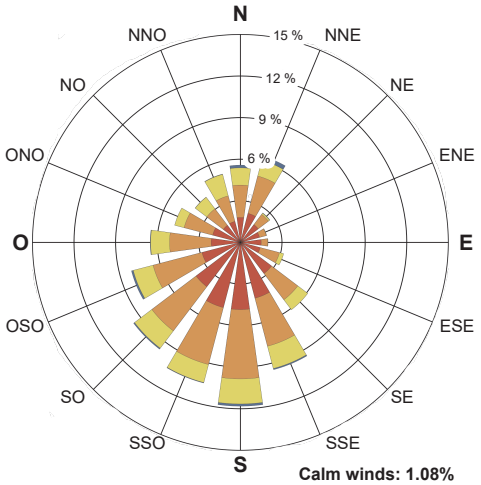
Lastly, it is important to note that topography is not taken into account by the AERMET meteorological model and that meteorological parameters are assumed to be spatially uniform across the entire modelling domain.

Table 1 Description of wind speeds in the meteorological data set

Paramètre	Value (all months)	Value (May to October)
Fraction of low winds[1]	2.29 %	2.40 %
Fraction of calm winds	1.27 %	1.31 %
Average wind speed	13.1 km/h	12.6 km/h
Lowest recorded wind speed (different than zero)	1.8 km/h	1.8 km/h
Highest recorded wind speed	48.2 km/h	48.2 km/h

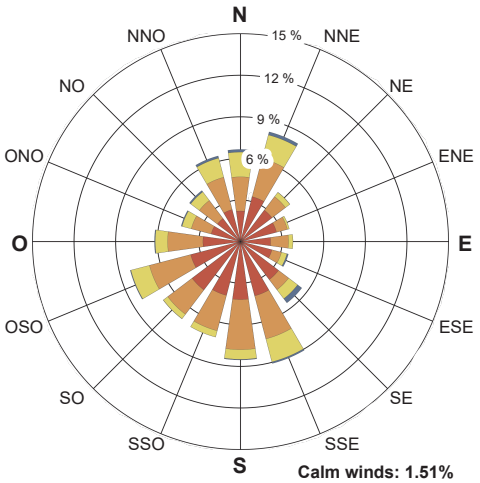
Note : [1] The threshold used here to define low winds is 3.5 km/h, or 0.97 m/s. This choice is first justified by the fact that wind speeds reported for Environment and Climate Change Canada stations are provided as whole numbers in km/h. In addition, the calm-wind threshold, below which a wind speed of 0 km/h is reported, varies between 1 and 4 km/h depending on the station and the equipment used. The use of a 3.5 km/h threshold therefore makes it possible to standardize comparisons between stations with different thresholds and/or forecast data. Finally, the term “calm wind” is reserved for wind values explicitly reported as zero in the original datasets, which are not processed by dispersion models.

Year 1
2020



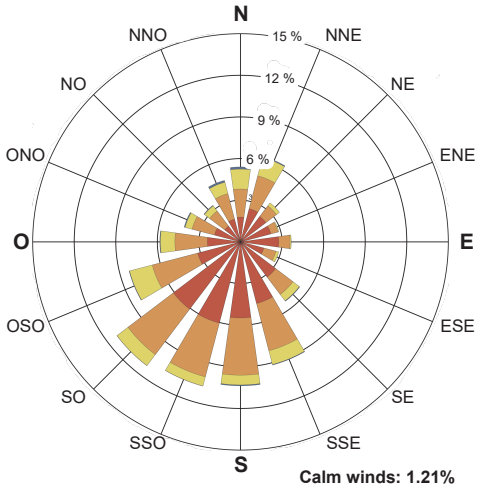
Calm winds: 1.08%
Average speed: 13.87 km/h

Year 2
2021



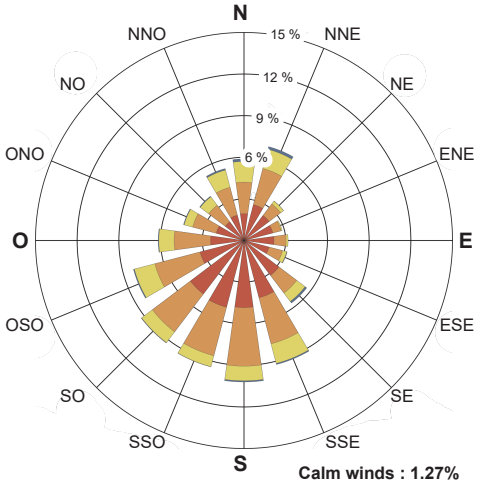
Calm winds: 1.51%
Average speed: 13.93 km/h

Year 3
2022



Calm winds: 1.21%
Average speed: 12.63 km/h

All years



Calm winds : 1.27%
Average speed: 13.13 km/h

Wind Speed

- > than 30.5 km/h
- 19.5 to 30.5 km/h
- 11.5 to 19.5 km/h
- 3.5 to 11.5 km/h

Note :
Wind direction frequency diagram, for example, the wind blows from the north less than 6% of the time

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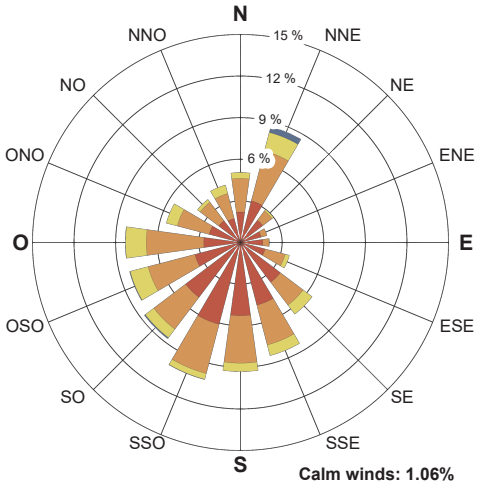
Figure 1
Wind Roses

Sources :
Weather data from station Kokkola Santahaka for AERMET v18081 (.SFC)

April 2026

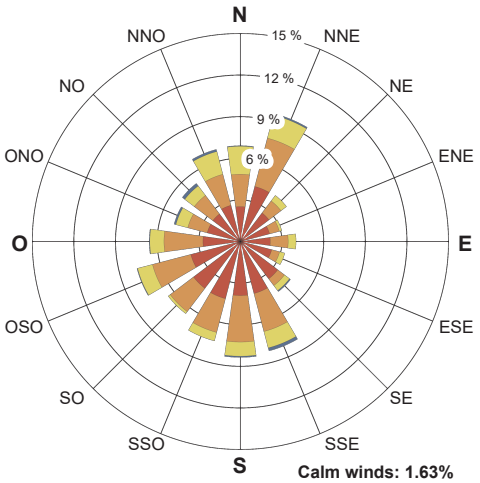
Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260326.aprx
CA0066095_5837_ma_f1_wsp_WindRose_260326

Year 1
2020



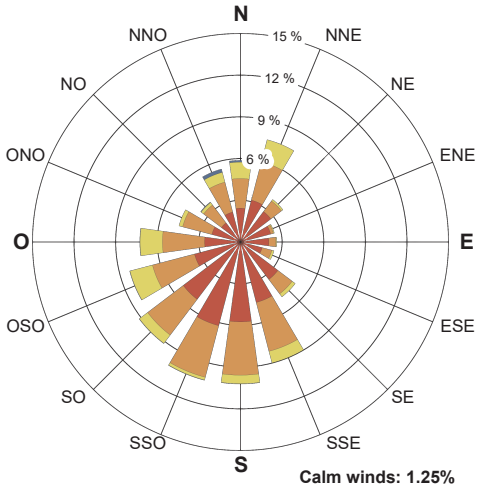
Calm winds: 1.06%
Average speed: 12.58 km/h

Year 2
2021



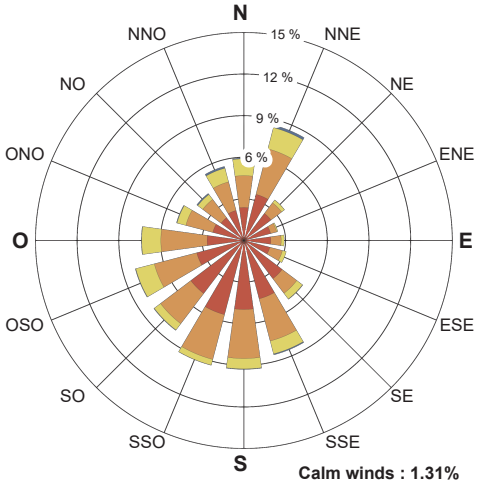
Calm winds: 1.63%
Average speed: 12.81 km/h

Year 3
2022



Calm winds: 1.25%
Average speed: 12.33 km/h

All years



Calm winds : 1.31%
Average speed: 12.58 km/h

Wind Speed

- > than 30.5 km/h
- 19.5 to 30.5 km/h
- 11.5 to 19.5 km/h
- 3.5 to 11.5 km/h

Note :
Wind direction frequency diagram, for example, the wind blows from the north less than 6% of the time

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Figure 2
Wind Roses (May to October)

Sources :
Weather data from station Kokkola Santahaka for AERMET v18081 (.SFC)

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260326.aprx
CA0066095_5837_ma_f2_wsp_WindRose_may_oct_260326

2.6 Receptors

Receptors (calculation points) are divided into three categories: the receptor grid, property boundary receptors, and sensitive receptors. These are described in the following subsections, and their locations are shown on Maps B-1-4 and B-1-5. Receptor elevations were established taking into account site topography (see Section 2.4) using the AERMAP preprocessor.

2.6.1 Receptor grid

The receptor grid consists of 2,991 calculation points covering a region of 12 km by 12 km. The modelling domain extends 1 km beyond the receptor grid boundary, corresponding to 14 km by 14 km. By using a modelling domain larger than the receptor grid, the recirculation of air parcels that may be temporarily transported beyond the peripheral receptors can be taken into account, thereby minimizing edge effects.

Grid resolution varies as a function of distance from the centre of the site under consideration. The resolutions used are as follows:

- a resolution 100 m is used within the property boundary;
- a resolution of 200 m is used up to a distance of 4 km;
- a resolution of 400 m is used up to a distance of 6 km.

Finally, a buffer zone with a resolution of 50 m extends 200 m beyond the property boundary.

The density of the receptor grid used allows for the generation of a sufficient number of modelled values to ensure good representativeness of estimated ambient air concentrations (spatial distribution). The receptor grid is shown on Map B-1-4.

2.6.2 Receptors at the property limit

A sequence of discrete receptors, spaced at 50 m intervals, was placed along the property boundary. A total of 176 receptors were therefore added.

Receptors located along the application boundary are illustrated on the map B-1-4.

2.6.3 Sensitive receptors

A total of 24 sensitive receptors were added to represent various sensitive land uses, including residential areas, livestock farms and horse stables and agricultural land. The nearest point of the Laajalahti Natura 2000 site is also included in this list. Table 2 presents these sensitive receptors along with their respective coordinates.

Finally, it is important to note that all receptor grid points located within the Laajalahti Natura 2000 zone are also taken into account in the presentation of modelling results at sensitive receptors. These receptors are shown on Map B-1-5.

Table 2 Coordinates of sensitive receptors

Description	Category	Identifier	X (m)	Y (m)	Elevation (m)	Distance to property boundary (m)
Nearest isolated residential area in northern site	Private residence	SR1	601,963	7,075,181	18.7	71
Nearest isolated residential area in southern site	Private residence	SR2	600,903	7,073,721	8.7	71
Isolated residential area within 1 km of Project boundary	Private residence	SR3	601,835	7,075,443	15.0	340
Isolated residential area within 1 km of Project boundary	Private residence	SR4	601,870	7,075,564	13.8	394
Isolated residential area within 1 km of Project boundary	Private residence	SR5	602,340	7,075,950	16.0	472
Isolated residential area within 1 km of Project boundary	Private residence	SR6	602,423	7,076,081	15.3	608
Isolated residential area within 1 km of Project boundary	Private residence	SR7	602,050	7,075,985	13.0	586
Isolated residential area within 1 km of Project boundary	Private residence	SR8	602,098	7,076,040	13.4	613
Isolated residential area within 1 km of Project boundary	Private residence	SR9	601,553	7,076,070	10.8	976
Isolated residential area within 1 km of Project boundary	Private residence	SR10	600,604	7,073,000	4.5	186
Livestock farm and isolated residential area within 1 km of Project boundary	Livestock farm	SR11	600,343	7,072,572	6.2	682

Description	Category	Identifier	X (m)	Y (m)	Elevation (m)	Distance to property boundary (m)
Nearest house representing Kokkola residential area	Private residence	SR12	604,179	7,077,074	15.4	2,393
Nearest point of Laajalahti Natura 2000 Site	Other	SR13	600,285	7,074,586	3.9	1,012
Livestock farms and horse stables within 3 km of property boundary	Livestock farms	SR14	600,869	7,075,565	9.4	1,160
Livestock farms and horse stables within 3 km of property boundary	Livestock farms	SR15	600,799	7,075,918	8.9	1,438
Livestock farms and horse stables within 3 km of property boundary	Livestock farms	SR16	601,023	7,076,178	9.7	1,435
Livestock farms and horse stables within 3 km of property boundary	Livestock farms	SR17	601,477	7,076,046	10.3	1,012
Livestock farms and horse stables within 3 km of property boundary	Livestock farms	SR18	602,951	7,077,298	8.9	1,919
Livestock farms and horse stables within 3 km of property boundary	Livestock farms	SR19	605,431	7,074,605	16.4	2,780
Kokkola Industrial Park	Other	SR20	600,464	7,081,454	6.3	6,264
Agricultural Land	Agricultural land	SR21	601,691	7,075,296	13.8	354
Agricultural Land	Agricultural land	SR22	602,261	7,073,465	16.8	26
Agricultural Land	Agricultural land	SR23	600,912	7,073,638	7.2	32
Agricultural Land	Agricultural land	SR24	601,073	7,072,699	7.5	400

2.7 Effect of buildings

Given the proximity of certain point sources to nearby buildings, the plume downwash effect is calculated. To this end, the Building Profile Input Program for PRIME [BPIPPRM] (US-EPA, 1993) was used to determine building effects. The results of this calculation are provided as input data to the dispersion model, which applies the required corrections for estimating ambient air concentrations using the PRIME module.

To calculate the plume downwash effect, site infrastructure was digitized. Geographic coordinates, building elevations, and the locations of emission sources were determined based on technical drawings provided by Arctial.

The building layout considered for plume downwash effects is presented on Map B-1-6.

2.8 Configuration of atmospheric dispersion models

2.8.1 AERMOD parameters

The default options of the AERMOD model, including RURAL mode, were used for its execution, in accordance with the requirements set out in the MELCCFP modelling guide.

2.8.2 CALPUFF parameters

In general, all default CALPUFF options were selected. Parameters without default values that must be specified by the user, as well as certain parameters for which the selected value differs from the default, are presented in Table 3.

Table 3 CALPUFF parameters

CALPUFF options	Selected values
Meteorological data format	METFM = 5 (AERMET tower and surface parameter files)
Building downwash	MBDW = 2 (PRIME)
Chemical mechanism flag	MCHEM = 0 (chemical transformation not modelled)
Wet removal modelled	MWET = 0 (i.e., not modelled)
Dry deposition modelled	MDRY = 1 (included)
Dispersion coefficients	MDISP = 2 (internally calculated dispersion coefficients)
PDF for dispersion under convective conditions	MPDF = 1 (included)

2.9 Specific methods

This section describes the specific methodologies adopted for the modelling of certain compounds.

2.9.1 Estimation of particulate matter deposition

To model dry deposition using the AERMOD model, the keyword DDEP must be added to the model options. This option activates both dry depletion (DRYDPLT) and wet depletion (WETDPLT). The NOWETDPLT option must also be specified to exclude wet depletion from the modelling. As for CALPUFF, the parameters for particulate matter deposition are specified in Table 3.

The particle size distribution and density of particles emitted by each source must be specified. To characterize particle size distribution, emissions must be divided into particle size categories based on the aerodynamic diameter of the particles and the corresponding mass fraction. The density of each particle size category must also be specified.

The method selected to model dry deposition of particulate matter is taken from the *Guideline for Plume Dispersion Modelling* (NLDEC, 2012). This guide recommends dividing particulate matter into three fractions (P1, P2, and P3) representing specific aerodynamic size ranges:

- fraction P1, representing particles with a diameter less than 2.5 µm;
- fraction P2, representing particles with diameters between 2.5 and 10 µm;
- fraction P3, representing particles with diameters greater than 10 µm.

Emission rates for each of these fractions are established, for each emission source, based on PMT, PM_{10}, and $PM_{2.5}$ emission rates using the following equations:

$$P1 = PM_{2.5}$$

$$P2 = PM_{10} - PM_{2.5}$$

$$P3 = PMT - PM_{10}$$

Modelling results for P1, P2, and P3 are subsequently recombined to estimate concentrations and deposition fluxes for each particle size category:

$$PMT \text{ with deposition} = P1 + P2 + P3$$

$$PM_{10} \text{ with deposition} = P1 + P2$$

$$PM_{2,5} \text{ with deposition} = P1$$

The guide also proposes a particle size distribution for each of the three fractions. These distributions are presented in Table 2.6.1 of the guide (NLDEC, 2012) and were used in the present modelling to describe fractions P1, P2, and P3. A particle density of 2.65 g/cm³ was used, representing a generic value selected in the absence of project-specific data.

This density was applied to all particulate matter sources and all particle size fractions.

Finally, although particle size distribution parameters and densities for fractions P1, P2, and P3 are identical for all sources, it is important to recall that the proportion of each fraction is source-specific, as emission rates are derived from PMT, PM_{10}, and $PM_{2.5}$ values, which are themselves specific to each emission source.

2.9.2 Estimation of annual concentrations

As described in Section 4.2.2, the modelling scenarios are developed to represent the conditions that maximize impacts on air quality. They are therefore defined based on variations in on-site operational activities and the averaging periods associated with air quality standards. In general, the scenarios represent a maximum operating day. As this approach can be exceedingly conservative for the annual period, an annual scenario can be defined that accounts for certain activities do not occur every day of the year.

2.9.3 Estimation of NO_2 concentrations

With respect to the estimation of ambient NO_2 concentrations, the total conversion method was used. As a conservative assumption, all NO_x emissions are therefore considered to be fully converted to NO_2.

3. Reference values

3.1 Finnish ambient air limit values

The Finnish ambient air limit values are aligned with the European Union regulation (EC, 2008; Government of Finland, 2017).

The limit values define the maximum permitted concentrations for air pollutants, above which the authorities must take measures to reduce the concentrations. The limit values are the most binding air quality standards in the European Union.

In this context, compliance with applicable limit values ensures a safe environment for human health. Consequently, the anticipated effects of particulate and gaseous compounds on human health can be considered negligible or acceptable when these limit values are respected.

In January 2030, more stringent limit values will take effect in Finland and across Europe (European Union, 2024). These 2030 limit values have been included for information purposes.

3.2 Quebec limit values

Neither Finland nor the European Union has relevant official limit values for hydrogen fluoride (HF) in ambient air. Arctial reviewed the scientific literature and concluded that Quebec's HF guidelines are the most applicable, particularly regarding stringency and climate conditions.

Indeed, Quebec is home to an extensive aluminium smelting industry and has established air quality criteria for HF to safeguard human health and vegetation during the May-to-October growing season.

In Quebec, ambient air quality criteria established by the MELCCFP are used to support air quality assessments; however, they do not have the same legal force as ambient air standards set out in air quality regulations. They may be used to analyze the results of measurements carried out as part of various monitoring programs, to establish the air quality index, or to assess the results of atmospheric dispersion modelling studies conducted in support of authorization applications and environmental impact assessments.

At the direction of Arctial, the Quebec air quality criteria are presented for the 1-hour and growing season (4416-hour, May-to-October) averaging periods.

3.3 Modelled substances

At the direction of the Finnish authorities, the substances considered in this study are those emitted by the Arctial project, as defined in Section 4.2.

Accordingly, the present study addresses the following pollutants: particulate matter (PMT, PM_{10}, $PM_{2.5}$), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), benzo[a]pyrene (B[a]P), polycyclic aromatic hydrocarbons (PAH), hydrogen fluoride (HF), and volatile organic compounds (VOC).

3.4 Initial concentrations

The initial concentration (or ambient background level) represents the pre-existing concentration of a contaminant in ambient air. To verify compliance with applicable limit values, the sum of the initial concentration and the modelled concentration must therefore be below the applicable standard or criterion for each substance.

Several approaches may be used to determine ambient background concentrations, including in situ measurements, local or regional air quality monitoring networks, or generic background concentrations proposed for use at a national level.

In the present case, initial concentrations for PM_{10}, $PM_{2.5}$, NO_2 and SO_2 were derived from local station data for the years 2023, 2024, and 2025. The methods used to evaluate background concentrations are as follows:

- for a 1-hour standard or criterion, the background concentration corresponds to the three-year average of the 99th percentile of measured hourly values;
- for a 24-hour standard or criterion, the background concentration corresponds to the three-year average of the 98th percentile of measured daily values;
- for an annual standard or criterion, the background concentration corresponds to the three-year average of the mean measured concentrations.

The nearest permanent monitoring station to the project area is the Kokkola Ykspihlaja monitoring station, which provides comprehensive air quality measurement data. However, it is not a background station, and it is also influenced by other emission sources in the Ykspihlaja industrial area. It is worth noting that the measurement data at the Kokkola Ykspihlaja station are influenced by local industrial emissions sources. The nearby Luoto Vikarholmen station is not influenced by these sources and would better represent the ambient background.

For reasons of data availability, the Luoto Vikarholmen station was used for SO_2 while the Kokkola Ykspihlaja station was used for PM_{10}, $PM_{2.5}$, and NO_2.

To facilitate the evaluation of the modelling results, these substances are presented both with and without initial concentrations. Local background levels were not available for the other modelled substances, so these substances are therefore presented without initial concentrations.

All modelled substances, applicable limit values, and initial concentrations considered in this study are presented in Table 4.

Table 4 Modelled substances, limit values and initial concentrations

Substance	Chemical Formula or Acronym	Gov. / Org.	Threshold Type	Averaging Period	Statistical	Limit (µg/m³)	Background Concentration reference	Background Concentration (µg/m³)
Sulfur dioxide	SO_2	Finland / Europe	Limit value	1-hour	25th maximum	350	Luoto Vikarholmen 2023-2025	3
			Limit value 2030	1-hour	4th maximum	350	Luoto Vikarholmen 2023-2025	3
			Limit value	24-hour	4th maximum	125	Luoto Vikarholmen 2023-2025	2
			Limit value 2030	24-hour	19th maximum	50	Luoto Vikarholmen 2023-2025	2
			Limit value 2030	1-year	1st maximum	20	Luoto Vikarholmen 2023-2025	1
Nitrogen dioxide	NO_2	Finland / Europe	Limit value	1-hour	19th maximum	200	Kokkola Ykspihlaja 2023-2025	26
			Limit value 2030	1-hour	4th maximum	200	Kokkola Ykspihlaja 2023-2025	26
			Limit value 2030	24-hour	19th maximum	50	Kokkola Ykspihlaja 2023-2025	13
			Limit value	1-year	1st maximum	40	Kokkola Ykspihlaja 2023-2025	5
			Limit value 2030	1-year	1st maximum	20	Kokkola Ykspihlaja 2023-2025	5
Carbon monoxide	CO	Finland / Europe	Limit value	8-hour	1st maximum	10000	-	-
			Limit value 2030	8-hour	1st maximum	10000	-	-
			Limit value 2030	24-hour	19th maximum	4000	-	-
Particulates < 10µm	PM_{10}	Finland / Europe	Limit value	24-hour	36th maximum	50	Kokkola Ykspihlaja 2023-2025	33
			Limit value 2030	24-hour	19th maximum	45	Kokkola Ykspihlaja 2023-2025	33
			Limit value	1-year	1st maximum	40	Kokkola Ykspihlaja 2023-2025	9
			Limit value 2030	1-year	1st maximum	20	Kokkola Ykspihlaja 2023-2025	9
Fine particulates	$PM_{2.5}$	Finland / Europe	Limit value 2030	24-hour	19th maximum	25	Kokkola Ykspihlaja 2023-2025	13
			Limit value	1-year	1st maximum	25	Kokkola Ykspihlaja 2023-2025	4
			Limit value 2030	1-year	1st maximum	10	Kokkola Ykspihlaja 2023-2025	4
Benzo[a]pyrene	B[a]P	Europe	Limit value 2030	1-year	1st maximum	0.001	-	-

Substance	Chemical Formula or Acronym	Gov. / Org.	Threshold Type	Averaging Period	Statistical	Limit (µg/m³)	Background Concentration reference	Background Concentration (µg/m³)
Polycyclic aromatic hydrocarbons	PAH	-	-	1-year	1st maximum	-	-	-
Hydrogen fluoride	HF	Quebec (MELCCFP)	Criterion	1-hour	1st maximum	60	-	-
				4416-hour [1]	1st maximum	0.4	-	-
Volatile organic compounds	VOC	-	-	1-hour	1st maximum	-	-	-
				24-hour	1st maximum	-	-	-
				1-year	1st maximum	-	-	-

Notes: [1] The annual criterion for HF is evaluated exclusively for the growing season between May 1 and October 31, which comprises 4416 hours.

4. Modelling scenarios

In an atmospheric dispersion study, the first step is to define the modelling scenario or scenarios. To do so, the main emission sources and the substances emitted must be identified. More specifically, the substances considered, along with the averaging periods associated with their applicable reference values, directly influence the selection and configuration of the modelling scenarios.

The modelling is intended to represent conditions that maximize potential impacts on air quality, taking into account the averaging periods associated with the prescribed limit values for each substance.

4.1 Summary of operations

Project Arctial operates 24 hours per day, 365 days per year.

The facility will include the development of a primary aluminium smelter and downstream manufacturing facilities, including:

- A Rio Tinto AP60 reduction potline with 368 cells
- Optional production of carbon anodes
- Casting facilities
- Downstream aluminium rolling mill

4.2 Identification of emission sources

The emission inventory for the project was provided by Arctial. The identified emissions sources include:

- Two potrooms, each approximately 1.2 km in length. The potrooms comprise 368 cells in total.
- Two SO_2 scrubber stacks, and two corresponding bypass stacks to be used during maintenance. At least one SO_2 scrubber will be running at all times.
- Two casthouse stacks.
- Six rolling mill stacks.

- Two regenerative thermal oxidizer (RTO) stacks, associated with the optional carbon anode production plant.

4.2.1 Selected modelling scenarios

The base case considers the full-time operation of the Arctial project, with an estimated production of 610,000 tonnes of aluminium per year.

Two modelling scenarios have been selected based on information provided by Arctial:

- Case 1: Base case including the carbon plant
- Case 2: Base case without the carbon plant.

4.2.2 Configuration of scenarios for different averaging periods

The substances modelled are subject to standards defined over different averaging periods (4 minutes, 1 hour, 8 hours, 24 hours, and 1 year). To the extent possible, the modelling scenarios are designed to maximize emissions over these periods for each source type.

According to the operational description, certain activities do not occur every day of the year. Modelling these activities as occurring on every day of the meteorological dataset makes it possible to capture the worst dispersion conditions and provides a conservative assessment of the greatest potential air quality impacts. This approach, however, overestimates annual concentrations. The scenarios are therefore weighted and combined according to their annual frequency in order to obtain a more realistic modelling result for the period of interest.

The frequency of rare events is also exaggerated with this approach. For example, the SO_2 scrubber bypass stacks will not be running continuously every day of the year. According to the operating plan, only fourteen days are assigned for maintenance of the SO_2 scrubbers:

- For the first 7 days, Scrubber A and Bypass B will be active.
- For the remaining 7 days, Scrubber B and Bypass A will be active.

At least one of the two SO_2 scrubbers will be active every day of the year. The 14 days of maintenance are further restricted to the winter months (November to April), reducing potential exposure to hydrogen fluoride emitted by the bypass stacks during the May-to-October growing season.

This information is used to scale emissions from the SO_2 scrubbers and bypass stacks for the annual scenario, as shown in Table 5.

Table 5 Day-to-day variation for emissions sources

Sources	Variant 1 Dual Scrubbers A + B (351.25 days)	Variant 2 Scrubber A + Bypass B (7 days)	Variant 3 Scrubber B + Bypass A (7 days)	Annual Scenario (365.25 days)
1. SO_2 Scrubber A Stack	**Active**	**Active**	*Inactive*	358.25 days per year
2. SO_2 Scrubber B Stack	**Active**	*Inactive*	**Active**	358.25 days per year
3. Bypass A Stack	*Inactive*	*Inactive*	**Active 181 days (Nov 1 to Apr 30)**	7 days per year, between Nov 1 and Apr 30
4. Bypass B Stack	*Inactive*	**Active 181 days (Nov 1 to Apr 30)**	*Inactive*	7 days per year, between Nov 1 and Apr 30
5. Potlines	**Active**	**Active**	**Active**	Active all year
6. Casthouse	**Active**	**Active**	**Active**	Active all year
7. Carbon Plant (Case 1 only)	**Active**	**Active**	**Active**	Active all year
8. Rolling Mill	**Active**	**Active**	**Active**	Active all year

5. Source characterization

The following sections present the description and characteristics of the emission sources considered in this study.

For ease of reading, detailed descriptions of the sources used in the dispersion model are presented in tabular format in Appendix A-1. Unless otherwise stated, the emission rates presented are provided without mitigation. The layout of emission sources is presented in Map B-1-3.

All source parameters and emission rates were provided by Arctial.

Table 6 Description of modelled emissions

Source	Estimation method for emissions	Source Type	Émissions				
			Particulate matter	Combustion gases	HF	VOC	B[a]P or PAH
Potlines	Project engineering	Buoyant Line	✓	✓	✓	✓	✓
SO_2 scrubbers and bypass stacks	Project engineering	Point Source	✓	✓	✓	✓	✓
Casthouse	Project engineering	Point Source	✓	✓	✓		
Carbon Plant	Project engineering	Point Source	✓	✓		✓	✓
Rolling Mill	Project engineering	Point Source	✓	✓		✓	

5.1 Buoyant line sources

The Arctial project includes two potrooms, each approximately 1.2 kilometres in length and oriented in the direction of Finnish national road 8.

Arctial evaluated available emission control technologies, and WSP conducted sensitivity testing to evaluate their ability to reduce the air quality impacts of the potrooms. Ultimately, Arctial selected the best available technologies to minimize air quality impacts:

- A tulip-roof configuration is used to improve dispersion relative to traditional roof design.

- Closed anode containers are considered, reducing emissions of hydrogen fluoride and particulate fluorides.

Combined, these technologies will allow Arctial to achieve a high level of emissions control.

The building parameters used to configure the potrooms are presented in Table 7. Two buoyant line sources are defined – lin1t and lin2t – and these are modelled as part of a single group, as is required for CALPUFF modelling.

The physical parameters and emission rates for the buoyant line sources are presented in Tables A-1-5 and A-1-6 respectively.

Table 7 Building parameters for buoyant line emission sources

Average building length (m)	Average building height (m)	Average building width (m)	Average building separation (m) (between the individual lines)	Average line source width (m) (of the individual lines)
1171	20	31.81	56.59	7.35

5.2 Point sources

Fourteen point sources are considered for Case 1; only 12 point sources are considered in Case 2 due to the exclusion of the carbon plant RTO stacks.

The physical parameters for the point sources are presented in Tables A-1-1 and A-1-2 for Case 1 and Case 2, respectively.

Emission rates vary slightly between the two cases. Emission rates are presented in Tables A-1-3 and A-1-4 for Case 1 and Case 2, respectively.

6. Modelling results

This section presents the results of the modelling performed for each modelled case. In order to compare the modelled concentrations with the applicable limit values for each substance, these concentrations are added to the initial background concentrations applicable to the area, where available.

It is important to note that the total concentrations presented in this section do not represent measured concentrations, but rather concentrations obtained through simulation of the planned activities.

Compliance with limit values is summarized in Table 8. The limit values are respected for all substances except SO_2 and HF. For SO_2, modelled exceedances are rare and impact only the closest residential receptor. For HF, the results show compliance with the 1-hour criterion but exceed the criterion for the May-to-October growing season. Exceedances for the growing season are modelled at seven sensitive receptors, but do not extend beyond 1 km of the plant.

Tabulated results are presented in the appendices in two parts, separated by year and by category of sensitive receptor. Results without background concentrations are presented in Appendix A-2, while results including background concentrations are presented in Appendix A-3.

Results are also illustrated in Appendix B-2 in the form of isoconcentration contours. The numerical values shown on these maps correspond exclusively to the contribution of the Arctial project. The colour of the contours indicates whether total concentrations, including background concentrations, exceed applicable ambient air quality reference values. The contours shown represent the maximum concentration calculated at each receptor for the averaging period and over all modelled meteorological years. As such, it should be noted that the maxima presented for each calculation point do not necessarily occur during the same hour, the same day, or the same year.

In summary, **the isoconcentration contours depict hypothetical situations in which the most unfavourable dispersion conditions are combined simultaneously on a single map.** Nevertheless, these contours allow for clear visualization of the maximum concentration over a given area of the modelling domain for the three meteorological years considered.

Isoconcentration maps were produced for sulfur dioxide, nitrogen dioxide, PM_{10} particulate matter, hydrogen fluoride and benzo[a]pyrene.

The full list of isoconcentration maps is presented at the beginning of Appendix B-2.

Table 8 Summary of compliance with limit values at sensitive receptors

Substance	Averaging period	Limit value (µg/m³)	Statistic	Regulatory body	Threshold type	Compliance with the standard	
						Case 1	Case 2
SO_2	1-hour	350	25th max.	Finland / Europe	Limit value	✓	✓
	1-hour	350	4th max.	Finland / Europe	Limit value 2030	× bypass only ✓ annual sc.	× bypass only ✓ annual sc.
	24-hour	125	4th max.	Finland / Europe	Limit value	✓	✓
	24-hour	50	19th max.	Finland / Europe	Limit value 2030	× bypass only ✓ annual sc.	× bypass only ✓ annual sc.
	1-year	20	1st max.	Finland / Europe	Limit value 2030	✓	✓
NO_2	1-hour	200	19th max.	Finland / Europe	Limit value	✓	✓
	1-hour	200	4th max.	Finland / Europe	Limit value 2030	✓	✓
	24-hour	50	19th max.	Finland / Europe	Limit value 2030	✓	✓
	1-year	40	1st max.	Finland / Europe	Limit value	✓	✓
	1-year	20	1st max.	Finland / Europe	Limit value 2030	✓	✓
CO	8-hour	10000	1st max.	Finland / Europe	Limit value	✓	✓
	24-hour	4000	19th max.	Finland / Europe	Limit value 2030	✓	✓
PM_{10}	24-hour	50	36th max.	Finland / Europe	Limit value	✓	✓
	24-hour	45	19th max.	Finland / Europe	Limit value 2030	✓	✓
	1-year	40	1st max.	Finland / Europe	Limit value	✓	✓
	1-year	20	1st max.	Finland / Europe	Limit value 2030	✓	✓
$PM_{2.5}$	24-hour	25	19th max.	Finland / Europe	Limit value 2030	✓	✓
	1-year	25	1st max.	Finland / Europe	Limit value	✓	✓
	1-year	10	1st max.	Finland / Europe	Limit value 2030	✓	✓
HF	1-hour	60	1st max.	Quebec	Criterion	✓	✓
	4416-hour	0.4	1st max.	Quebec	Criterion	×	×
B[a]P	1-year	0.001	1st max.	Finland / Europe	Limit value	✓	✓

Notes: ✓ The maximum total concentration is below the limit value.
× The maximum total concentration exceeds the limit value.

6.1 Sulfur dioxide

The modelled concentrations for sulfur dioxide respect the current Finnish and European ambient air standards for the 1-hour, 24-hour, and 1-year periods. For the 2030 limit values, exceedances are modelled for the 1-hour and 24-hour periods, but these events are rare and only occur when one of the SO_2 scrubbers is deactivated for maintenance.

Results are similar for Case 1 and Case 2; the inclusion of the carbon plant has little impact on the results for this substance.

6.1.1 1-hour and 24-hour periods

The differences between the modelled results for SO_2 for the typical dual-scrubber condition and the bypass condition are stark.

When both SO_2 scrubbers are operating, the 4th maximum 1-hour modelled concentration at the sensitive receptors is 32 µg/m^3. When a background concentration is added, the total modelled concentration is 35 µg/m^3, which represents 10% of the 2030 limit value (see Map B-2-45). In the bypass condition, the 4th maximum 1-hour modelled concentration at the sensitive receptors is 417 µg/m^3, measured at receptor SR1. When a background concentration is added, the total modelled concentration is 420 µg/m^3, which represents 120% of the 2030 limit value (see Map B-2-44).

For the 24-hour period, the 19th maximum modelled concentration at the sensitive receptors is 6.7 µg/m^3 when both SO_2 scrubbers are operating. When a background concentration is added, the total modelled concentration is 8.7 µg/m^3, which represents 17% of the 2030 limit value (see Map B-2-49). In the bypass condition, the 19th maximum 24-hour modelled concentration at the sensitive receptors is 48.6 µg/m^3, measured at receptor SR1. When a background concentration is added, the total modelled concentration is 50.6 µg/m^3, which represents 101% of the 2030 limit value (see Map B-2-48).

The probability of these exceedances is extremely small. First, maintenance on the scrubbers will be completed outside of the May-to-October growing season. Second, the maintenance period will last at most 14 days. Third and finally, the exceedances appear to occur only when Bypass Stack B (the northernmost bypass stack) is active.

Table A-3-2 presents data on exceedances for 1-hour and 24-hour sulfur dioxide, with the background concentration included.

For the 1-hour averaging period, the model predicts a maximum of 22 exceedances assuming continuous operation throughout the entire November-to-April period (181 days). As the maintenance scenario would occur for no more than 7 days, this corresponds to fewer than one predicted exceedance per year (24 × 7 / 181 ≈ 0.93). For the 24-hour averaging period,

exceedances are even less likely: the three exceedance days predicted under continuous operation conditions translate to approximately one exceedance day every 8 to 9 years.

Finally, it should be noted that the presentation of isocontours depends on the interpolation of modelled concentrations at the gridded receptors. The precision of this procedure is such that, on occasion, sensitive receptors may appear on the wrong side of a contour line. This is especially apparent for results that are very close to the limit value. This is the case for receptor SR1 in maps[1] of the current 1-hour and 24-hour limit values for SO_2. In these cases, the true modelled values at SR1 are below the limit value, as shown in the tabulated results.

6.1.2 Annual period

The results for the annual modelled concentration for SO_2 are well below the 2030 limit value. The isocontours are shown for Case 1 in Map B-2-50.

6.2 Nitrogen dioxide

The modelled concentrations for nitrogen dioxide respect the current and future Finnish and European ambient air standards for the 1-hour, 24-hour, and 1-year periods. The isocontours are shown for Case 1 in Maps B-2-51 to B-2-55 and for Case 2 in Maps B-2-69 to B-2-73. The results are slightly higher in Case 1, owing to influence from the carbon plant RTO stacks and because NO_x emissions are higher from the SO_2 scrubber stacks when manufactured carbon anodes are used.

6.3 Carbon monoxide

The modelled concentrations for carbon monoxide respect and are well below the current and future Finnish and European ambient air standards for the 8-hour and 24-hour periods. No isocontours are presented for this substance.

6.4 Particulates PM_{10}

The modelled concentrations for PM_{10} respect the current and future Finnish and European ambient air standards for the 24-hour and 1-year periods at all sensitive receptors.

As mentioned in Section 3.4, the background concentrations for PM_{10} were estimated conservatively from measurement data at Kokkola Ykspihlaja, because no data were available at other nearby stations. An initial concentration of 33 µg/m^3 was therefore considered for the 24-hour period; this represents already 73% of the 2030 limit value 45 µg/m^3.

[1] Maps B-2-1, B-2-5, B-2-22, B-2-26, B-2-42, B-2-46, B-2-60 and B-2-64.

For this reason, the isocontours are presented both with and without the initial concentration.

The isocontours are shown without initial concentration for Case 1 in Maps B-2-15 to B-2-18 and for Case 2 in Maps B-2-36 to B-2-39.

The isocontours are shown with the initial concentration from Kokkola Ykspihlaja for Case 1 in Maps B-2-56 to B-2-59 and for Case 2 in Maps B-2-74 to B-2-77.

For the 24-hour period, a potential exceedance area of the 2030 limit value is modelled along the fenceline east of the rolling mill, in the southern sector of the plant. However, this area does not include any sensitive receptors and is moreover a symptom of an overly prudent initial concentration.

6.5 Fine particulates

The modelled concentrations for $PM_{2.5}$ respect the current and future Finnish and European ambient air standards for the 24-hour and 1-year periods. No isocontours are presented for this substance.

6.6 Hydrogen fluoride

In the absence of applicable limit values for hydrogen fluoride in Finland, the Quebec air quality criteria have been selected for the 1-hour and 4416-hour averaging periods at the direction of Arctial.

Results are similar for Case 1 and Case 2; the inclusion of the carbon plant has little impact on the results for this substance.

6.6.1 1-hour period

The modelled concentrations for HF respect the Quebec 1-hour criterion.

6.6.2 4416-hour period (May-to-October growing season)

The modelled concentrations for HF exceed the Quebec 4416-hour criterion of 0.4 µg/m^3. The potlines are the principal contributor to the modelled concentrations, and the maximum concentration for this period is modelled at receptor SR1, which is the nearest isolated residential area for the northern site. Seven sensitive receptors are contained within the exceedance zone (see Map B-2-21 for Case 1).

The maximum concentration in the Natura 2000 zone is 0.121 µg/m^3, which represents 30% of the Quebec criterion. The initial concentration for HF is expected to be zero, so only the modelled concentrations from the Arctial project are presented.

6.7 Benzo[a]pyrene, PAH and VOC

The modelled concentrations for B[a]P respect the future Finnish and European ambient air standard for the 1-year period. The isocontours are shown for Case 1 in Map B-2-19.

Results are also tabulated for PAH and VOC, but these are not presented in comparison to a reference value, and no isocontours are presented for these substances.

Although no limit value is presented for PAH, the results are quite different between Case 1 and Case 2 for this class of substances. Indeed, the maximum annual modelled concentration for Case 1 is 0.0432 µg/m^3 and less than 0.001 for Case 2. The carbon plant emission sources (RTO stacks) are the main reason for this significant difference.

7. Conservatism and limitations

7.1 Limitation of the modelling approach

7.1.1 Particulate matter dispersion

The dispersion of particulate matter is a complex physical process that is currently not well represented by dispersion models. It is now recognized that several phenomena affect particle dispersion, including dry deposition (due to gravity and particle mass), wet deposition (due to precipitation), filtration of emissions by ground cover (grass, trees, buildings, etc.) when emissions occur near the ground, as well as electrostatic forces, thermophoresis, and particle agglomeration, which can further enhance ground deposition. These phenomena are in addition to the dry deposition already supported by dispersion models and taken into account in the present study.

7.1.2 Meteorological model and dispersion model

Dispersion models are designed to represent reality as accurately as possible while remaining conservative. However, they are mathematical models with inherent limitations, based on a finite set of parameters. As a result, these models are always subject to a certain degree of uncertainty.

7.1.2.1 Complex wind conditions

The AERMOD model does not account for complex wind fields that may be encountered in rugged terrain or in areas where land use is not uniform. Indeed, the meteorological parameters used by the model are assumed to be identical at all points within the modelling domain, both horizontally and vertically. As a result, the wind field considered by the model is the same in a valley bottom, at the top of a mountain, in an urban area, as well as over the middle of a lake.

This is in contrast to the CALPUFF model, which is used to model the buoyant line sources (potlines).

7.1.2.2 Topography and line-of-sight conditions

AERMOD is a Gaussian model that is valid under line-of-sight dispersion conditions. While it can reasonably represent dispersion within a valley, it cannot adequately simulate contaminant

transport beyond significant topographic barriers and is therefore not appropriate where such obstacles must be crossed.

This limitation is inherent in AERMOD's treatment of topography. Terrain effects are handled using the AERMAP preprocessor, which assigns a *zhill* value to each receptor based solely on local topography, without considering the position of emission sources or the direction of transport. Consequently, the model cannot distinguish whether a topographic obstacle is located upwind or downwind of a receptor relative to the source. Moreover, upstream terrain features have no influence on dispersion at downwind receptors.

As a result, AERMOD is not capable of representing ambient air concentrations on the opposite side of major topographic obstacles.

7.1.3 Other sources of uncertainty

Other sources of uncertainty that may affect modelling results include the following:

- Topography, which typically has an uncertainty on the order of ±5 m. As a result, actual receptor elevations are approximate.
- Initial dispersion and release height parameters, which are approximate values intended to broadly represent typical emission behaviour at the source.
- Source characterization (physical parameters and emission rates), particularly when not based on measurements obtained from dedicated sampling campaigns.
- Building downwash calculations performed using the BPIPPRM program, which are known to be highly sensitive and can significantly influence modelling results.

8. Conclusion

Project Arctial is a 610,000 tonnes per annum low carbon greenfield primary aluminium smelter facility proposed for Kokkola and Kronoby, Finland. Arctial's aluminium smelter facility, utilising Rio Tinto's industry-leading AP60 aluminium reduction technology in combination with low-carbon electricity. The facility will include the development of a primary aluminium smelter and downstream manufacturing facilities, including potlines, casting facilities, and a downstream aluminium rolling mill, as well as an optional carbon anode production plant. SO_2 scrubbers and closed containers for spent anodes are included as emission mitigation measures. Project Arctial is expected to operate 24 hours per day, 365 days per year.

In this context, WSP Canada Inc. (WSP) was mandated to carry out atmospheric dispersion modelling to assess the impact of emissions from the operation of the future facility on ambient air quality.

The modelling approach recommended in this study is largely based on the methodology proposed by Quebec's ministry for the environment, the *ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs* (MELCCFP), other Canadian guidelines, as well as the U.S. Environmental Protection Agency [US-EPA](MELCCFP, 2025; US-EPA, 2024b).

The MELCCFP generally recommends AERMOD, the default regulatory model of US-EPA, for atmospheric dispersion modelling studies. There are, however, important questions about AERMOD's representativeness when modelling buoyant line sources, which are used to represent long narrow aluminium smelters (potlines). A composite model, specifically developed by WSP for the modelling of aluminium smelters in Quebec, is therefore used to evaluate air quality impacts. This model combines the point source modelling algorithms of AERMOD with the buoyant line modelling algorithms of CALPUFF, thereby retaining the best adapted model for all source types, including buoyant line sources.

Source parameters and emission rates were provided by Arctial. The present study addresses the following pollutants: particulate matter (PMT, PM_{10}, $PM_{2.5}$), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), benzo[a]pyrene (B[a]P), polycyclic aromatic hydrocarbons (PAH), hydrogen fluoride (HF), and volatile organic compounds (VOC). Modelled concentrations of these substances were compared to reference values and presented with local ambient background concentrations when available. HF is evaluated with respect to the Quebec air quality criteria for the 1-hour period and the May-to-October growing season.

Two scenarios were modelled: Case 1, which includes the carbon anode plant, and Case 2, which does not. Results were largely similar between the two scenarios, except for PAH, which are much higher for Case 1.

The modelling results are summarized in Table 8. The limit values are respected for all substances except SO_2 and HF.

For SO_2, modelled exceedances are rare and impact only the closest residential receptor, SR1. The exceedances correspond to less than 1 hour per year, and approximately 1 day every 8 to 9 years.

For HF, the results show compliance with the 1-hour criterion but exceed the criterion for the May-to-October growing season. Exceedances for the growing season are modelled at seven sensitive receptors within 1 km of the plant, namely several isolated residences and some agricultural land located on the opposite side of Finland national road 8. No exceedances are modelled within the Laajalahti Natura 2000 site.

9. Bibliography

ALBERTA, ENVIRONMENT AND PARKS (AEP). 2021. *Air Quality Model Guideline*. Air Policy Section.

ALLEGHENY COUNTY HEALTH DEPARTMENT (ACHD). 2018. *Alternative Modeling Technical Support Document - BLP/AERMOD Hybrid Approach for Buoyant Fugitives in Complex Terrain*.

BARCLAY, J. and J. SCIRE. 2011. *Generic Guidance and Optimum Model Settings for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia.'* Atmospheric Studies Group TRC Environnemental Corporation.

BRIDGERS, George (US-EPA). 2024a. *Model Clearinghouse review of a site-specific alternative approach to demonstrate modeled attainment of the 2010 SO2 NAAQS at the Alcoa West Aluminum Smelter in Massena, New York*.

BRIDGERS, George (US-EPA). 2022. *Model Clearinghouse review of the use of case-specific alternative approaches to demonstrate modeled attainment of the 2010 SO2 NAAQS at the Alcoa West aluminum smelter in Massena, New York*.

BRIDGERS, George (US-EPA). 2018a. *Model Clearinghouse Review of a BLP/AERMOD Hybrid Alternative Model Approach for Modeling Buoyant Roofline Sources at the FMMI Copper Smelter in Miami, AZ*.

BRITISH COLUMBIA, MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE STRATEGY (BCMOE). 2022. *British Columbia air quality dispersion modelling guideline*. Victoria, British Columbia. Environmental Protection Division, Environmental Standards Branch, Clean Air Section. 106 p. et annexes.

ESSA TECHNOLOGIES, J. LAURENCE, RISK SCIENCES INTERNATIONAL, TRENT UNIVERSITY and TRINITY CONSULTANTS. 2020. *2019 Comprehensive Review of Sulphur Dioxide Environmental Effects Monitoring for the Kitimat Modernization Project – Volume 1, V.3 Final*. Rio Tinto, B.C. Works, Kitimat, B.C.

EUROPEAN COMMISSION (EC). 2025. *Air quality modelling for air quality policy – Technical support document on the use of modelling for various application domains under the Ambient Air Quality Directive – Final version*. Publications Office of the European Union. Online: https://data.europa.eu/doi/10.2779/6569975.

EUROPEAN COMMISSION (EC). 2008. *EU air quality standards*. Online: https://environment.ec.europa.eu/topics/air/air-quality/eu-air-quality-standards_en. Accessed March 27, 2026.

EUROPEAN UNION. 2024. *Directive (EU) 2024/2881 of the European Parliament and of the Council of 23 October 2024 on ambient air quality and cleaner air for Europe*.

GOVERNMENT OF FINLAND. 2017. *Government Decree on Air Quality*. Online: https://www.finlex.fi/fi/lainsaadanto/2017/79#sec_4. Accessed March 27, 2026.

NEW YORK STATE DEPARTMENT OF CONSERVATION (NYSDEC). 28 June 2022. *New York State Department of Environmental Conservation (NYSDEC) Alternative Model Request*.

NEWFOUNDLAND AND LABRADOR, DEPARTMENT OF ENVIRONMENT AND CONSERVATION (NLDEC). 2012. *Guideline for Plume Dispersion Modelling*. Saint John's, NL. 2nd Revision.

ONTARIO, MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE (MOECC). 2017. *Air dispersion modelling guideline for Ontario*. Version 3.0. 130 p. et annexes.

QUÉBEC, MINISTÈRE DE L'ENVIRONNEMENT, DE LA LUTTE CONTRE LES CHANGEMENTS CLIMATIQUES, DE LA FAUNE ET DES PARCS (MELCCFP). 2025. *Guide de la modélisation de la dispersion atmosphérique*. Direction principale de la qualité de l'air et du climat et la Direction des politiques de l'atmosphère du ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs. 48 p. et annexes.

SCIRE, J., D.G. STRIMAITIS and R.J. YAMARTINO. 2000. *A User's Guide for the CALPUFF Dispersion Model*. Earth Tech Inc. Version 5.

SCIRE, J.S. and L.L. SCHULMAN. 1980. *Buoyant line and point source (BLP) dispersion model user's guide*. Concord, MA. Environmental research & technology, inc. Document P-7304B. Prepared for The Aluminum Association, Inc.

U.S. ENVIRONMENTAL PROTECTION AGENCY (US-EPA). 2024b. *Guideline on Air Quality Models*. 40 CFR Part 51, Appendix W.

U.S. ENVIRONMENTAL PROTECTION AGENCY (US-EPA). 2024c. *User's Guide for the AMS/EPA Regulatory Model (AERMOD)*. Research Triangle Park, North Carolina. Office of Air Quality Planning and Standards, Air Quality Assessment Division.

U.S. ENVIRONMENTAL PROTECTION AGENCY (US-EPA). 2018b. *User's Guide for the AERMOD Meteorological Preprocessor (AERMET)*. Research Triangle Park, North Carolina. Office of Air Quality Planning and Standards, Air Quality Assessment Division, Air Quality Modeling Group.

U.S. ENVIRONMENTAL PROTECTION AGENCY (US-EPA). 2016. *Technical Support Document (TSD) for AERMOD/BLP Development and Testing*. Online: https://gaftp.epa.gov/aqmg/SCRAM/models/preferred/aermod/AERMOD_BLP_TSD.pdf.

U.S. ENVIRONMENTAL PROTECTION AGENCY (US-EPA). 2015. *Addendum - User's Guide for the AMS/EPA Regulatory Model (AERMOD)*. Research Triangle Park, North Carolina. Office of Air Quality Planning and Standards, Air Quality Assessment Division.

U.S. ENVIRONMENTAL PROTECTION AGENCY (US-EPA). 1993. *User's guide to the building profile input program*. Research Triangle Park, North Carolina. Office of Air Quality Planning and Standards. EPA-454/R-93-038, Revised April 21, 2004.

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This limitations statement is considered an integral part of this report.

Appendix A

Tables

Appendix A-1
Source characteristics

A-1-1 Physical parameters for emission sources – Case 1

Source ID	Description	X (m)	Y (m)	Ground Elevation (m)	Release Height (m)	Temperature (K)	Exhaust Gas Speed (m/s)	Stack Diameter (m)	Stack Orientation	Daily Operating Hours (h/d)
pt01	SO_2 Scrubber A Stack	601,853	7,074,462	15.1	65.0	312.7	16.3	9.0	Vertical	24
pt02	SO_2 Scrubber B Stack	602,247	7,074,946	15.1	65.0	312.7	16.3	9.0	Vertical	24
pt04	Bypass A Stack	601,865	7,074,487	15.1	65.0	393.2	16.3	9.7	Vertical	24
pt05	Bypass B Stack	602,226	7,074,928	15.1	65.0	393.2	16.3	9.7	Vertical	24
pt06	Casthouse Stack 1	601,993	7,074,260	15.1	45.0	393.2	12.0	2.9	Vertical	24
pt07	Casthouse Stack 2	602,042	7,074,317	15.1	45.0	393.2	12.0	2.9	Vertical	24
pt08	Hoods Stack 1	601,391	7,073,712	15.1	30.0	523.2	13.6	2.0	Vertical	24
pt09	Furnace Stack 2	601,406	7,073,660	15.1	30.0	523.2	14.2	2.0	Vertical	24
pt10	Airpure Foil Mill Gas Treatment Stack 3	601,311	7,073,590	15.1	30.0	523.2	13.0	2.2	Vertical	24
pt11	Airpure Cold Mill Gas Treatment Stack 4	601,273	7,073,735	15.1	30.0	523.2	14.5	1.5	Vertical	24
pt12	Foil Annealing Furnaces Stack 5	601,250	7,073,567	15.1	30.0	523.2	13.5	1.5	Vertical	24
pt13	Annealing Furnaces Stack 6	601,108	7,073,735	15.1	30.0	523.2	13.5	1.5	Vertical	24
pt14	Carbon Plant Stack 1 (Case 1 only)	602,414	7,074,817	15.1	45.0	373.2	13.9	1.0	Vertical	24
pt15	Carbon Plant Stack 2 (Case 1 only)	602,435	7,074,801	15.1	45.0	373.2	13.9	1.0	Vertical	24

A-1-2 Physical parameters for emission sources – Case 2

Source ID	Description	X (m)	Y (m)	Ground Elevation (m)	Release Height (m)	Temperature (K)	Exhaust Gas Speed (m/s)	Stack Diameter (m)	Stack Orientation	Daily Operating Hours (h/d)
pt01	SO2 Scrubber A Stack	601,853	7,074,462	15.1	65.0	312.2	16.3	8.8	Vertical	24
pt02	SO2 Scrubber B Stack	602,247	7,074,946	15.1	65.0	312.2	16.3	8.8	Vertical	24
pt04	Bypass A Stack	601,865	7,074,487	15.1	65.0	393.2	16.3	9.7	Vertical	24
pt05	Bypass B Stack	602,226	7,074,928	15.1	65.0	393.2	16.3	9.7	Vertical	24
pt06	Casthouse Stack 1	601,993	7,074,260	15.1	45.0	393.2	12.0	2.9	Vertical	24
pt07	Casthouse Stack 2	602,042	7,074,317	15.1	45.0	393.2	12.0	2.9	Vertical	24
pt08	Hoods Stack 1	601,391	7,073,712	15.1	30.0	523.2	13.6	2.0	Vertical	24
pt09	Furnace Stack 2	601,406	7,073,660	15.1	30.0	523.2	14.2	2.0	Vertical	24
pt10	Airpure Foil Mill Gas Treatment Stack 3	601,311	7,073,590	15.1	30.0	523.2	13.0	2.2	Vertical	24
pt11	Airpure Cold Mill Gas Treatment Stack 4	601,273	7,073,735	15.1	30.0	523.2	14.5	1.5	Vertical	24
pt12	Foil Annealing Furnaces Stack 5	601,250	7,073,567	15.1	30.0	523.2	13.5	1.5	Vertical	24
pt13	Annealing Furnaces Stack 6	601,108	7,073,735	15.1	30.0	523.2	13.5	1.5	Vertical	24

A-1-3 Emission rates for point sources – Case 1

Source ID	Emission Rate (g/s)										
	PMT	PM_{10}	$PM_{2,5}$	CO	NO_x	PAH(16)	B(a)P	Fp [1]	HF	SO_2	VOC
pt01	2.76E+00	2.46E+00	2.29E+00	9.85E+02	6.28E+00	4.83E-04	3.94E-06	9.76E-02	8.54E-03	1.12E+01	1.12E+00
pt02	2.76E+00	2.46E+00	2.29E+00	9.85E+02	6.28E+00	4.83E-04	3.94E-06	9.76E-02	8.54E-03	1.12E+01	1.12E+00
pt04	2.51E+00	2.23E+00	2.08E+00	9.81E+02	4.47E-01	4.83E-04	3.94E-06	1.39E-01	4.18E-01	2.04E+02	1.12E+00
pt05	2.51E+00	2.23E+00	2.08E+00	9.81E+02	4.47E-01	4.83E-04	3.94E-06	1.39E-01	4.18E-01	2.04E+02	1.12E+00
pt06	2.67E-01	1.55E-01	1.20E-01	0	5.48E+00	0	0	0	2.67E-01	3.63E-02	0
pt07	2.67E-01	1.55E-01	1.20E-01	0	5.48E+00	0	0	0	2.67E-01	3.63E-02	0
pt08	1.55E+00	1.55E+00	1.55E+00	1.29E-01	1.33E-01	0	0	0	0	1.97E-02	0
pt09	5.16E-01	5.16E-01	5.16E-01	3.87E-01	3.98E-01	0	0	0	0	5.90E-02	0
pt10	0	0	0	0	0	0	0	0	0	0	2.83E-01
pt11	0	0	0	0	0	0	0	0	0	0	7.08E-02
pt12	1.42E-01	1.42E-01	1.42E-01	0	0	0	0	0	0	0	1.62E-02
pt13	3.30E-01	3.30E-01	3.30E-01	0	0	0	0	0	0	0	3.77E-02
pt14	7.92E-02	7.92E-02	7.92E-02	3.96E-02	7.92E-01	7.92E-02	6.46E-04	0	0	7.92E-03	1.58E-01
pt15	7.92E-02	7.92E-02	7.92E-02	3.96E-02	7.92E-01	7.92E-02	6.46E-04	0	0	7.92E-03	1.58E-01

Notes: [1] Particulate fluorides

A-1-4 Emission rates for point sources – Case 2

Source ID	Emission Rate (g/s)										
	PMT	PM_{10}	$PM_{2,5}$	CO	NO_x	PAH(16)	B(a)P	Fp [1]	HF	SO_2	VOC
pt01	2.63E+00	2.34E+00	2.18E+00	9.81E+02	4.47E-01	4.83E-04	3.94E-06	9.76E-02	8.36E-03	1.02E+01	1.12E+00
pt02	2.63E+00	2.34E+00	2.18E+00	9.81E+02	4.47E-01	4.83E-04	3.94E-06	9.76E-02	8.36E-03	1.02E+01	1.12E+00
pt04	2.51E+00	2.23E+00	2.08E+00	9.81E+02	4.47E-01	4.83E-04	3.94E-06	1.39E-01	4.18E-01	2.04E+02	1.12E+00
pt05	2.51E+00	2.23E+00	2.08E+00	9.81E+02	4.47E-01	4.83E-04	3.94E-06	1.39E-01	4.18E-01	2.04E+02	1.12E+00
pt06	2.67E-01	1.55E-01	1.20E-01	0	5.48E+00	0	0	0	2.67E-01	3.63E-02	0
pt07	2.67E-01	1.55E-01	1.20E-01	0	5.48E+00	0	0	0	2.67E-01	3.63E-02	0
pt08	1.55E+00	1.55E+00	1.55E+00	1.29E-01	1.33E-01	0	0	0	0	1.97E-02	0
pt09	5.16E-01	5.16E-01	5.16E-01	3.87E-01	3.98E-01	0	0	0	0	5.90E-02	0
pt10	0	0	0	0	0	0	0	0	0	0	2.83E-01
pt11	0	0	0	0	0	0	0	0	0	0	7.08E-02
pt12	1.42E-01	1.42E-01	1.42E-01	0	0	0	0	0	0	0	1.62E-02
pt13	3.30E-01	3.30E-01	3.30E-01	0	0	0	0	0	0	0	3.77E-02
pt14	0	0	0	0	0	0	0	0	0	0	0
pt15	0	0	0	0	0	0	0	0	0	0	0

Notes: [1] Particulate fluorides

A-1-5 Physical parameters for buoyant line sources – Both cases

Source ID	Description	X1 (m)	Y1 (m)	X2 (m)	Y2 (m)	Elevation (m)	Release Height (m)	Exhaust Gas Temperature (K) [1]	Exhaust Gas Minimum Temperature (K)	Exhaust Gas Velocity (m/s)	Sigma Y (m)	Sigma Z (m)
lin1t	Potline A - Tulip roof	601,724	7,074,244	602,436	7,075,115	15.1	26.8	-10.00	False	0.75	0.00	0.00
lin2t	Potline B - Tulip roof	601,658	7,074,298	602,371	7,075,170	15.1	26.8	-10.00	False	0.75	0.00	0.00

Notes: [1] The exhaust gas temperature is assumed to be 10 degrees higher than the ambient temperature, calculated hourly.

A-1-6 Emission rates for buoyant line sources – Both cases

Source ID	Description	Emission Rates (g/s)										
		PMT	PM_{10}	$PM_{2.5}$	CO	NO_x	PAH(16)	B(a)P	Fp [1]	HF	SO_2	VOC
lin1t	Potline A - Tulip roof	2.76E+00	1.60E+00	1.24E+00	3.63E+00	1.70E-03	1.45E-03	6.43E-08	4.96E-01	1.51E+00	8.16E-01	4.48E+00
lin2t	Potline B - Tulip roof	2.76E+00	1.60E+00	1.24E+00	3.63E+00	1.70E-03	1.45E-03	6.43E-08	4.96E-01	1.51E+00	8.16E-01	4.48E+00

Notes: [1] Particulate fluorides

Appendix A-2
Results – Without background concentrations

A-2-1 Modelling results without background concentrations presented by sensitive receptor category

Description of standard							Description of the modelled values	Modelled concentration at sensitive receptors (µg/m³)						Percentage of the limit value (%)
Substance	CAS, Chem. Formula or Acronym	Gov. / Org.	Threshold Type	Averaging Period	Statistic	Limit (µg/m³)	Scenario	Maximum by category					Maximum	
								Sensitive receptors	Private residences	Agricultural land	Livestock	Natura Zone		
Sulfur dioxide	SO_2	Finland / Europe	Limit value	1-hour	25th maximum	350	Case 1 (Worst Case: Bypass)	347	347	215	59	35	347	99
							Case 1 (Dual Scrubbers)	27	27	18	7	8	27	8
			Limit value 2030	1-hour	4th maximum	350	Case 1 (Worst Case: Bypass)	417	417	229	71	59	417	119
							Case 1 (Dual Scrubbers)	32	32	19	9	11	32	9
			Limit value	24-hour	4th maximum	125	Case 1 (Worst Case: Bypass)	120	119	120	32	11	120	96
							Case 1 (Dual Scrubbers)	13	13	11	4	2	13	11
			Limit value 2030	24-hour	19th maximum	50	Case 1 (Worst Case: Bypass)	48.6	27.0	48.6	10.1	1.2	48.6	97
							Case 1 (Dual Scrubbers)	6.7	6.7	6.4	2.5	1.2	6.7	13
				1-year	1st maximum	20	Case 1 (Annual Scenario)	2.0	2.0	1.5	0.7	0.2	2.0	10
Nitrogen dioxide	NO_2	Finland / Europe	Limit value	1-hour	19th maximum	200	Case 1 (Worst Case: Bypass)	34	34	28	12	9	34	17
			Limit value 2030	1-hour	4th maximum	200		45	45	40	13	11	45	22
				24-hour	19th maximum	50		14.6	14.6	10.5	4.8	1.8	14.6	29
			Limit value	1-year	1st maximum	40	Case 1 (Annual Scenario)	3.8	3.8	2.5	1.1	0.3	3.8	9
			Limit value 2030	1-year	1st maximum	20		3.8	3.8	2.5	1.1	0.3	3.8	19
Carbon monoxide	CO	Finland / Europe	Limit value	8-hour	1st maximum	10000	Case 1 (Worst Case: Bypass)	1675	1675	1308	581	410	1675	17
			Limit value 2030	8-hour	1st maximum	10000		1675	1675	1308	581	410	1675	17
				24-hour	19th maximum	4000		497	497	488	185	70	497	12
Particulates < 10µm	PM_{10}	Finland / Europe	Limit value	24-hour	36th maximum	50	Case 1 (Worst Case: Bypass)	4.1	4.1	3.7	1.8	1.1	4.1	8
			Limit value 2030	24-hour	19th maximum	45		6.0	6.0	5.8	2.2	1.5	6.0	13
			Limit value	1-year	1st maximum	40	Case 1 (Annual Scenario)	1.7	1.7	1.1	0.6	0.3	1.7	4
			Limit value 2030	1-year	1st maximum	20		1.7	1.7	1.1	0.6	0.3	1.7	8
Fine particulates	$PM_{2.5}$	Finland / Europe	Limit value 2030	24-hour	19th maximum	25	Case 1 (Worst Case: Bypass)	6.0	6.0	5.8	2.0	1.4	6.0	24
			Limit value	1-year	1st maximum	25	Case 1 (Annual Scenario)	1.4	1.4	1.1	0.5	0.3	1.4	6
			Limit value 2030	1-year	1st maximum	10		1.4	1.4	1.1	0.5	0.3	1.4	14
Benzo[a]pyrene	B[a]P	Europe	Limit value	1-year	1st maximum	0.001	Case 1 (Annual Scenario)	0.00035	0.00035	0.00020	0.00016	0.00005	0.00035	35
Polycyclic aromatic hydrocarbons	PAH	-	-	1-year	1st maximum	-	Case 1 (Annual Scenario)	0.0432	0.0432	0.0250	0.0197	0.0067	0.0432	-

Description of standard							Description of the modelled values	Modelled concentration at sensitive receptors (µg/m³)						Percentage of the limit value (%)
Substance	CAS, Chem. Formula or Acronym	Gov. / Org.	Threshold Type	Averaging Period	Statistic	Limit (µg/m³)	Scenario	Maximum by category					Maximum	
								Sensitive receptors	Private residences	Agricultural land	Livestock	Natura Zone		
Hydrogen fluoride	HF	Quebec (MELCCFP)	Criterion	1-hour	1st maximum	60	Case 1 (Dual Scrubbers)	12.5	11.9	12.5	9.2	8.0	12.5	21
				4416-hour	1st maximum	0.4	Case 1 (Dual Scrubbers)	0.964	0.964	0.458	0.301	0.117	0.964	241
Volatile organic compounds	VOC	-	-	1-hour	1st maximum	-	Case 1 (Worst Case: Bypass)	35.5	35.5	35.0	27.5	23.9	35.5	-
				24-hour	1st maximum	-		21.3	21.3	11.2	13.3	8.2	21.3	-
				1-year	1st maximum	-	Case 1 (Annual Scenario)	3.08	3.08	1.46	0.98	0.39	3.08	-
						-	-	-	-	-	-	-	-	-
Sulfur dioxide	SO_2	Finland / Europe	Limit value	1-hour	25th maximum	350	Case 2 (Worst Case: Bypass)	347	347	215	59	34	347	99
							Case 2 (Dual Scrubbers)	26	26	16	7	8	26	7
			Limit value 2030	1-hour	4th maximum	350	Case 2 (Worst Case: Bypass)	417	417	229	71	59	417	119
							Case 2 (Dual Scrubbers)	29	29	17	9	11	29	8
			Limit value	24-hour	4th maximum	125	Case 2 (Worst Case: Bypass)	120	119	120	32	11	120	96
							Case 2 (Dual Scrubbers)	12	12	11	4	2	12	10
			Limit value 2030	24-hour	19th maximum	50	Case 2 (Worst Case: Bypass)	48.6	26.9	48.6	10.1	1.2	48.6	97
							Case 2 (Dual Scrubbers)	6.7	6.7	6.1	2.5	1.2	6.7	13
				1-year	1st maximum	20	Case 2 (Annual Scenario)	2.0	2.0	1.5	0.6	0.2	2.0	10
Nitrogen dioxide	NO_2	Finland / Europe	Limit value	1-hour	19th maximum	200	Case 2 (Worst Case: Bypass)	34	34	26	10	7	34	17
			Limit value 2030	1-hour	4th maximum	200		45	45	35	11	9	45	22
				24-hour	19th maximum	50		11.4	11.4	8.1	3.3	1.2	11.4	23
			Limit value	1-year	1st maximum	40	Case 2 (Annual Scenario)	2.8	2.8	1.7	0.7	0.2	2.8	7
			Limit value 2030	1-year	1st maximum	20		2.8	2.8	1.7	0.7	0.2	2.8	14
Carbon monoxide	CO	Finland / Europe	Limit value	8-hour	1st maximum	10000	Case 2 (Worst Case: Bypass)	1700	1700	1318	603	427	1700	17
			Limit value 2030	8-hour	1st maximum	10000		1700	1700	1318	603	427	1700	17
				24-hour	19th maximum	4000		531	531	520	192	76	531	13
Particulates < 10µm	PM_{10}	Finland / Europe	Limit value	24-hour	36th maximum	50	Case 2 (Worst Case: Bypass)	4.0	4.0	3.7	1.7	1.1	4.0	8
			Limit value 2030	24-hour	19th maximum	45		6.0	6.0	5.8	2.2	1.4	6.0	13
			Limit value	1-year	1st maximum	40	Case 2 (Annual Scenario)	1.7	1.7	1.1	0.6	0.3	1.7	4
			Limit value 2030	1-year	1st maximum	20		1.7	1.7	1.1	0.6	0.3	1.7	8

Description of standard							Description of the modelled values	Modelled concentration at sensitive receptors (µg/m³)						Percentage of the limit value (%)
Substance	CAS, Chem. Formula or Acronym	Gov. / Org.	Threshold Type	Averaging Period	Statistic	Limit (µg/m³)	Scenario	Maximum by category					Maximum	
								Sensitive receptors	Private residences	Agricultural land	Livestock	Natura Zone		
Fine particulates	$PM_{2.5}$	Finland / Europe	Limit value 2030	24-hour	19th maximum	25	Case 2 (Worst Case: Bypass)	5.9	5.9	5.8	1.9	1.4	5.9	24
			Limit value	1-year	1st maximum	25	Case 2 (Annual Scenario)	1.4	1.4	1.1	0.5	0.3	1.4	6
			Limit value 2030	1-year	1st maximum	10		1.4	1.4	1.1	0.5	0.3	1.4	14
Benzo[a]pyrene	B[a]P	Europe	Limit value	1-year	1st maximum	0.001	Case 2 (Annual Scenario)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 1
Polycyclic aromatic hydrocarbons	PAH	-	-	1-year	1st maximum	-	Case 2 (Annual Scenario)	9.76E-04	9.76E-04	4.53E-04	3.05E-04	1.15E-04	9.76E-04	-
Hydrogen fluoride	HF	Quebec (MELCCFP)	Criterion	1-hour	1st maximum	60	Case 2 (Dual Scrubbers)	12.5	11.9	12.5	9.2	8.0	12.5	21
				4416-hour	1st maximum	0.4	Case 2 (Dual Scrubbers)	0.964	0.964	0.458	0.301	0.117	0.964	241
Volatile organic compounds	VOC	-	-	1-hour	1st maximum	-	Case 2 (Worst Case: Bypass)	35.3	35.3	35.0	27.4	23.8	35.3	-
				24-hour	1st maximum	-		21.0	21.0	10.9	13.0	8.0	21.0	-
				1-year	1st maximum	-	Case 2 (Annual Scenario)	3.02	3.02	1.41	0.95	0.38	3.02	-

A-2-2 Modelling results without background concentrations presented for individual sensitive receptors

Description of standard				Description of the modelled values	Modelled concentration at sensitive receptors (µg/m³)																					
CAS, Chem. Formula or Acronym	Averaging Period	Statistic	Limit (µg/m³)	Scenario	Private residences												Livestock farms						Agricultural land				Other	
					SR1	SR2	SR3	SR4	SR5	SR6	SR7	SR8	SR9	SR10	SR11	SR12	SR14	SR15	SR16	SR17	SR18	SR19	SR21	SR22	SR23	SR24	SR13	SR20
SO_2	1-hour	25th maximum	350	Case 1 (Worst Case: Bypass)	347	11	205	177	36	22	88	77	62	8	9	18	52	54	46	59	15	17	215	72	9	27	39	13
				Case 1 (Dual Scrubbers)	27	9	16	15	23	22	16	16	7	5	4	5	7	6	6	7	7	4	18	11	8	7	10	3
	1-hour	4th maximum	350	Case 1 (Worst Case: Bypass)	417	17	233	204	69	70	121	100	70	24	25	30	71	63	60	67	28	31	229	91	19	36	75	15
				Case 1 (Dual Scrubbers)	32	15	18	16	27	26	19	21	8	7	6	7	7	7	7	8	9	5	19	16	14	9	13	5
	24-hour	4th maximum	125	Case 1 (Worst Case: Bypass)	119	3	104	79	12	8	37	31	31	3	3	5	7	9	11	32	4	5	120	32	3	8	10	6
				Case 1 (Dual Scrubbers)	13	2	10	9	10	8	8	8	5	1	1	2	3	3	3	4	2	1	11	6	2	3	3	1
	24-hour	19th maximum	50	Case 1 (Worst Case: Bypass)	26.1	1.1	27.0	19.8	6.4	5.1	16.0	15.0	10.2	0.8	0.7	1.7	1.2	1.4	2.0	10.1	1.3	1.3	48.6	13.0	1.0	1.7	1.5	2.6
				Case 1 (Dual Scrubbers)	6.7	1.1	5.4	5.5	6.3	5.1	5.9	5.8	3.0	0.8	0.7	1.0	1.0	1.2	1.5	2.5	1.2	0.9	6.4	3.3	1.0	1.7	1.5	0.9
	1-year	1st maximum	20	Case 1 (Annual Scenario)	2.0	0.2	1.6	1.6	1.6	1.3	1.5	1.5	0.7	0.2	0.1	0.3	0.3	0.3	0.4	0.7	0.3	0.2	1.5	0.8	0.2	0.3	0.2	0.2
NO_2	1-hour	19th maximum	200	Case 1 (Worst Case: Bypass)	34	22	23	21	20	19	17	17	13	11	9	8	11	9	9	12	9	7	26	28	22	13	9	5
	1-hour	4th maximum	200		45	25	23	21	21	20	18	18	14	13	11	11	12	11	10	13	12	7	27	40	24	15	12	7
	24-hour	19th maximum	50		14.6	3.6	9.5	8.8	7.0	5.8	7.1	7.5	5.1	1.7	1.4	2.5	3.4	3.2	3.3	4.8	2.6	1.4	10.5	8.9	3.5	3.1	1.7	1.3
	1-year	1st maximum	40	Case 1 (Annual Scenario)	3.8	0.8	2.4	2.2	1.9	1.6	1.8	1.8	1.2	0.4	0.3	0.7	0.7	0.7	0.8	1.1	0.7	0.4	2.5	2.0	0.7	0.6	0.4	0.3
	1-year	1st maximum	20		3.8	0.8	2.4	2.2	1.9	1.6	1.8	1.8	1.2	0.4	0.3	0.7	0.7	0.7	0.8	1.1	0.7	0.4	2.5	2.0	0.7	0.6	0.4	0.3
CO	8-hour	1st maximum	10000	Case 1 (Worst Case: Bypass)	1675	555	1230	1050	1397	1304	951	996	613	393	325	377	511	496	480	581	534	238	1308	718	455	587	431	172
	8-hour	1st maximum	10000		1675	555	1230	1050	1397	1304	951	996	613	393	325	377	511	496	480	581	534	238	1308	718	455	587	431	172
	24-hour	19th maximum	4000		497	71	413	411	490	407	421	422	211	58	50	75	74	88	109	185	82	63	488	257	78	129	88	62

Description of standard				Description of the modelled values	Modelled concentration at sensitive receptors (µg/m³)																							
CAS, Chem. Formula or Acronym	Averaging Period	Statistic	Limit (µg/m³)	Scenario	Private residences												Livestock farms						Agricultural land				Other	
					SR1	SR2	SR3	SR4	SR5	SR6	SR7	SR8	SR9	SR10	SR11	SR12	SR14	SR15	SR16	SR17	SR18	SR19	SR21	SR22	SR23	SR24	SR13	SR20
PM_{10}	24-hour	36th maximum	50	Case 1 (Worst Case: Bypass)	4.1	3.2	2.8	2.9	2.7	2.3	2.6	2.5	1.9	1.8	1.1	0.9	1.2	1.2	1.3	1.8	0.9	0.6	2.7	2.0	3.7	2.3	1.3	0.5
	24-hour	19th maximum	45		5.4	6.0	3.6	3.7	3.3	3.0	3.3	3.2	2.3	2.6	1.4	1.1	1.5	1.3	1.6	2.2	1.2	0.8	3.6	2.5	5.8	3.2	1.7	0.8
	1-year	1st maximum	40	Case 1 (Annual Scenario)	1.7	1.0	1.1	1.1	1.0	0.8	1.0	0.9	0.6	0.5	0.3	0.3	0.4	0.4	0.4	0.6	0.3	0.2	1.1	0.7	1.1	0.6	0.4	0.2
	1-year	1st maximum	20		1.7	1.0	1.1	1.1	1.0	0.8	1.0	0.9	0.6	0.5	0.3	0.3	0.4	0.4	0.4	0.6	0.3	0.2	1.1	0.7	1.1	0.6	0.4	0.2
$PM_{2.5}$	24-hour	19th maximum	25	Case 1 (Worst Case: Bypass)	4.4	6.0	3.0	3.1	2.8	2.6	2.8	2.8	2.1	2.5	1.4	1.0	1.4	1.2	1.4	2.0	1.0	0.7	3.0	2.3	5.8	3.1	1.6	0.7
	1-year	1st maximum	25	Case 1 (Annual Scenario)	1.4	1.0	1.0	0.9	0.9	0.7	0.8	0.8	0.6	0.5	0.3	0.3	0.4	0.3	0.4	0.5	0.3	0.2	0.9	0.7	1.1	0.6	0.3	0.2
	1-year	1st maximum	10		1.4	1.0	1.0	0.9	0.9	0.7	0.8	0.8	0.6	0.5	0.3	0.3	0.4	0.3	0.4	0.5	0.3	0.2	0.9	0.7	1.1	0.6	0.3	0.2
B[a]P	1-year	1st maximum	0.001	Case 1 (Annual Scenario)	0.00028	0.00006	0.00027	0.00028	0.00035	0.00032	0.00030	0.00030	0.00017	0.00005	0.00005	0.00014	0.00008	0.00008	0.00010	0.00016	0.00016	0.00005	0.00020	0.00015	0.00006	0.00007	0.00006	0.00003
PAH	1-year	1st maximum	-	Case 1 (Annual Scenario)	0.0348	0.0069	0.0332	0.0349	0.0432	0.0397	0.0376	0.0375	0.0215	0.0065	0.0060	0.0177	0.0101	0.0105	0.0127	0.0197	0.0192	0.0061	0.0250	0.0186	0.0069	0.0083	0.0071	0.0043
HF	1-hour	1st maximum	60	Case 1 (Dual Scrubbers)	10.9	8.4	11.9	10.8	11.4	10.6	10.9	10.9	9.3	3.9	3.5	4.1	7.5	7.8	8.0	9.2	6.8	9.0	9.4	12.5	7.4	6.7	8.7	4.9
	4416-hour	1st maximum	0.4	Case 1 (Dual Scrubbers)	0.964	0.084	0.546	0.538	0.432	0.370	0.435	0.412	0.325	0.045	0.043	0.109	0.131	0.132	0.184	0.301	0.168	0.106	0.458	0.301	0.070	0.097	0.121	0.082
VOC	1-hour	1st maximum	-	Case 1 (Worst Case: Bypass)	32.5	25.9	35.3	32.1	35.5	33.1	33.7	33.9	27.9	13.3	11.4	12.7	22.7	23.7	24.0	27.5	20.3	27.1	27.9	35.0	23.5	20.3	25.7	14.5
	24-hour	1st maximum	-		18.1	6.7	14.1	16.7	19.1	18.0	21.3	21.3	15.3	3.9	3.6	4.1	6.4	7.4	11.2	13.3	7.4	6.0	11.2	7.6	7.3	4.1	9.2	4.5
	1-year	1st maximum	-	Case 1 (Annual Scenario)	3.08	0.42	1.78	1.79	1.60	1.33	1.58	1.52	1.06	0.23	0.18	0.42	0.48	0.48	0.64	0.98	0.54	0.31	1.46	0.80	0.39	0.35	0.44	0.29
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SO_2	1-hour	25th maximum	350	Case 2 (Worst Case: Bypass)	347	11	205	177	36	22	88	77	62	7	9	17	52	54	46	59	15	17	215	72	9	27	39	13
				Case 2 (Dual Scrubbers)	26	8	15	14	22	21	15	16	7	5	4	5	6	6	6	7	7	4	16	11	8	7	9	3
	1-hour	4th maximum	350	Case 2 (Worst Case: Bypass)	417	17	233	204	69	70	121	100	70	24	25	30	71	63	60	67	28	31	229	91	19	36	75	15
				Case 2 (Dual Scrubbers)	29	15	17	15	25	25	18	20	8	7	6	7	7	6	6	8	9	5	17	15	14	9	13	4

Description of standard				Description of the modelled values	Modelled concentration at sensitive receptors (µg/m³)																							
CAS, Chem. Formula or Acronym	Averaging Period	Statistic	Limit (µg/m³)	Scenario	Private residences												Livestock farms						Agricultural land				Other	
					SR1	SR2	SR3	SR4	SR5	SR6	SR7	SR8	SR9	SR10	SR11	SR12	SR14	SR15	SR16	SR17	SR18	SR19	SR21	SR22	SR23	SR24	SR13	SR20
	24-hour	4th maximum	125	Case 2 (Worst Case: Bypass)	119	3	104	79	12	8	37	31	31	3	3	5	6	9	11	32	4	5	120	32	3	8	10	6
				Case 2 (Dual Scrubbers)	12	2	9	8	10	8	8	8	4	1	1	2	3	3	3	4	2	1	11	6	2	3	3	1
	24-hour	19th maximum	50	Case 2 (Worst Case: Bypass)	26.1	1.0	26.9	19.8	6.1	4.9	15.9	14.7	10.1	0.8	0.7	1.7	1.2	1.4	2.0	10.1	1.3	1.3	48.6	13.0	1.0	1.6	1.5	2.6
				Case 2 (Dual Scrubbers)	6.7	1.0	5.1	5.3	6.1	4.9	5.7	5.7	2.8	0.8	0.7	0.9	1.0	1.2	1.5	2.5	1.1	0.8	6.1	3.1	1.0	1.6	1.5	0.8
	1-year	1st maximum	20	Case 2 (Annual Scenario)	2.0	0.2	1.5	1.6	1.6	1.3	1.5	1.5	0.7	0.2	0.1	0.3	0.3	0.3	0.3	0.6	0.3	0.2	1.5	0.8	0.2	0.3	0.2	0.2
NO_2	1-hour	19th maximum	200	Case 2 (Worst Case: Bypass)	34	21	17	15	12	11	12	11	10	8	7	6	10	9	9	10	6	5	19	26	21	10	8	3
	1-hour	4th maximum	200		45	24	18	16	13	12	13	12	11	11	9	6	11	9	9	10	7	6	20	35	23	11	11	4
	24-hour	19th maximum	50		11.4	3.2	6.7	5.6	2.6	2.3	3.6	3.7	3.4	1.1	0.8	1.7	2.4	2.2	2.3	3.3	1.5	0.9	8.1	6.9	3.2	2.0	1.0	0.8
	1-year	1st maximum	40	Case 2 (Annual Scenario)	2.8	0.6	1.5	1.3	0.8	0.7	0.8	0.8	0.7	0.2	0.2	0.4	0.5	0.5	0.5	0.7	0.4	0.2	1.7	1.5	0.6	0.4	0.2	0.2
	1-year	1st maximum	20		2.8	0.6	1.5	1.3	0.8	0.7	0.8	0.8	0.7	0.2	0.2	0.4	0.5	0.5	0.5	0.7	0.4	0.2	1.7	1.5	0.6	0.4	0.2	0.2
CO	8-hour	1st maximum	10000	Case 2 (Worst Case: Bypass)	1700	562	1241	1060	1423	1329	978	1021	624	411	339	393	513	516	483	603	544	242	1318	724	475	606	458	177
	8-hour	1st maximum	10000		1700	562	1241	1060	1423	1329	978	1021	624	411	339	393	513	516	483	603	544	242	1318	724	475	606	458	177
	24-hour	19th maximum	4000		531	77	419	422	510	418	442	452	228	61	52	77	77	93	112	192	84	65	520	264	80	132	96	64
PM_{10}	24-hour	36th maximum	50	Case 2 (Worst Case: Bypass)	4.0	3.2	2.8	2.8	2.6	2.2	2.5	2.4	1.8	1.8	1.1	0.8	1.2	1.1	1.2	1.7	0.9	0.6	2.7	2.0	3.7	2.3	1.3	0.5
	24-hour	19th maximum	45		5.3	6.0	3.5	3.6	3.2	2.8	3.2	3.1	2.3	2.5	1.4	1.0	1.4	1.3	1.5	2.2	1.1	0.8	3.6	2.5	5.8	3.2	1.7	0.8
	1-year	1st maximum	40	Case 2 (Annual Scenario)	1.7	1.0	1.1	1.1	0.9	0.8	0.9	0.9	0.6	0.5	0.3	0.3	0.4	0.3	0.4	0.6	0.3	0.2	1.0	0.7	1.1	0.6	0.4	0.2
	1-year	1st maximum	20		1.7	1.0	1.1	1.1	0.9	0.8	0.9	0.9	0.6	0.5	0.3	0.3	0.4	0.3	0.4	0.6	0.3	0.2	1.0	0.7	1.1	0.6	0.4	0.2
$PM_{2.5}$	24-hour	19th maximum	25	Case 2 (Worst Case: Bypass)	4.4	5.9	2.9	3.0	2.8	2.5	2.9	2.7	2.0	2.5	1.4	0.9	1.4	1.2	1.4	1.9	1.0	0.7	3.0	2.2	5.8	3.1	1.5	0.6
	1-year	1st maximum	25	Case 2 (Annual Scenario)	1.4	1.0	0.9	0.9	0.8	0.7	0.8	0.8	0.5	0.5	0.3	0.2	0.4	0.3	0.4	0.5	0.3	0.2	0.9	0.6	1.1	0.6	0.3	0.2

Description of standard				Description of the modelled values	Modelled concentration at sensitive receptors (µg/m³)																					
CAS, Chem. Formula or Acronym	Averaging Period	Statistic	Limit (µg/m³)	Scenario	Private residences												Livestock farms						Agricultural land				Other	
					SR1	SR2	SR3	SR4	SR5	SR6	SR7	SR8	SR9	SR10	SR11	SR12	SR14	SR15	SR16	SR17	SR18	SR19	SR21	SR22	SR23	SR24	SR13	SR20
	1-year	1st maximum	10		1.4	1.0	0.9	0.9	0.8	0.7	0.8	0.8	0.5	0.5	0.3	0.2	0.4	0.3	0.4	0.5	0.3	0.2	0.9	0.6	1.1	0.6	0.3	0.2
B[a]P	1-year	1st maximum	0.001	Case 2 (Annual Scenario)	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
PAH	1-year	1st maximum	-	Case 2 (Annual Scenario)	9.76E-04	7.68E-05	5.57E-04	5.59E-04	4.99E-04	4.12E-04	4.96E-04	4.76E-04	3.29E-04	4.73E-05	4.42E-05	1.20E-04	1.42E-04	1.43E-04	1.95E-04	3.05E-04	1.60E-04	9.59E-05	4.53E-04	2.37E-04	6.53E-05	8.57E-05	1.30E-04	8.98E-05
HF	1-hour	1st maximum	60	Case 2 (Dual Scrubbers)	10.9	8.4	11.9	10.8	11.4	10.6	10.9	10.9	9.3	3.9	3.5	4.1	7.5	7.8	8.0	9.2	6.8	9.0	9.4	12.5	7.4	6.7	8.7	4.9
	4416-hour	1st maximum	0.4	Case 2 (Dual Scrubbers)	0.964	0.084	0.546	0.538	0.432	0.370	0.435	0.412	0.325	0.045	0.043	0.109	0.131	0.132	0.184	0.301	0.168	0.106	0.458	0.301	0.070	0.097	0.121	0.082
VOC	1-hour	1st maximum	-	Case 2 (Worst Case: Bypass)	32.5	25.3	35.3	32.1	34.8	32.9	33.0	33.0	27.7	12.8	11.1	12.3	22.3	23.0	23.7	27.4	19.9	26.5	27.9	35.0	22.9	20.0	25.7	14.3
	24-hour	1st maximum	-		18.1	6.4	13.8	16.7	18.9	17.6	21.0	20.9	15.2	3.7	3.5	3.9	6.2	7.3	11.0	13.0	7.1	5.9	10.9	7.4	7.0	4.0	8.9	4.4
	1-year	1st maximum	-	Case 2 (Annual Scenario)	3.02	0.40	1.73	1.73	1.52	1.26	1.52	1.46	1.02	0.21	0.17	0.38	0.46	0.46	0.62	0.95	0.50	0.30	1.41	0.77	0.38	0.33	0.43	0.28

A-2-3 Selected exceedance results without background concentrations

Description of standard							Description of the modelled values	Number of exceedances within the domain where standards apply				Percentile of the highest value not exceeding the standard threshold			
Substance	CAS, Chem. Formula or Acronym	Gov. / Org.	Threshold Type	Averaging Period	Statistic	Limit (µg/m³)	Scenario	Maximum for any receptor for each meteorological sample year			Maximum	Minimum for any receptor for each meteorological sample year			Minimum
								A1	A2	A3		A1	A2	A3	
Sulfur dioxide	SO_2	Finland / Europe	Limit value	1-hour	25th maximum	350	Case 1 (Dual Scrubbers)	0	0	0	0	100	100	100	100
							Case 1 (Scrubber A + Bypass B)	0	0	0	0	100	100	100	100
							Case 1 (Scrubber B + Bypass A)	22	3	12	22	99.750	99.966	99.863	99.750
							Case 1 (Annual Scenario)	0.851	0.116	0.464	0.851	99.990	99.999	99.995	99.990
			Limit value 2030	1-hour	4th maximum	350	Case 1 (Dual Scrubbers)	0	0	0	0	100	100	100	100
							Case 1 (Scrubber A + Bypass B)	0	0	0	0	100	100	100	100
							Case 1 (Scrubber B + Bypass A)	22	3	12	22	99.750	99.966	99.863	99.750
							Case 1 (Annual Scenario)	0.851	0.116	0.464	0.851	99.990	99.999	99.995	99.990
			Limit value	24-hour	4th maximum	125	Case 1 (Dual Scrubbers)	0	0	0	0	100	100	100	100
							Case 1 (Scrubber A + Bypass B)	0	0	0	0	100	100	100	100
							Case 1 (Scrubber B + Bypass A)	3	0	1	3	99.180	100.000	99.726	99.180
							Case 1 (Annual Scenario)	0.116	0	0.039	0.116	99.968	100.000	99.989	99.968
			Limit value 2030	24-hour	19th maximum	50	Case 1 (Dual Scrubbers)	0	0	0	0	100	100	100	100
							Case 1 (Scrubber A + Bypass B)	1	1	0	1	99.727	99.726	100.000	99.726
							Case 1 (Scrubber B + Bypass A)	18	6	6	18	95.082	98.356	98.356	95.082
							Case 1 (Annual Scenario)	0.696	0.271	0.232	0.696	99.810	99.926	99.936	99.810

Appendix A-3
Results – With background concentrations

A-3-1 Modelling results with background concentrations presented by sensitive receptor category

Description of standard									Description of the modelled values	Modelled concentration at sensitive receptors (µg/m³)						Total Concentration Modelled (µg/m³)	Contribution of the project (%)	Percentage of the limit value (%)
Substance	CAS, Chem. Formula or Acronym	Gov. / Org.	Threshold Type	Averaging Period	Statistic	Limit (µg/m³)	Background Concentration reference	Background Concentration (µg/m³)	Scenario	Maximum by category					Maximum			
										Sensitive receptors	Private residences within 1 km	Agricultural land	Livestock	Natura Zone				
Sulfur dioxide	SO_2	Finland / Europe	Limit value	1-hour	25th maximum	350	Luoto Vikarholmen 2023-2025	3	Case 1 (Worst Case: Bypass)	347	347	215	59	35	347	350	99	99.96
									Case 1 (Dual Scrubbers)	27	27	18	7	8	27	30	90	9
			Limit value 2030	1-hour	4th maximum	350	Luoto Vikarholmen 2023-2025	3	Case 1 (Worst Case: Bypass)	417	417	229	71	59	417	420	99	120
									Case 1 (Dual Scrubbers)	32	32	19	9	11	32	35	91	10
			Limit value	24-hour	4th maximum	125	Luoto Vikarholmen 2023-2025	2	Case 1 (Worst Case: Bypass)	120	119	120	32	11	120	122	98	97
									Case 1 (Dual Scrubbers)	13	13	11	4	2	13	15	87	12
			Limit value 2030	24-hour	19th maximum	50	Luoto Vikarholmen 2023-2025	2	Case 1 (Worst Case: Bypass)	48.6	27.0	48.6	10.1	1.2	48.6	50.6	96	101
									Case 1 (Dual Scrubbers)	6.7	6.7	6.4	2.5	1.2	6.7	8.7	77	17
				1-year	1st maximum	20	Luoto Vikarholmen 2023-2025	1	Case 1 (Annual Scenario)	2.0	2.0	1.5	0.7	0.2	2.0	3.0	66	15
Nitrogen dioxide	NO_2	Finland / Europe	Limit value	1-hour	19th maximum	200	Kokkola Ykspihlaja 2023-2025	26	Case 1 (Worst Case: Bypass)	34	34	28	12	9	34	60	57	30
			Limit value 2030	1-hour	4th maximum	200	Kokkola Ykspihlaja 2023-2025	26		45	45	40	13	11	45	71	63	35
				24-hour	19th maximum	50	Kokkola Ykspihlaja 2023-2025	13		14.6	14.6	10.5	4.8	1.8	14.6	27.6	53	55
			Limit value	1-year	1st maximum	40	Kokkola Ykspihlaja 2023-2025	5	Case 1 (Annual Scenario)	3.8	3.8	2.5	1.1	0.3	3.8	8.8	43	22
			Limit value 2030	1-year	1st maximum	20	Kokkola Ykspihlaja 2023-2025	5		3.8	3.8	2.5	1.1	0.3	3.8	8.8	43	44
Particulates < 10µm	PM_{10}	Finland / Europe	Limit value	24-hour	36th maximum	50	Kokkola Ykspihlaja 2023-2025	33	Case 1 (Worst Case: Bypass)	4.1	4.1	3.7	1.8	1.1	4.1	37.1	11	74
			Limit value 2030	24-hour	19th maximum	45	Kokkola Ykspihlaja 2023-2025	33		6.0	6.0	5.8	2.2	1.5	6.0	39.0	15	87
			Limit value	1-year	1st maximum	40	Kokkola Ykspihlaja 2023-2025	9	Case 1 (Annual Scenario)	1.7	1.7	1.1	0.6	0.3	1.7	10.7	16	27
			Limit value 2030	1-year	1st maximum	20	Kokkola Ykspihlaja 2023-2025	9		1.7	1.7	1.1	0.6	0.3	1.7	10.7	16	53
Fine particulates	$PM_{2.5}$	Finland / Europe	Limit value 2030	24-hour	19th maximum	25	Kokkola Ykspihlaja 2023-2025	13	Case 1 (Worst Case: Bypass)	6.0	6.0	5.8	2.0	1.4	6.0	19.0	31	76
			Limit value	1-year	1st maximum	25	Kokkola Ykspihlaja 2023-2025	4	Case 1 (Annual Scenario)	1.4	1.4	1.1	0.5	0.3	1.4	5.4	26	22
			Limit value 2030	1-year	1st maximum	10	Kokkola Ykspihlaja 2023-2025	4		1.4	1.4	1.1	0.5	0.3	1.4	5.4	26	54
										-	-	-	-	-	-	-	-	-
Sulfur dioxide	SO_2	Finland / Europe	Limit value	1-hour	25th maximum	350	Luoto Vikarholmen 2023-2025	3	Case 2 (Worst Case: Bypass)	347	347	215	59	34	347	350	99	99.96
									Case 2 (Dual Scrubbers)	26	26	16	7	8	26	29	90	8
			Limit value 2030	1-hour	4th maximum	350	Luoto Vikarholmen 2023-2025	3	Case 2 (Worst Case: Bypass)	417	417	229	71	59	417	420	99	120
									Case 2 (Dual Scrubbers)	29	29	17	9	11	29	32	91	9

Description of standard									Description of the modelled values	Modelled concentration at sensitive receptors (µg/m³)						Total Concentration Modelled (µg/m³)	Contribution of the project (%)	Percentage of the limit value (%)
Substance	CAS, Chem. Formula or Acronym	Gov. / Org.	Threshold Type	Averaging Period	Statistic	Limit (µg/m³)	Background Concentration reference	Background Concentration (µg/m³)	Scenario	Maximum by category					Maximum			
										Sensitive receptors	Private residences within 1 km	Agricultural land	Livestock	Natura Zone				
			Limit value	24-hour	4th maximum	125	Luoto Vikarholmen 2023-2025	2	Case 2 (Worst Case: Bypass)	120	119	120	32	11	120	122	98	97
									Case 2 (Dual Scrubbers)	12	12	11	4	2	12	14	86	12
			Limit value 2030	24-hour	19th maximum	50	Luoto Vikarholmen 2023-2025	2	Case 2 (Worst Case: Bypass)	48.6	26.9	48.6	10.1	1.2	48.6	50.6	96	101
									Case 2 (Dual Scrubbers)	6.7	6.7	6.1	2.5	1.2	6.7	8.7	77	17
				1-year	1st maximum	20	Luoto Vikarholmen 2023-2025	1	Case 2 (Annual Scenario)	2.0	2.0	1.5	0.6	0.2	2.0	3.0	66	15
Nitrogen dioxide	NO_2	Finland / Europe	Limit value	1-hour	19th maximum	200	Kokkola Ykspihlaja 2023-2025	26	Case 2 (Worst Case: Bypass)	34	34	26	10	7	34	60	56	30
			Limit value 2030	1-hour	4th maximum	200	Kokkola Ykspihlaja 2023-2025	26		45	45	35	11	9	45	71	63	35
				24-hour	19th maximum	50	Kokkola Ykspihlaja 2023-2025	13		11.4	11.4	8.1	3.3	1.2	11.4	24.4	47	49
			Limit value	1-year	1st maximum	40	Kokkola Ykspihlaja 2023-2025	5	Case 2 (Annual Scenario)	2.8	2.8	1.7	0.7	0.2	2.8	7.8	36	20
			Limit value 2030	1-year	1st maximum	20	Kokkola Ykspihlaja 2023-2025	5		2.8	2.8	1.7	0.7	0.2	2.8	7.8	36	39
Particulates < 10µm	PM_{10}	Finland / Europe	Limit value	24-hour	36th maximum	50	Kokkola Ykspihlaja 2023-2025	33	Case 2 (Worst Case: Bypass)	4.0	4.0	3.7	1.7	1.1	4.0	37.0	11	74
			Limit value 2030	24-hour	19th maximum	45	Kokkola Ykspihlaja 2023-2025	33		6.0	6.0	5.8	2.2	1.4	6.0	39.0	15	87
			Limit value	1-year	1st maximum	40	Kokkola Ykspihlaja 2023-2025	9	Case 2 (Annual Scenario)	1.7	1.7	1.1	0.6	0.3	1.7	10.7	16	27
			Limit value 2030	1-year	1st maximum	20	Kokkola Ykspihlaja 2023-2025	9		1.7	1.7	1.1	0.6	0.3	1.7	10.7	16	53
Fine particulates	$PM_{2.5}$	Finland / Europe	Limit value 2030	24-hour	19th maximum	25	Kokkola Ykspihlaja 2023-2025	13	Case 2 (Worst Case: Bypass)	5.9	5.9	5.8	1.9	1.4	5.9	18.9	31	76
			Limit value	1-year	1st maximum	25	Kokkola Ykspihlaja 2023-2025	4	Case 2 (Annual Scenario)	1.4	1.4	1.1	0.5	0.3	1.4	5.4	26	22
			Limit value 2030	1-year	1st maximum	10	Kokkola Ykspihlaja 2023-2025	4		1.4	1.4	1.1	0.5	0.3	1.4	5.4	26	54

A-3-2 Selected exceedance results with background concentrations

Description of standard									Description of the modelled values	Number of exceedances within the domain where standards apply				Percentile of the highest value not exceeding the standard threshold			
Substance	CAS, Chem. Formula or Acronym	Gov. / Org.	Threshold Type	Averaging Period	Statistic	Limit (µg/m³)	Background Concentration reference	Background Concentration (µg/m³)	Scenario	Maximum for any receptor for each meteorological sample year			Maximum	Minimum for any receptor for each meteorological sample year			Minimum
										A1	A2	A3		A1	A2	A3	
Sulfur dioxide	SO_2	Finland / Europe	Limit value	1-hour	25th maximum	350	Luoto Vikarholmen 2023-2025	3	Case 1 (Dual Scrubbers)	0	0	0	0	100	100	100	100
									Case 1 (Scrubber A + Bypass B)	0	0	0	0	100	100	100	100
									Case 1 (Scrubber B + Bypass A)	24	3	12	24	99.727	99.966	99.863	99.727
									Case 1 (Annual Scenario)	0.928	0.116	0.464	0.928	99.989	99.999	99.995	99.989
			Limit value 2030	1-hour	4th maximum	350	Luoto Vikarholmen 2023-2025	3	Case 1 (Dual Scrubbers)	0	0	0	0	100	100	100	100
									Case 1 (Scrubber A + Bypass B)	0	0	0	0	100	100	100	100
									Case 1 (Scrubber B + Bypass A)	24	3	12	24	99.727	99.966	99.863	99.727
									Case 1 (Annual Scenario)	0.928	0.116	0.464	0.928	99.989	99.999	99.995	99.989
			Limit value	24-hour	4th maximum	125	Luoto Vikarholmen 2023-2025	2	Case 1 (Dual Scrubbers)	0	0	0	0	100	100	100	100
									Case 1 (Scrubber A + Bypass B)	0	0	0	0	100	100	100	100
									Case 1 (Scrubber B + Bypass A)	3	0	1	3	99.180	100	99.726	99.180
									Case 1 (Annual Scenario)	0.116	0	0.039	0.116	99.968	100	99.989	99.968
			Limit value 2030	24-hour	19th maximum	50	Luoto Vikarholmen 2023-2025	2	Case 1 (Dual Scrubbers)	0	0	0	0	100	100	100	100
									Case 1 (Scrubber A + Bypass B)	1	1	0	1	99.727	99.726	100	99.726
									Case 1 (Scrubber B + Bypass A)	19	6	6	19	94.809	98.356	98.356	94.809
									Case 1 (Annual Scenario)	0.735	0.271	0.232	0.735	99.799	99.926	99.936	99.799

Appendix B

Maps

Appendix B-1
General maps

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-1-1
Project Location

Sources :
ESRI, World Topographic Map

0 1,5 3 km

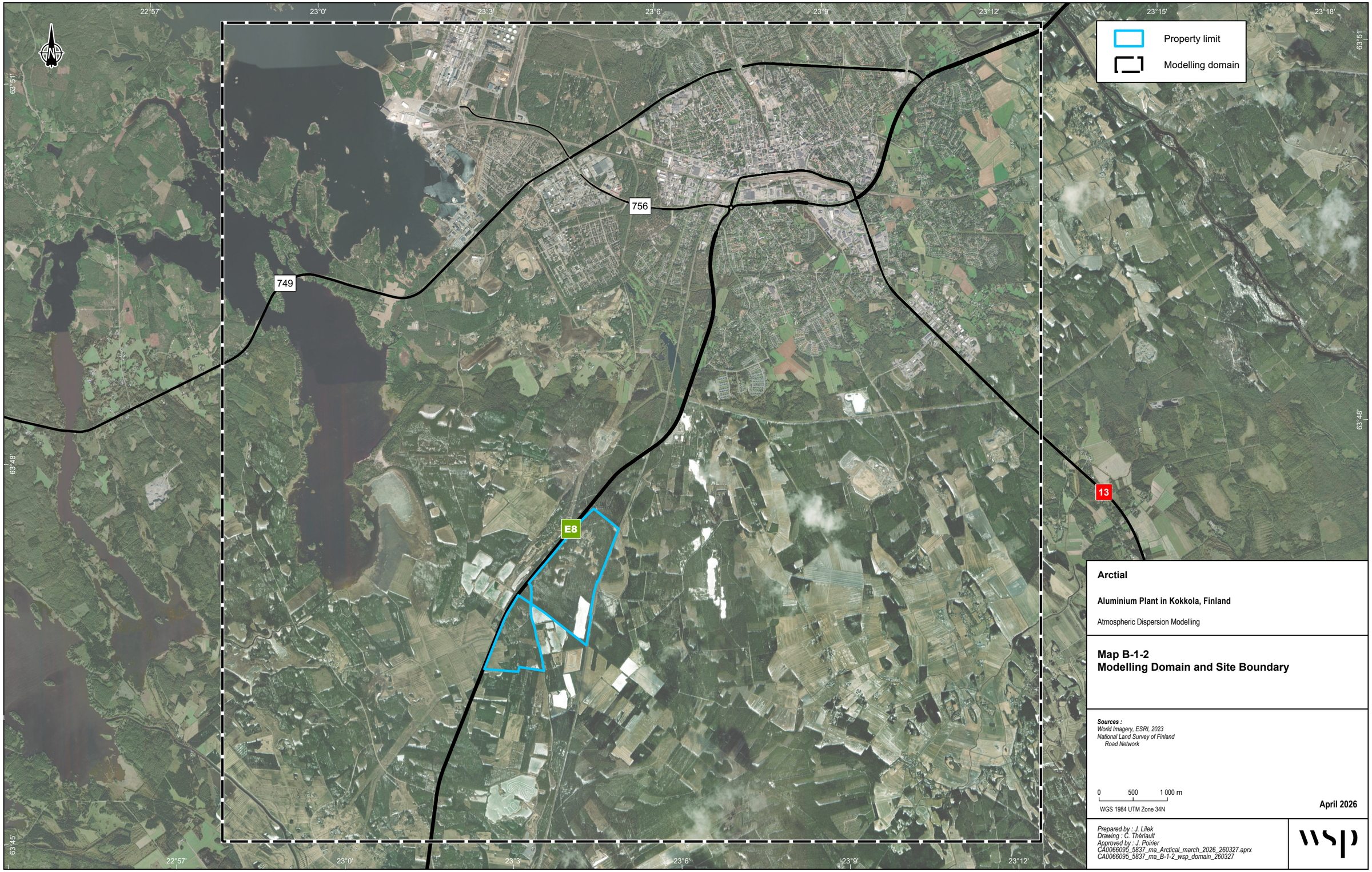
WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260327.aprx
CA0066095_5837_ma_B-1-1_wsp_Loc_260327

wsp

Boundary accuracy and measurements shown on this document are not to be used for engineering or land delineation purposes. No land analysis was carried out by a land surveyor.



Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-1-2
Modelling Domain and Site Boundary

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Road Network

0 500 1 000 m
WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260327.aprx
CA0066095_5837_ma_B-1-2_wsp_domain_260327

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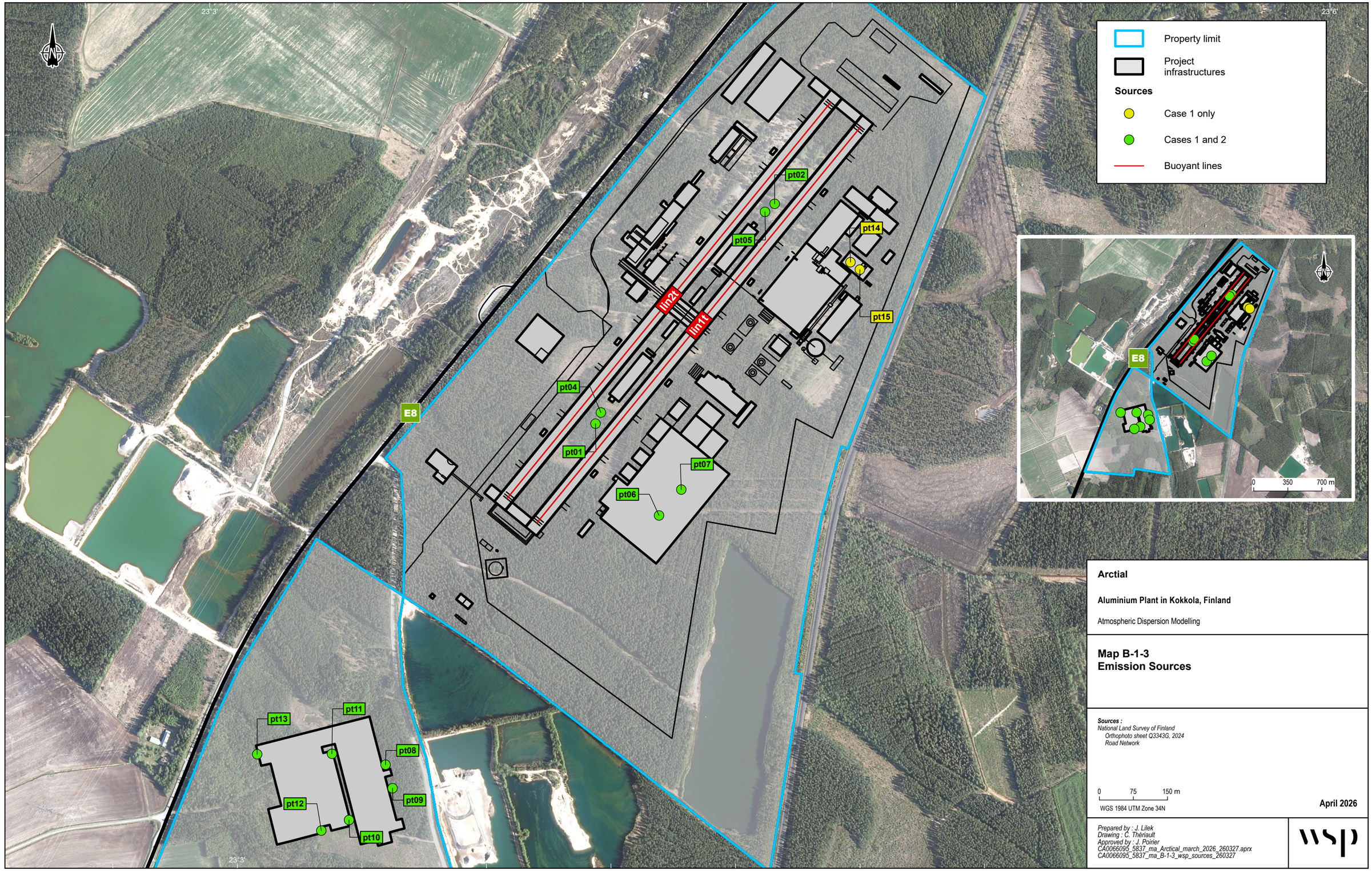

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-1-3
Emission Sources

Sources :
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260327.aprx
CA0066095_5837_ma_B-1-3_wsp_sources_260327

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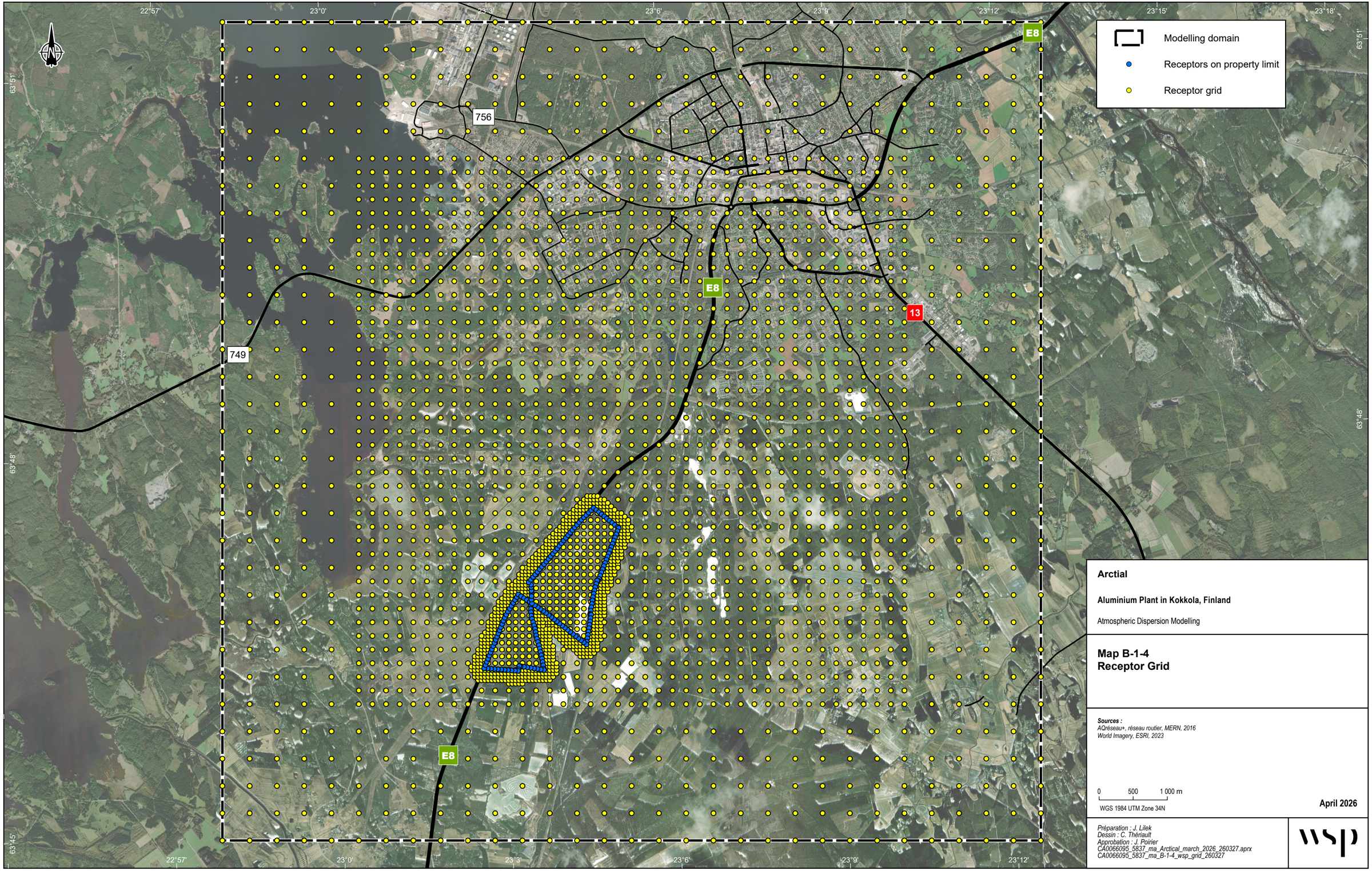


Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-1-4
Receptor Grid

Sources :
AQréseau+, réseau routier, MERN, 2016
World Imagery, ESRI, 2023

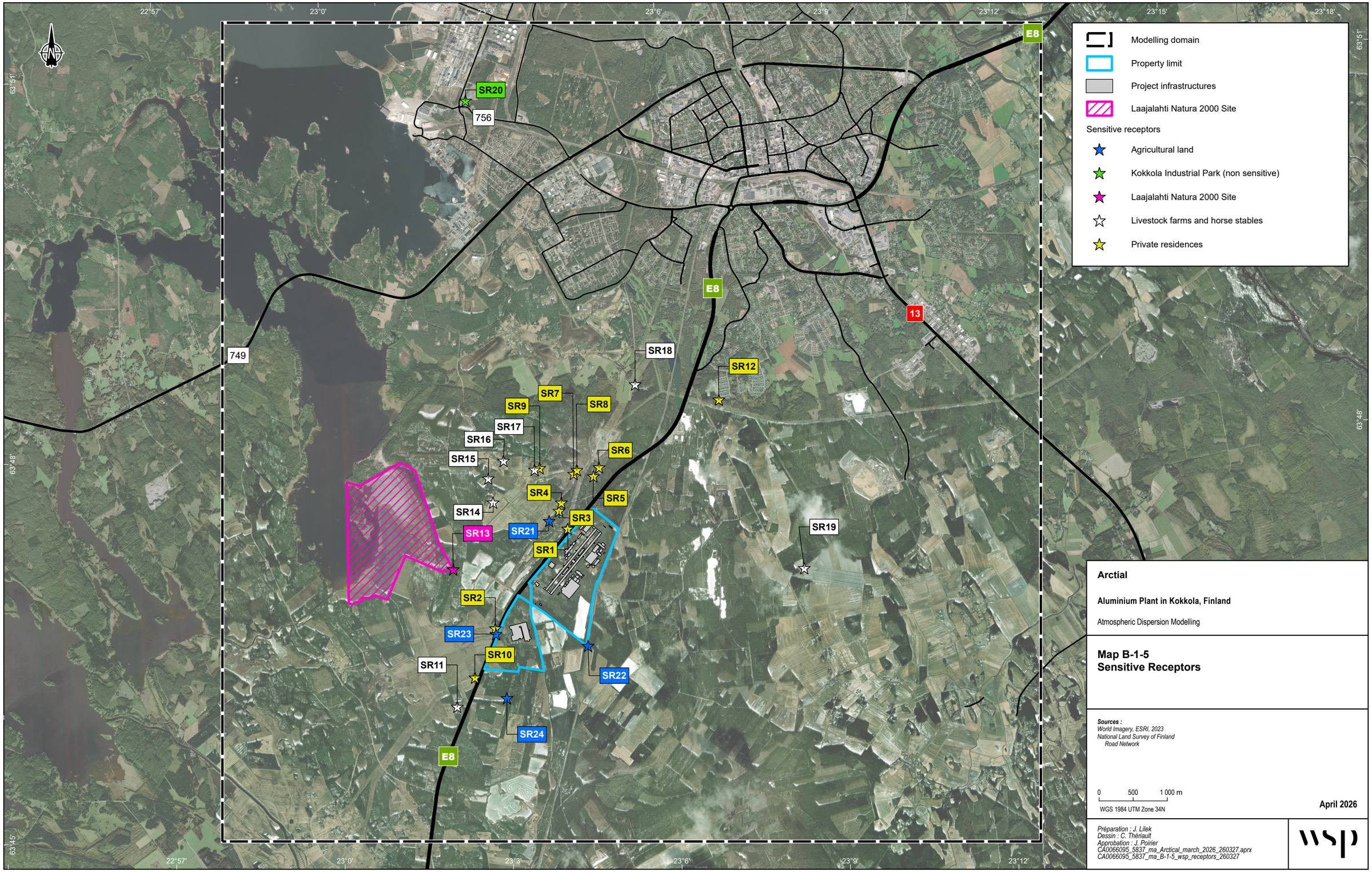
0 500 1 000 m

WGS 1984 UTM Zone 34N

April 2026

Préparation : J. Lilek
Dessin : C. Thériault
Approbation : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260327.aprx
CA0066095_5837_ma_B-1-4_wsp_grid_260327

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre.



Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-1-5
Sensitive Receptors

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Road Network

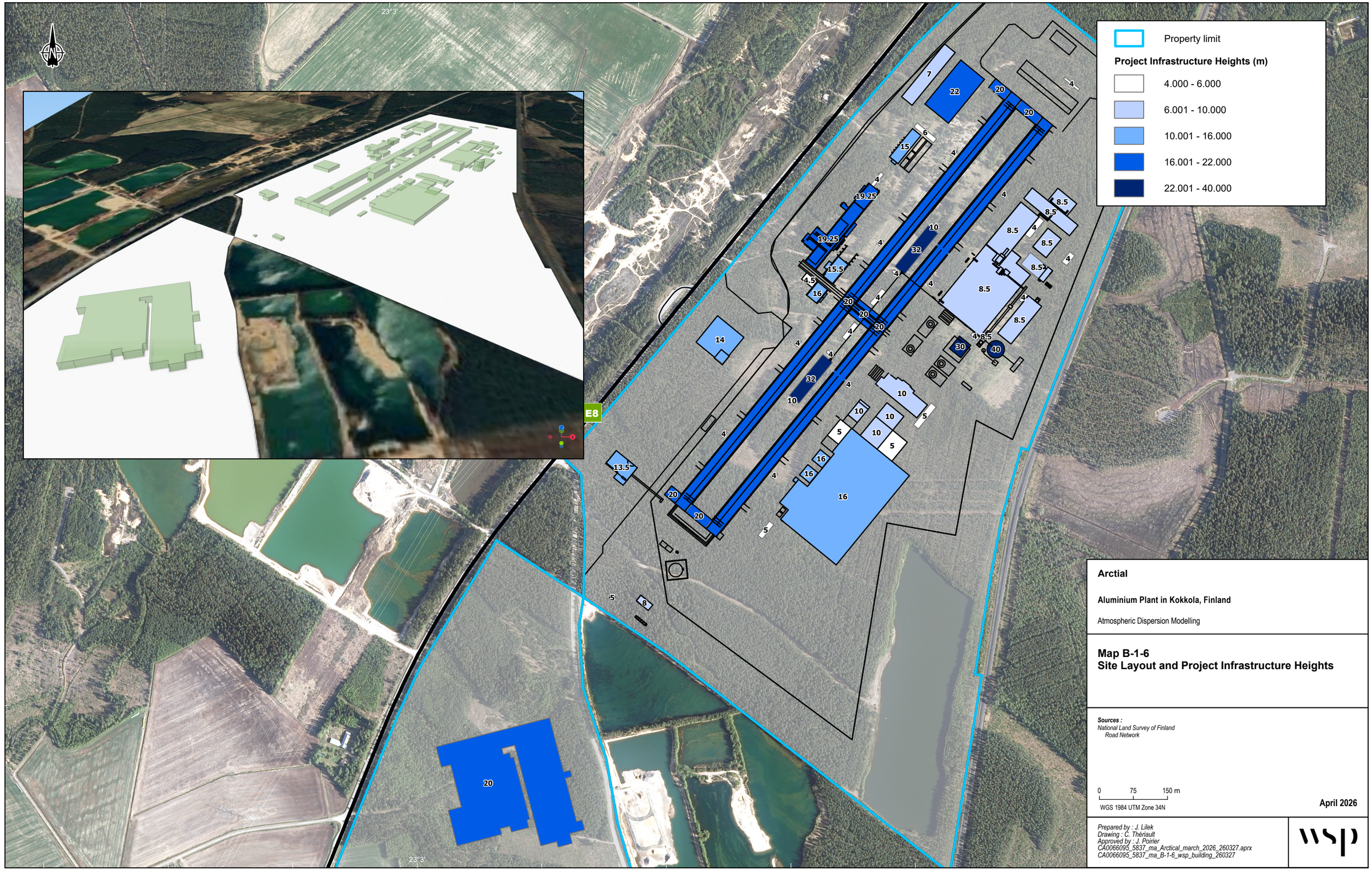
0 500 1 000 m

WGS 1984 UTM Zone 34N

April 2026

Préparation : J. Lilek
Dessin : C. Thériault
Approbation : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260327.aprx
CA0066095_5837_ma_B-1-5_wsp_receptors_260327

La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre.



Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-1-6
Site Layout and Project Infrastructure Heights

Sources :
National Land Survey of Finland
Road Network

0 75 150 m
WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260327.aprx
CA0066095_5837_ma_B-1-6_wsp_building_260327

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Appendix B-2
Results – Isoconcentration maps

Without background concentrations (B-2-1 to B-2-41)

B-2-1 **Maximum Modelled Concentrations on rank 25 - Sulfur dioxide (SO2) - 1-hour - Case 1 (Worst Case: Bypass)**

B-2-2 **Maximum Modelled Concentrations on rank 25 - Sulfur dioxide (SO2) - 1-hour - Case 1 (Dual Scrubbers)**

B-2-3 **Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 1-hour - Case 1 (Worst Case: Bypass)**

B-2-4 **Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 1-hour - Case 1 (Dual Scrubbers)**

B-2-5 **Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 24-hour - Case 1 (Worst Case: Bypass)**

B-2-6 **Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 24-hour - Case 1 (Dual Scrubbers)**

B-2-7 **Maximum Modelled Concentrations on rank 19 - Sulfur dioxide (SO2) - 24-hour - Case 1 (Worst Case: Bypass)**

B-2-8 **Maximum Modelled Concentrations on rank 19 - Sulfur dioxide (SO2) - 24-hour - Case 1 (Dual Scrubbers)**

B-2-9 **Maximum Modelled Concentrations - Sulfur dioxide (SO2) - 1-year - Case 1 (Annual Scenario)**

B-2-10 **Maximum Modelled Concentrations on rank 19 - Nitrogen dioxide (NO2) - 1-hour - Case 1 (Worst Case: Bypass)**

B-2-11 **Maximum Modelled Concentrations on rank 4 - Nitrogen dioxide (NO2) - 1-hour - Case 1 (Worst Case: Bypass)**

B-2-12 **Maximum Modelled Concentrations on rank 19 - Nitrogen dioxide (NO2) - 24-hour - Case 1 (Worst Case: Bypass)**

B-2-13 **Maximum Modelled Concentrations - Nitrogen dioxide (NO2) - 1-year - Case 1 (Annual Scenario)**

B-2-14 **Maximum Modelled Concentrations - Nitrogen dioxide (NO2) - 1-year - Case 1 (Annual Scenario)**

B-2-15 **Maximum Modelled Concentrations on rank 36 - Particulates < 10µm (PM10) - 24-hour - Case 1 (Worst Case: Bypass)**

B-2-16 Maximum Modelled Concentrations on rank 19 - Particulates < 10µm (PM10) - 24-hour - Case 1 (Worst Case: Bypass)

B-2-17 Maximum Modelled Concentrations - Particulates < 10µm (PM10) - 1-year - Case 1 (Annual Scenario)

B-2-18 Maximum Modelled Concentrations - Particulates < 10µm (PM10) - 1-year - Case 1 (Annual Scenario)

B-2-19 Maximum Modelled Concentrations - Benzo[a]pyrene (50-32-8) - 1-year - Case 1 (Annual Scenario)

B-2-20 Maximum Modelled Concentrations - Hydrogen fluoride (HF) - 1-hour - Case 1 (Dual Scrubbers)

B-2-21 Maximum Modelled Concentrations - Hydrogen fluoride (HF) - 4416-hour - Case 1 (Dual Scrubbers)

B-2-22 Maximum Modelled Concentrations on rank 25 - Sulfur dioxide (SO2) - 1-hour - Case 2 (Worst Case: Bypass)

B-2-23 Maximum Modelled Concentrations on rank 25 - Sulfur dioxide (SO2) - 1-hour - Case 2 (Dual Scrubbers)

B-2-24 Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 1-hour - Case 2 (Worst Case: Bypass)

B-2-25 Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 1-hour - Case 2 (Dual Scrubbers)

B-2-26 Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 24-hour - Case 2 (Worst Case: Bypass)

B-2-27 Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 24-hour - Case 2 (Dual Scrubbers)

B-2-28 Maximum Modelled Concentrations on rank 19 - Sulfur dioxide (SO2) - 24-hour - Case 2 (Worst Case: Bypass)

B-2-29 Maximum Modelled Concentrations on rank 19 - Sulfur dioxide (SO2) - 24-hour - Case 2 (Dual Scrubbers)

B-2-30 Maximum Modelled Concentrations - Sulfur dioxide (SO2) - 1-year - Case 2 (Annual Scenario)

B-2-31 Maximum Modelled Concentrations on rank 19 - Nitrogen dioxide (NO2) - 1-hour - Case 2 (Worst Case: Bypass)

B-2-32 Maximum Modelled Concentrations on rank 4 - Nitrogen dioxide (NO2) - 1-hour - Case 2 (Worst Case: Bypass)

B-2-33 Maximum Modelled Concentrations on rank 19 - Nitrogen dioxide (NO2) - 24-hour - Case 2 (Worst Case: Bypass)

B-2-34 Maximum Modelled Concentrations - Nitrogen dioxide (NO2) - 1-year - Case 2 (Annual Scenario)

B-2-35 Maximum Modelled Concentrations - Nitrogen dioxide (NO2) - 1-year - Case 2 (Annual Scenario)

B-2-36 Maximum Modelled Concentrations on rank 36 - Particulates < 10µm (PM10) - 24-hour - Case 2 (Worst Case: Bypass)

B-2-37 Maximum Modelled Concentrations on rank 19 - Particulates < 10µm (PM10) - 24-hour - Case 2 (Worst Case: Bypass)

B-2-38 Maximum Modelled Concentrations - Particulates < 10µm (PM10) - 1-year - Case 2 (Annual Scenario)

B-2-39 Maximum Modelled Concentrations - Particulates < 10µm (PM10) - 1-year - Case 2 (Annual Scenario)

B-2-40 Maximum Modelled Concentrations - Hydrogen fluoride (HF) - 1-hour - Case 2 (Dual Scrubbers)

B-2-41 Maximum Modelled Concentrations - Hydrogen fluoride (HF) - 4416-hour - Case 2 (Dual Scrubbers)

With background concentrations (B-2-42 to B-2-77)

B-2-42 **Maximum Modelled Concentrations on rank 25 - Sulfur dioxide (SO2) - 1-hour - Case 1 (Worst Case: Bypass)**

B-2-43 **Maximum Modelled Concentrations on rank 25 - Sulfur dioxide (SO2) - 1-hour - Case 1 (Dual Scrubbers)**

B-2-44 **Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 1-hour - Case 1 (Worst Case: Bypass)**

B-2-45 **Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 1-hour - Case 1 (Dual Scrubbers)**

B-2-46 **Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 24-hour - Case 1 (Worst Case: Bypass)**

B-2-47 **Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 24-hour - Case 1 (Dual Scrubbers)**

B-2-48 **Maximum Modelled Concentrations on rank 19 - Sulfur dioxide (SO2) - 24-hour - Case 1 (Worst Case: Bypass)**

B-2-49 **Maximum Modelled Concentrations on rank 19 - Sulfur dioxide (SO2) - 24-hour - Case 1 (Dual Scrubbers)**

B-2-50 **Maximum Modelled Concentrations - Sulfur dioxide (SO2) - 1-year - Case 1 (Annual Scenario)**

B-2-51 **Maximum Modelled Concentrations on rank 19 - Nitrogen dioxide (NO2) - 1-hour - Case 1 (Worst Case: Bypass)**

B-2-52 **Maximum Modelled Concentrations on rank 4 - Nitrogen dioxide (NO2) - 1-hour - Case 1 (Worst Case: Bypass)**

B-2-53 **Maximum Modelled Concentrations on rank 19 - Nitrogen dioxide (NO2) - 24-hour - Case 1 (Worst Case: Bypass)**

B-2-54 **Maximum Modelled Concentrations - Nitrogen dioxide (NO2) - 1-year - Case 1 (Annual Scenario)**

B-2-55 **Maximum Modelled Concentrations - Nitrogen dioxide (NO2) - 1-year - Case 1 (Annual Scenario)**

B-2-56 **Maximum Modelled Concentrations on rank 36 - Particulates < 10µm (PM10) - 24-hour - Case 1 (Worst Case: Bypass)**

B-2-57 **Maximum Modelled Concentrations on rank 19 - Particulates < 10µm (PM10) - 24-hour - Case 1 (Worst Case: Bypass)**

B-2-58 **Maximum Modelled Concentrations - Particulates < 10µm (PM10) - 1-year - Case 1 (Annual Scenario)**

B-2-59 **Maximum Modelled Concentrations - Particulates < 10µm (PM10) - 1-year - Case 1 (Annual Scenario)**

B-2-60 **Maximum Modelled Concentrations on rank 25 - Sulfur dioxide (SO2) - 1-hour - Case 2 (Worst Case: Bypass)**

B-2-61 **Maximum Modelled Concentrations on rank 25 - Sulfur dioxide (SO2) - 1-hour - Case 2 (Dual Scrubbers)**

B-2-62 **Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 1-hour - Case 2 (Worst Case: Bypass)**

B-2-63 **Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 1-hour - Case 2 (Dual Scrubbers)**

B-2-64 **Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 24-hour - Case 2 (Worst Case: Bypass)**

B-2-65 **Maximum Modelled Concentrations on rank 4 - Sulfur dioxide (SO2) - 24-hour - Case 2 (Dual Scrubbers)**

B-2-66 **Maximum Modelled Concentrations on rank 19 - Sulfur dioxide (SO2) - 24-hour - Case 2 (Worst Case: Bypass)**

B-2-67 **Maximum Modelled Concentrations on rank 19 - Sulfur dioxide (SO2) - 24-hour - Case 2 (Dual Scrubbers)**

B-2-68 **Maximum Modelled Concentrations - Sulfur dioxide (SO2) - 1-year - Case 2 (Annual Scenario)**

B-2-69 **Maximum Modelled Concentrations on rank 19 - Nitrogen dioxide (NO2) - 1-hour - Case 2 (Worst Case: Bypass)**

B-2-70 **Maximum Modelled Concentrations on rank 4 - Nitrogen dioxide (NO2) - 1-hour - Case 2 (Worst Case: Bypass)**

B-2-71 **Maximum Modelled Concentrations on rank 19 - Nitrogen dioxide (NO2) - 24-hour - Case 2 (Worst Case: Bypass)**

B-2-72 **Maximum Modelled Concentrations - Nitrogen dioxide (NO2) - 1-year - Case 2 (Annual Scenario)**

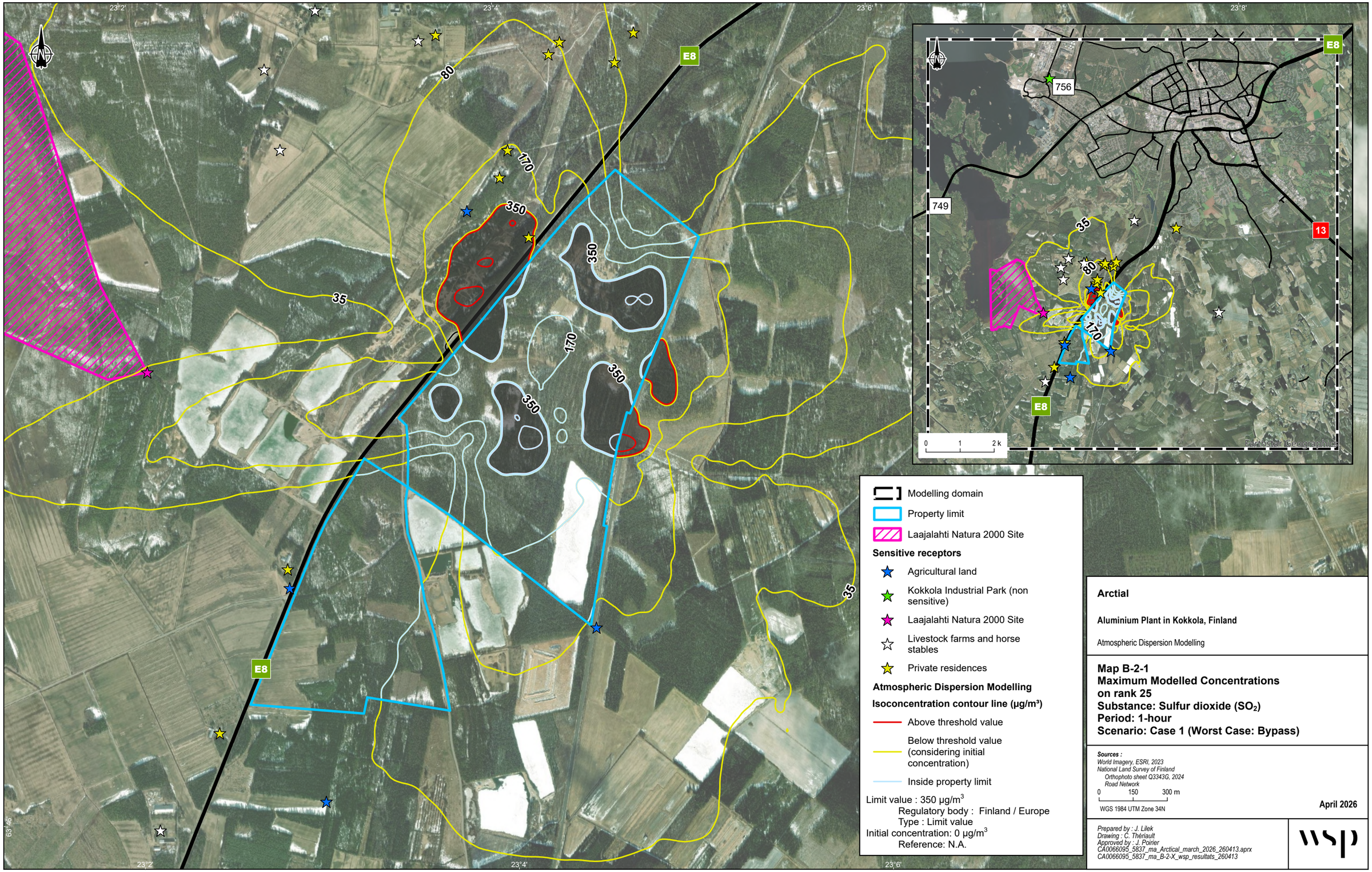
B-2-73 **Maximum Modelled Concentrations - Nitrogen dioxide (NO2) - 1-year - Case 2 (Annual Scenario)**

B-2-74 **Maximum Modelled Concentrations on rank 36 - Particulates < 10µm (PM10) - 24-hour - Case 2 (Worst Case: Bypass)**

B-2-75 **Maximum Modelled Concentrations on rank 19 - Particulates < 10µm (PM10) - 24-hour - Case 2 (Worst Case: Bypass)**

B-2-76 **Maximum Modelled Concentrations - Particulates < 10µm (PM10) - 1-year - Case 2 (Annual Scenario)**

B-2-77 **Maximum Modelled Concentrations - Particulates < 10µm (PM10) - 1-year - Case 2 (Annual Scenario)**



Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-1
Maximum Modelled Concentrations on rank 25
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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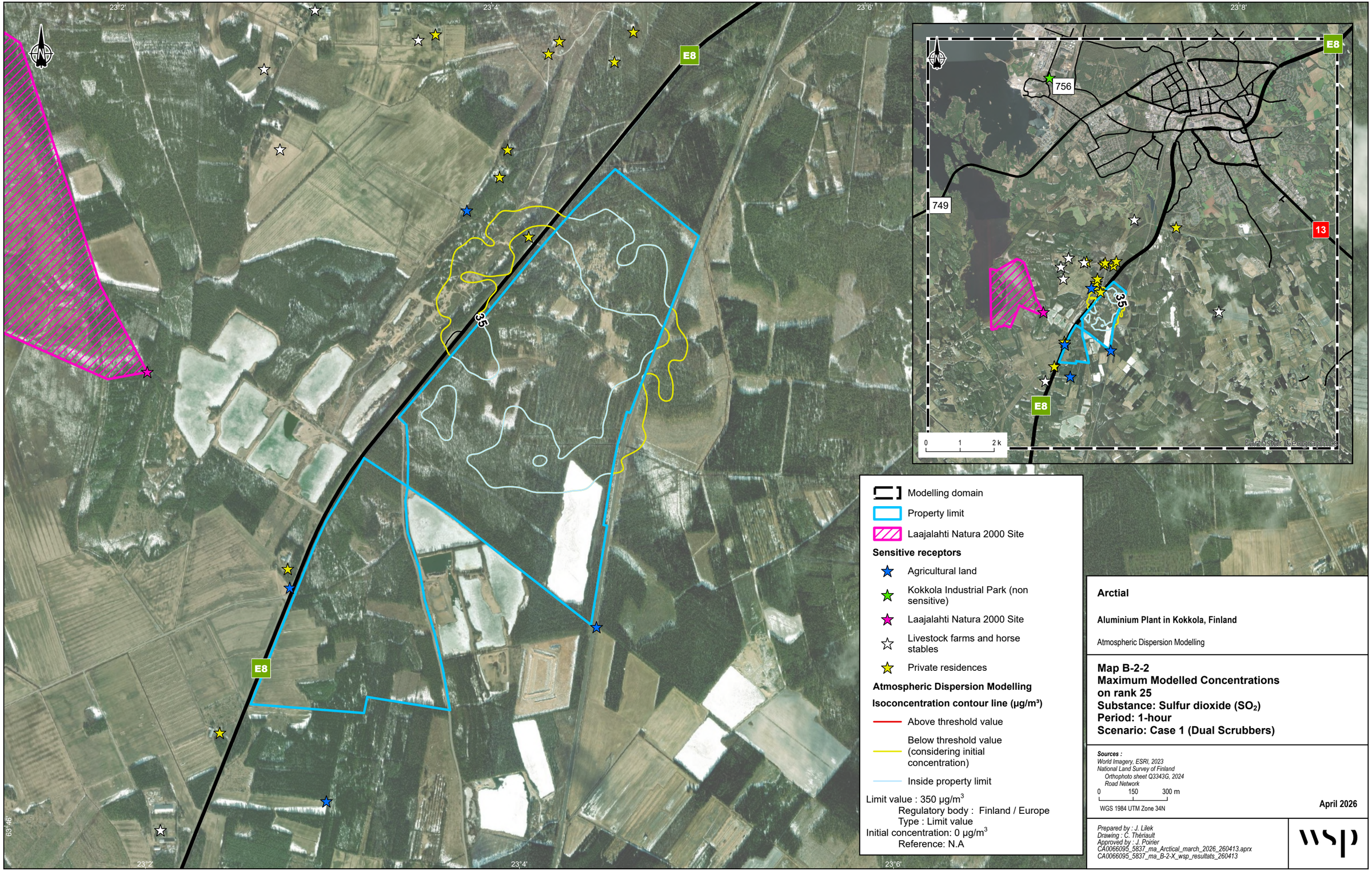

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-2
Maximum Modelled Concentrations on rank 25
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 1 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
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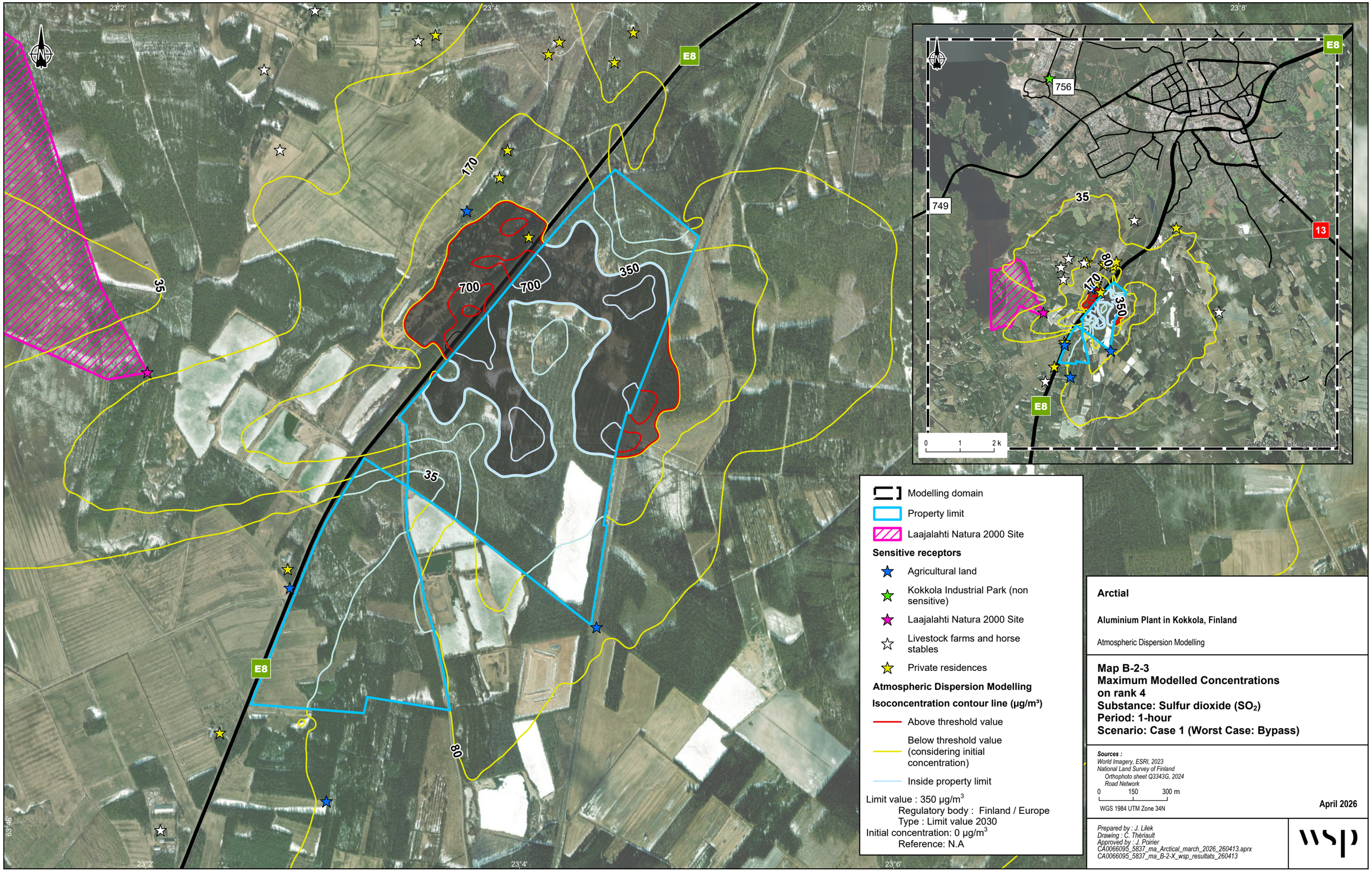

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-3
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
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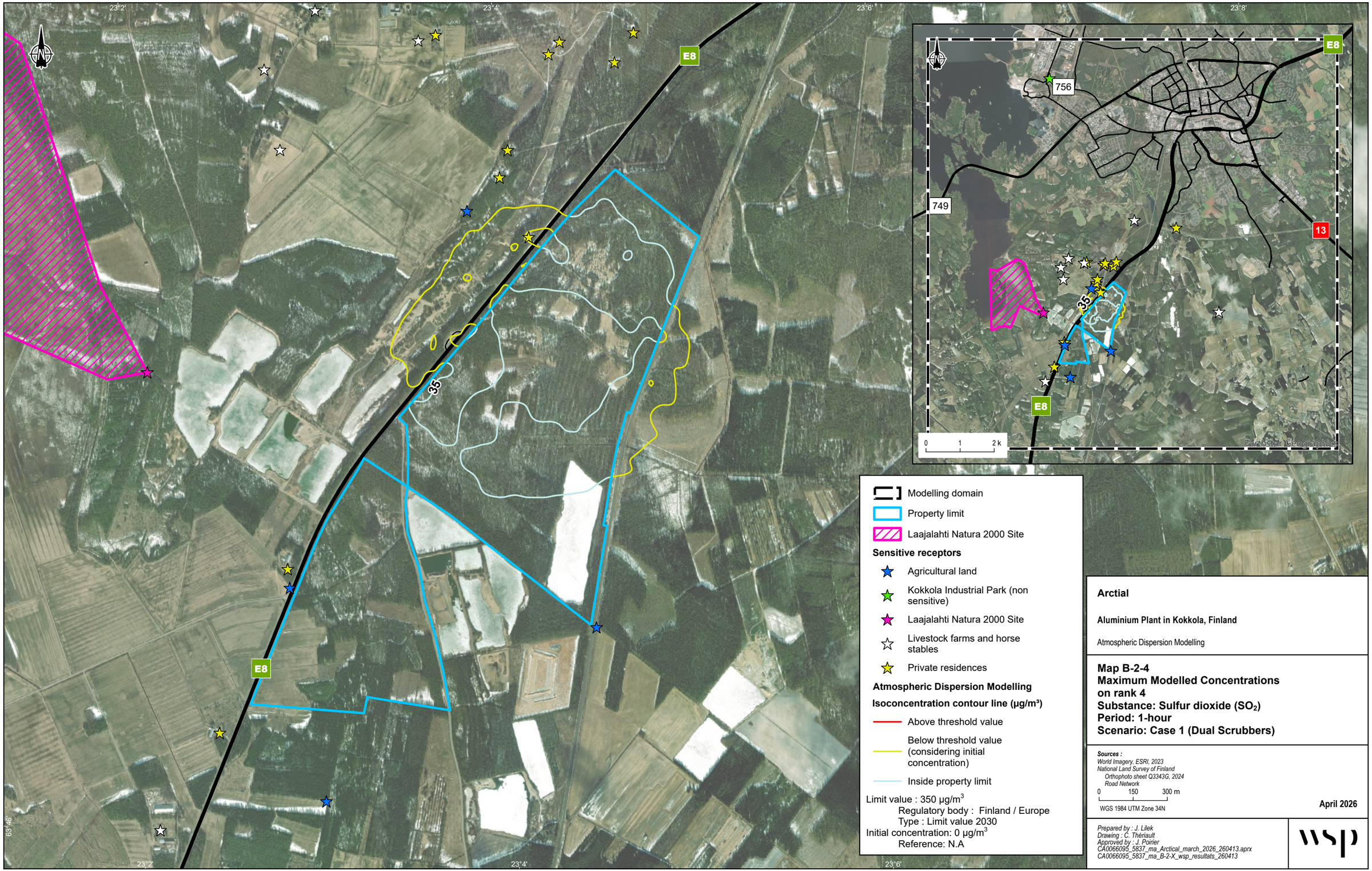

Modelling domain
Property limit
Laajalahti Natura 2000 Site

Sensitive receptors

- Agricultural land
- Kokkola Industrial Park (non sensitive)
- Laajalahti Natura 2000 Site
- Livestock farms and horse stables
- Private residences

Atmospheric Dispersion Modelling

Isoconcentration contour line (µg/m³)

- Above threshold value
- Below threshold value (considering initial concentration)
- Inside property limit

Limit value : 350 µg/m^3
Regulatory body : Finland / Europe
Type : Limit value 2030
Initial concentration: 0 µg/m^3
Reference: N.A

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Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-4
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 1 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
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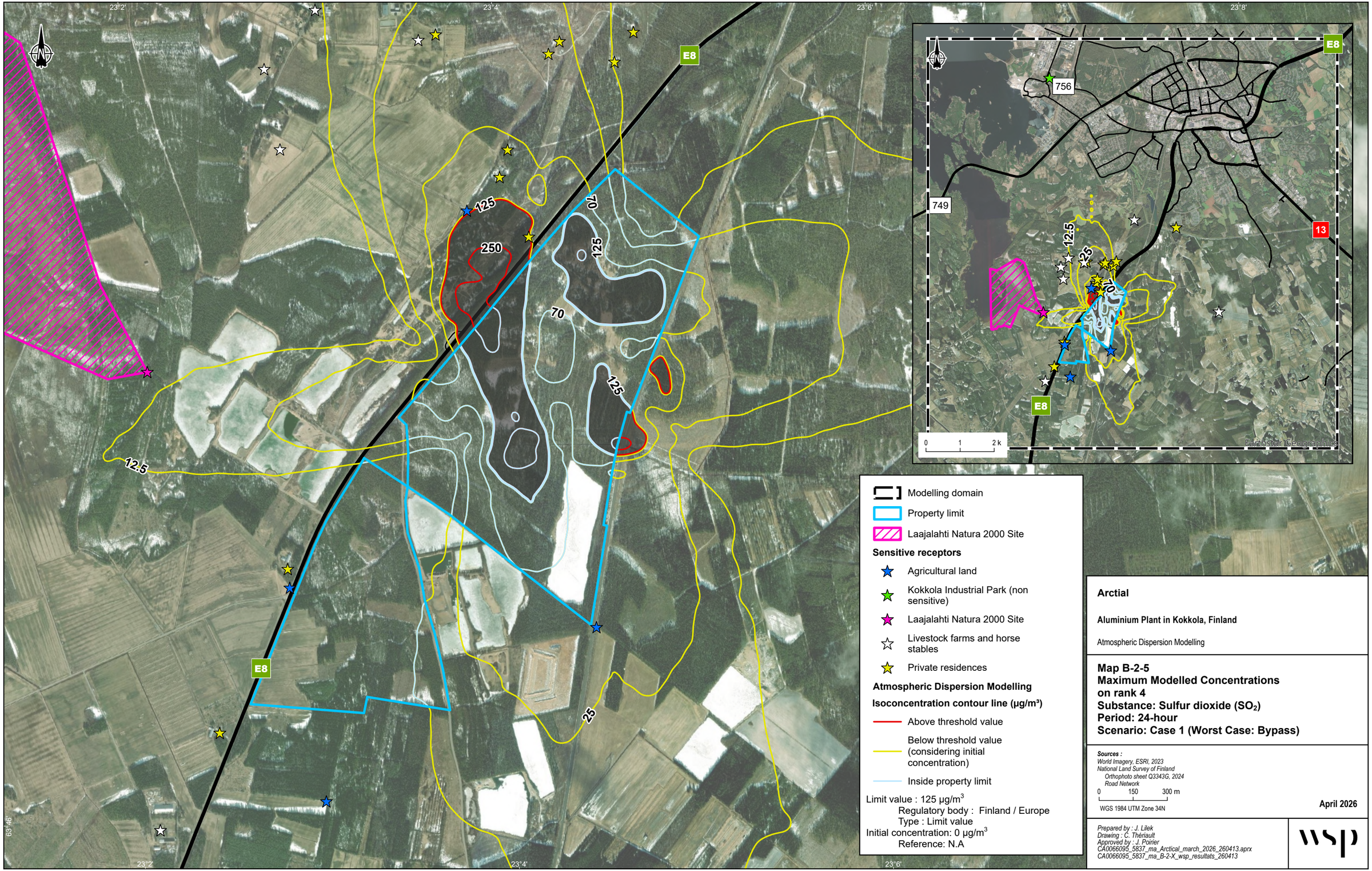

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Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-5
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

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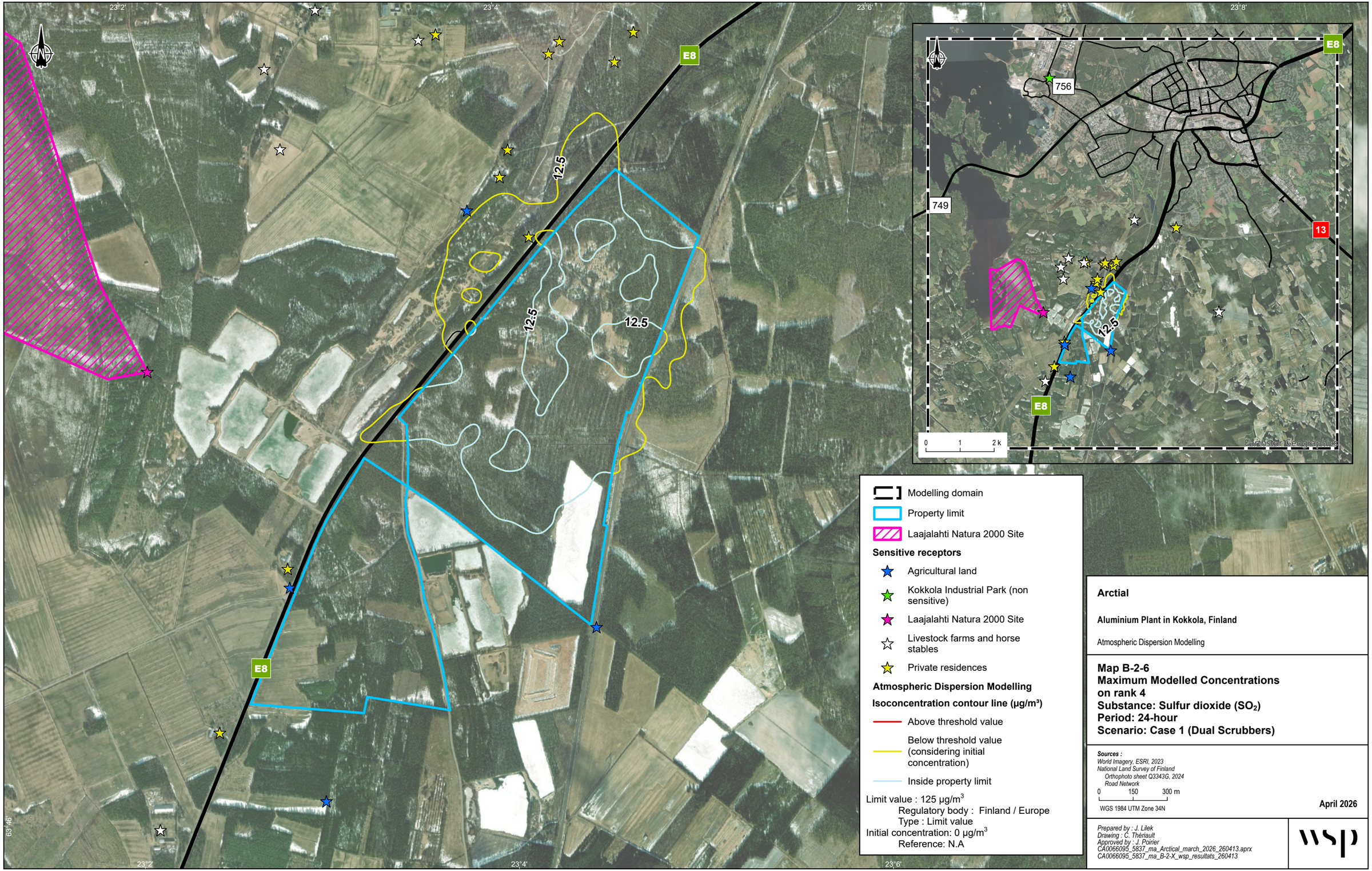

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Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-6
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 1 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
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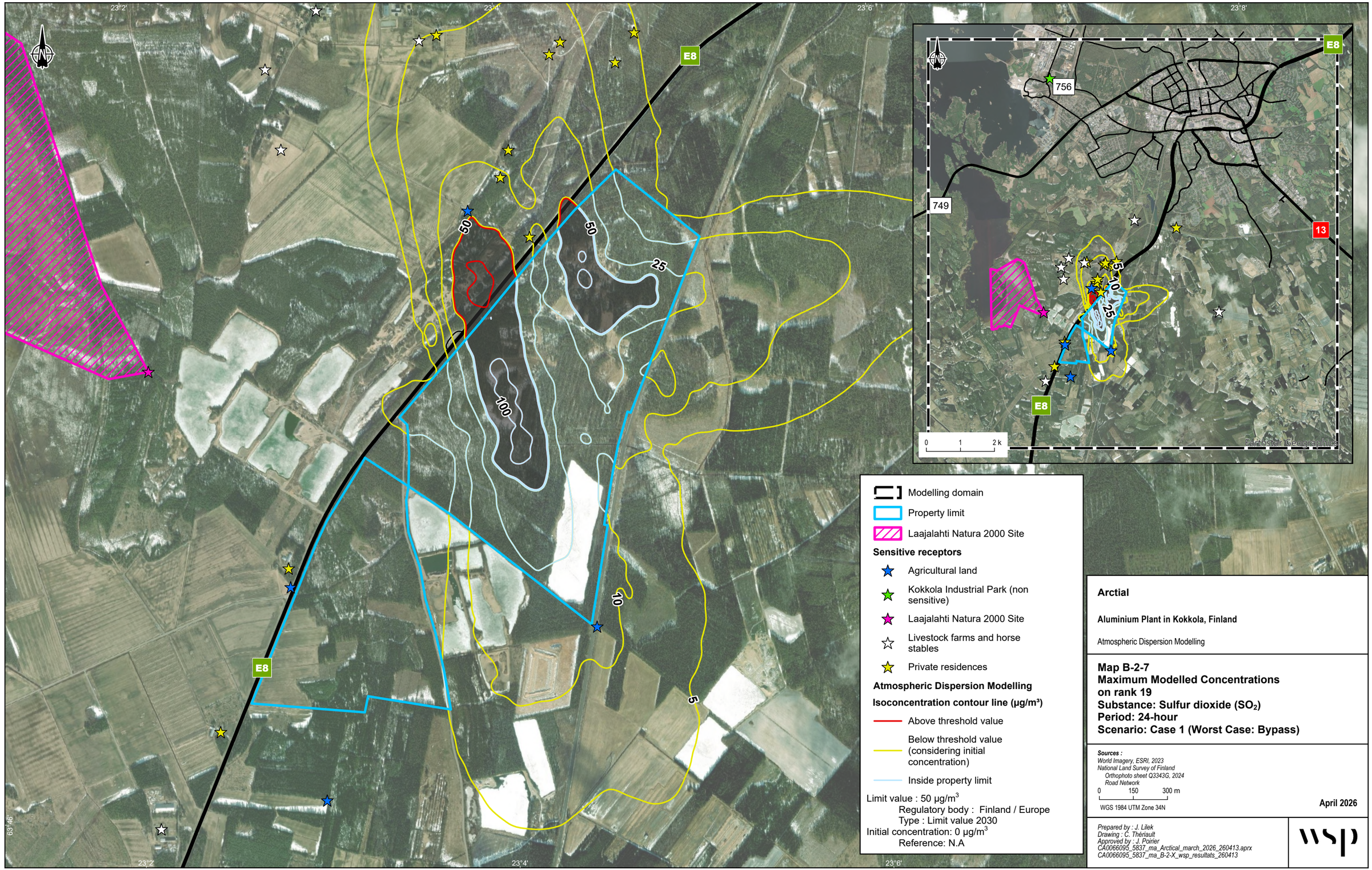

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Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-7
Maximum Modelled Concentrations on rank 19
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
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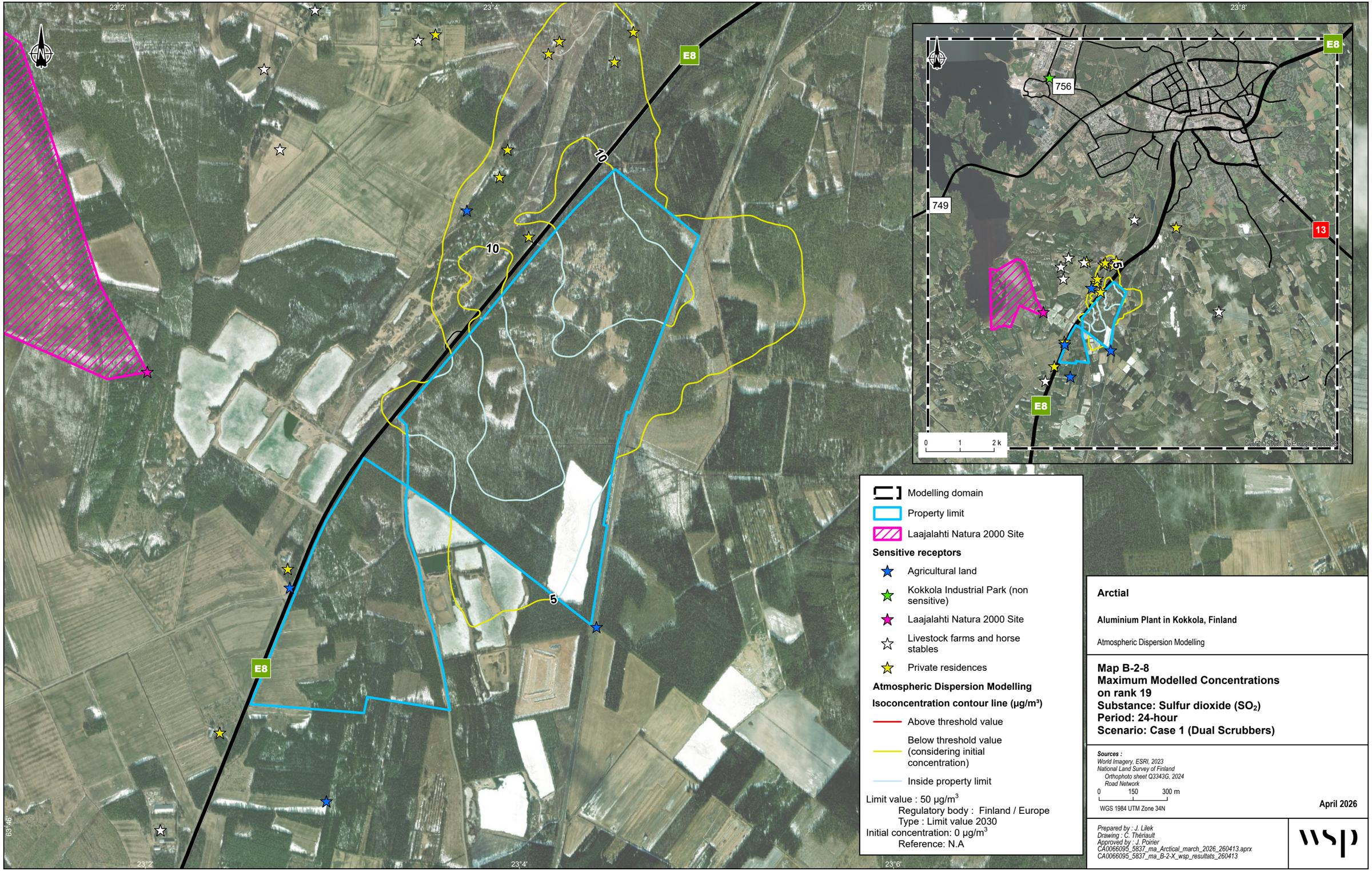

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Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-8
Maximum Modelled Concentrations on rank 19
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 1 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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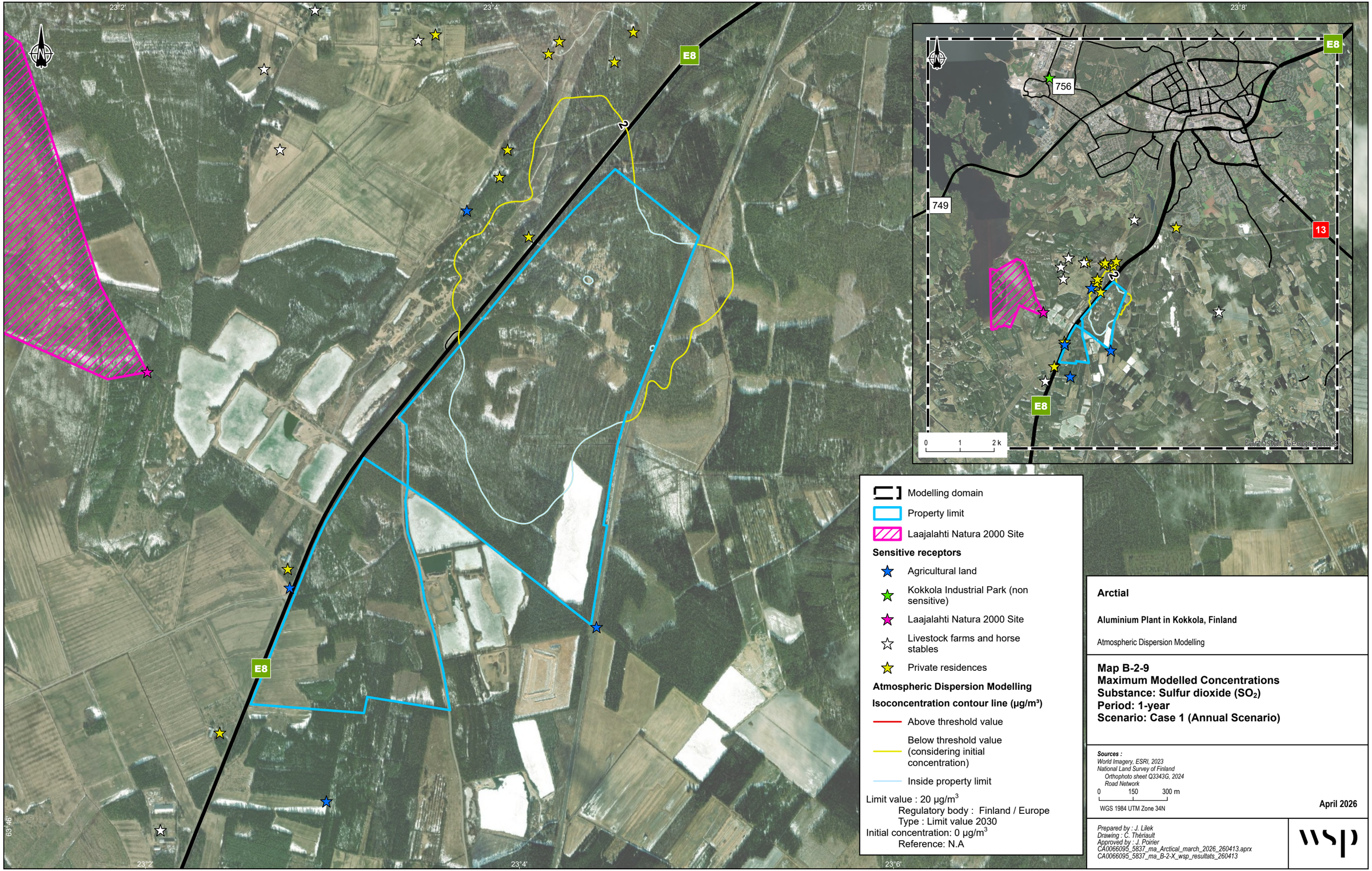

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-9
Maximum Modelled Concentrations
Substance: Sulfur dioxide (SO_2)
Period: 1-year
Scenario: Case 1 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
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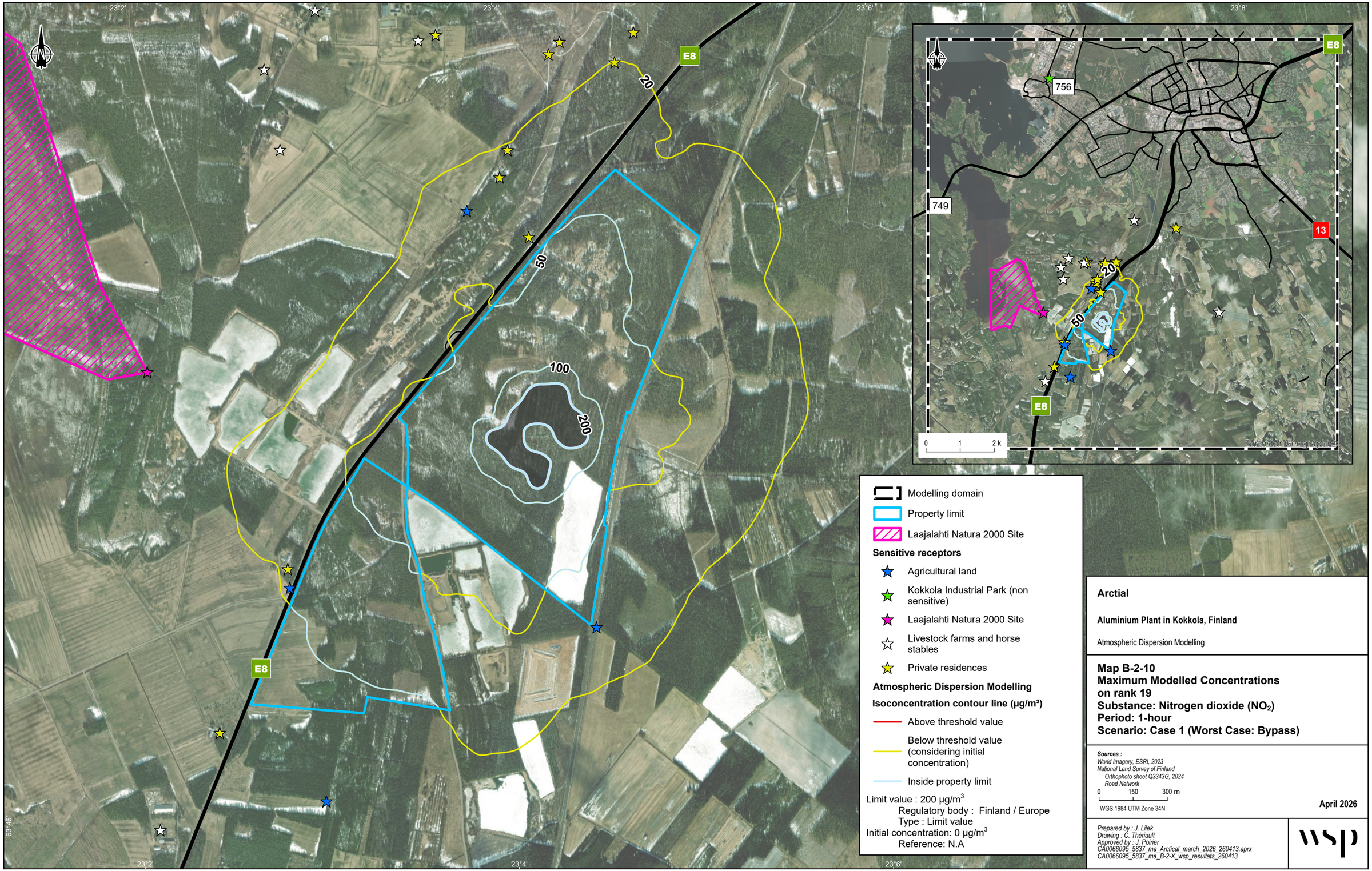

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-10
Maximum Modelled Concentrations on rank 19
Substance: Nitrogen dioxide (NO_2)
Period: 1-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
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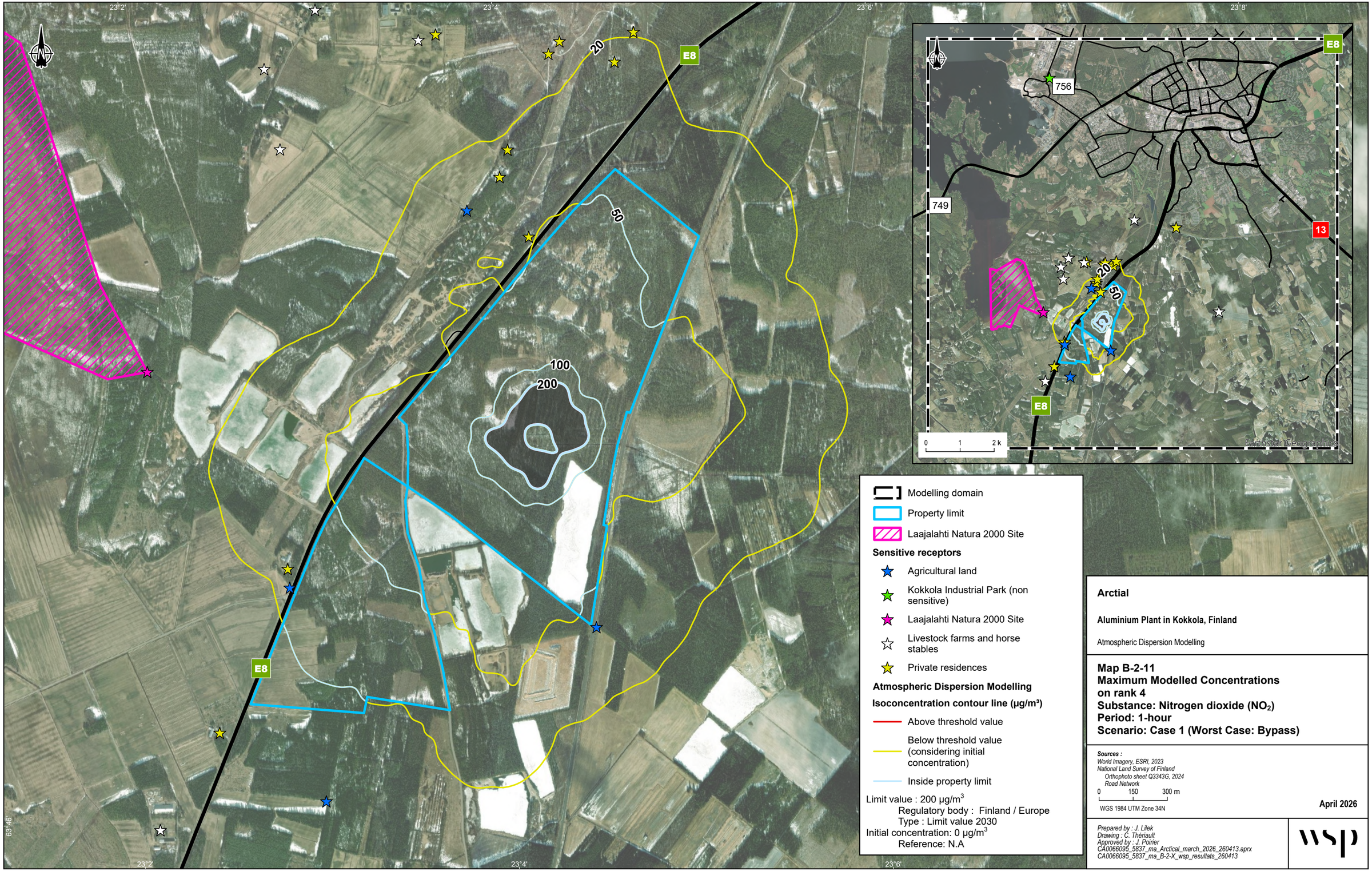

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-11
Maximum Modelled Concentrations on rank 4
Substance: Nitrogen dioxide (NO_2)
Period: 1-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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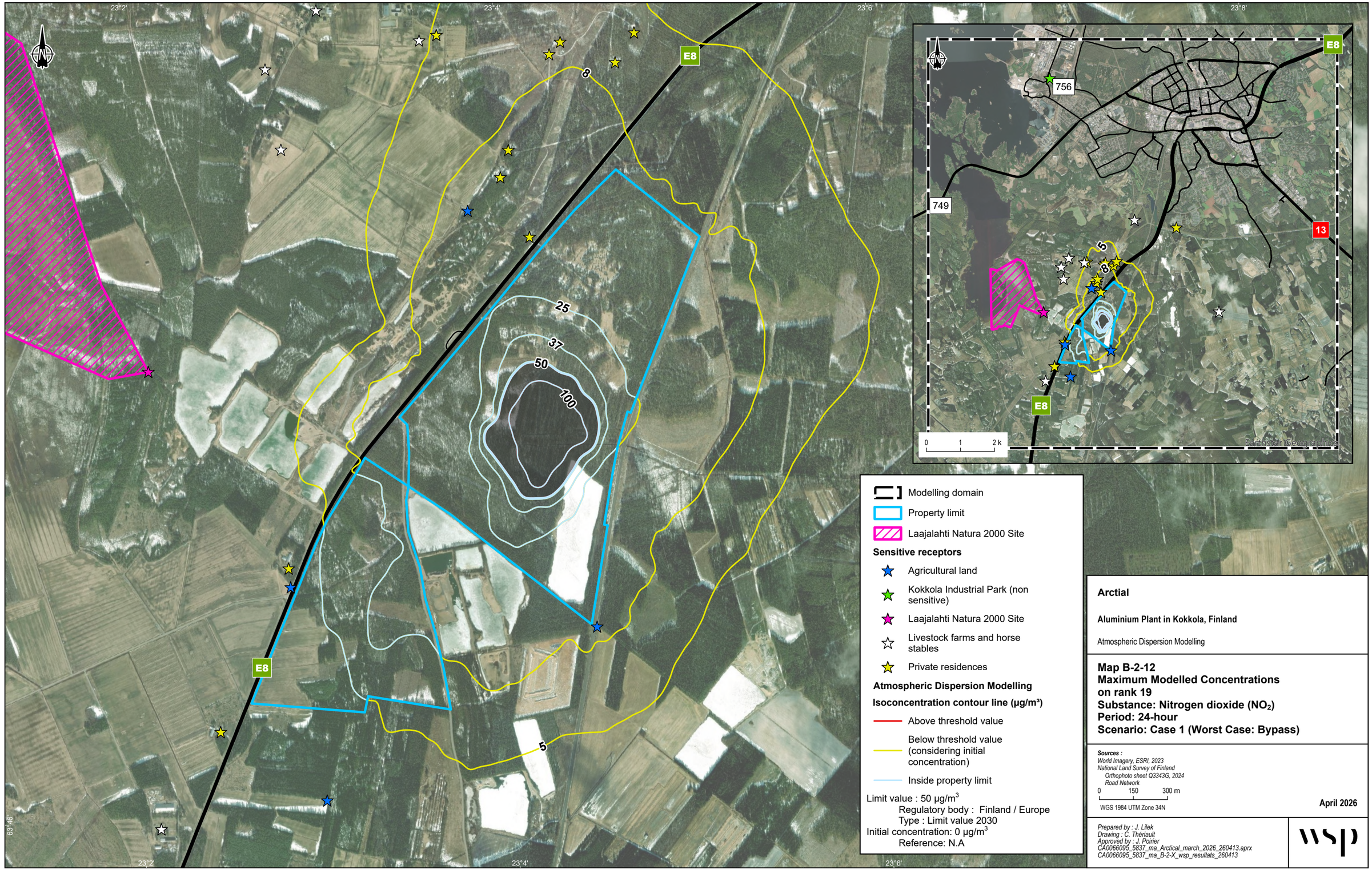

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-12
Maximum Modelled Concentrations on rank 19
Substance: Nitrogen dioxide (NO_2)
Period: 24-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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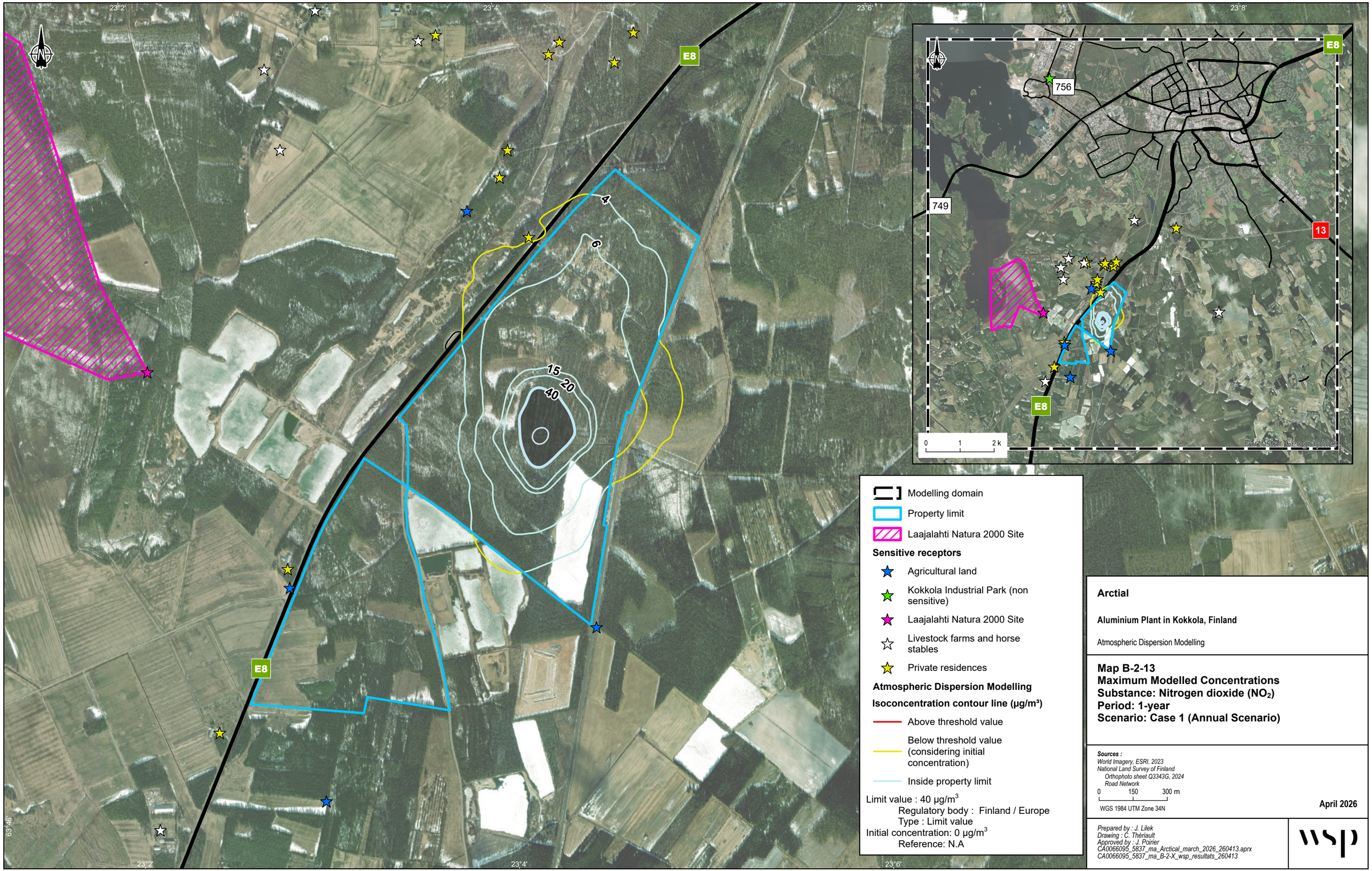

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-13
Maximum Modelled Concentrations
Substance: Nitrogen dioxide (NO_2)
Period: 1-year
Scenario: Case 1 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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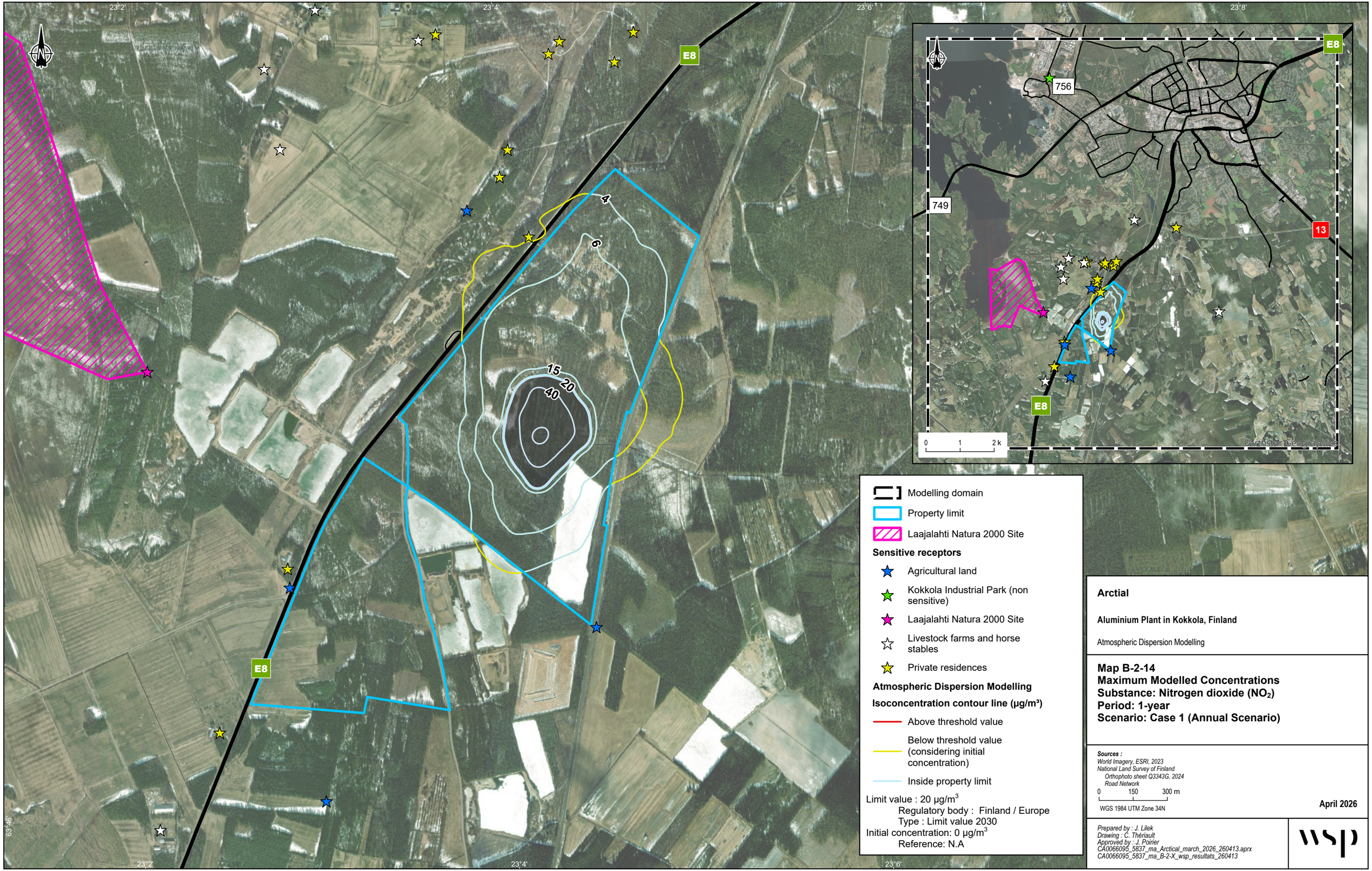

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-14
Maximum Modelled Concentrations
Substance: Nitrogen dioxide (NO_2)
Period: 1-year
Scenario: Case 1 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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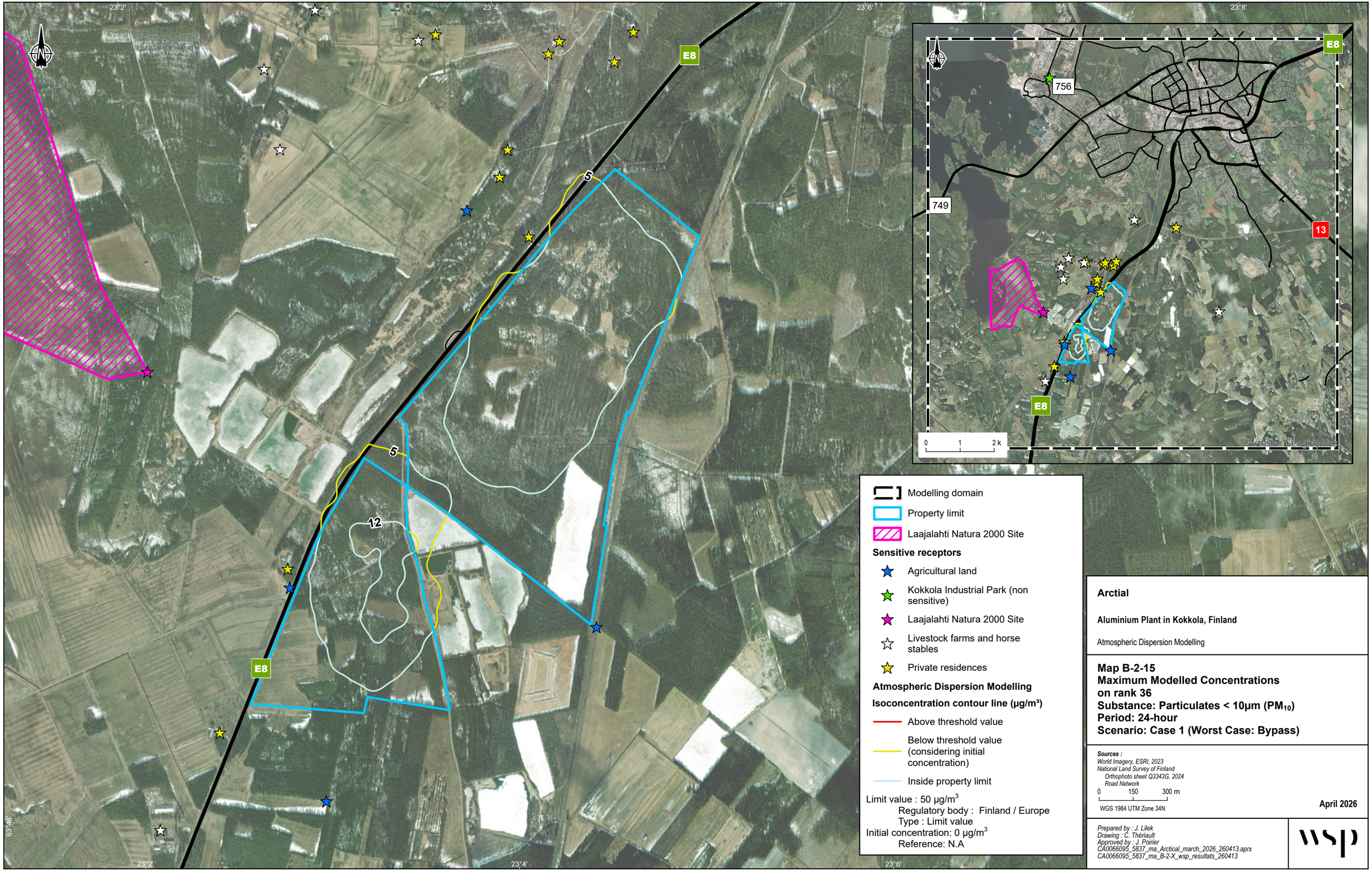

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-15
Maximum Modelled Concentrations on rank 36
Substance: Particulates < 10µm (PM_{10})
Period: 24-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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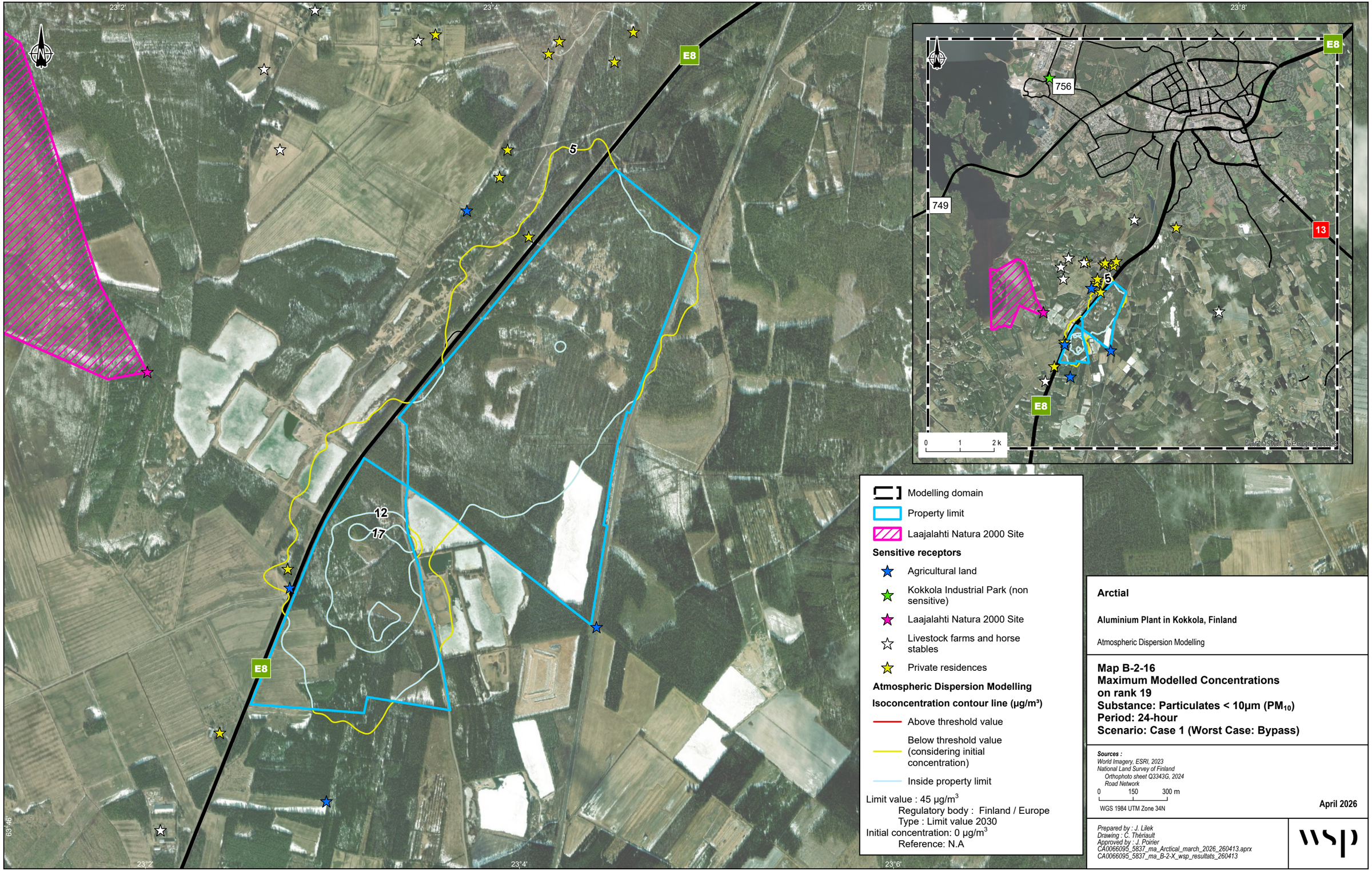

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-16
Maximum Modelled Concentrations on rank 19
Substance: Particulates < 10µm (PM_{10})
Period: 24-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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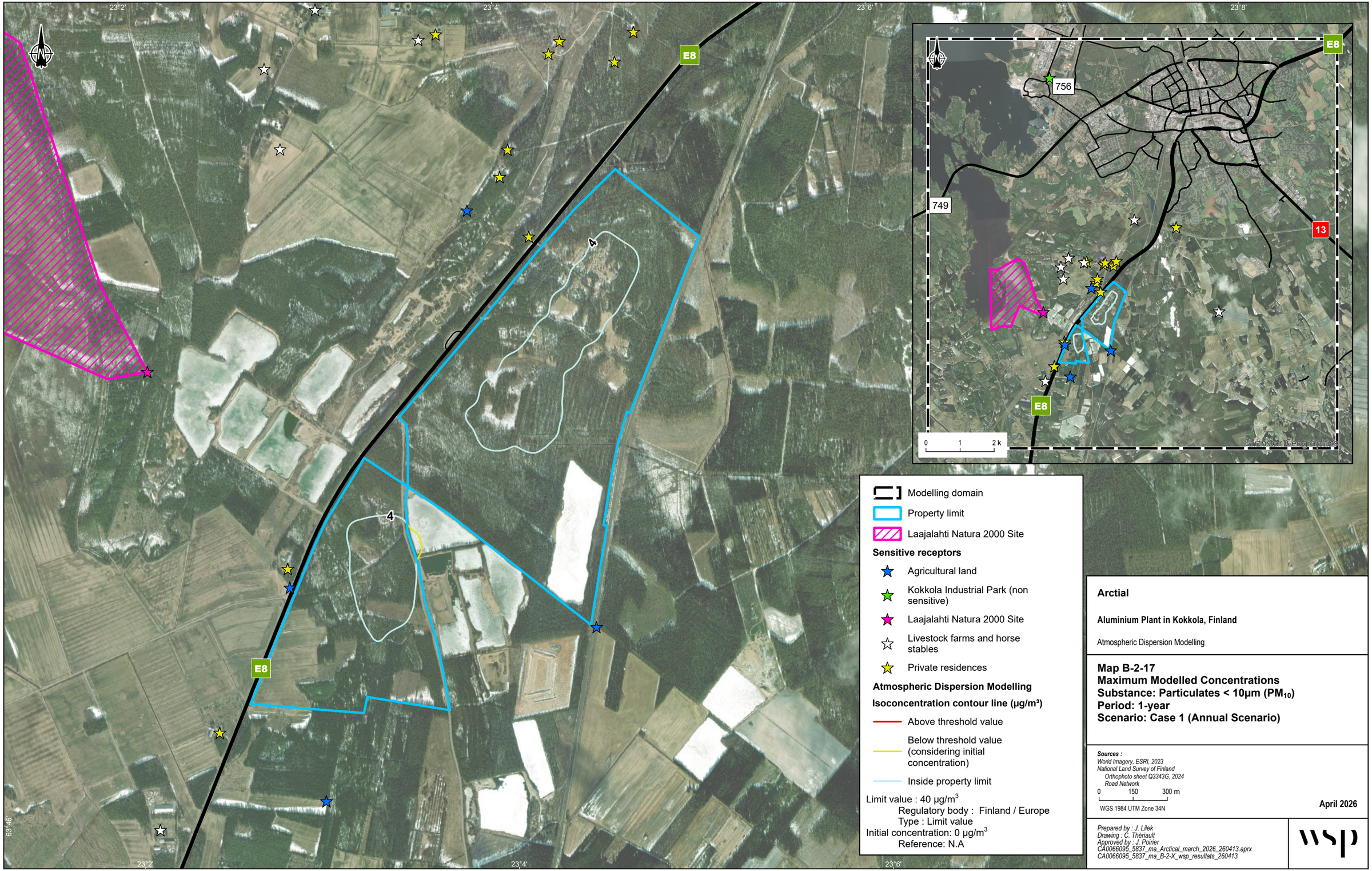

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-17
Maximum Modelled Concentrations
Substance: Particulates < 10µm (PM_{10})
Period: 1-year
Scenario: Case 1 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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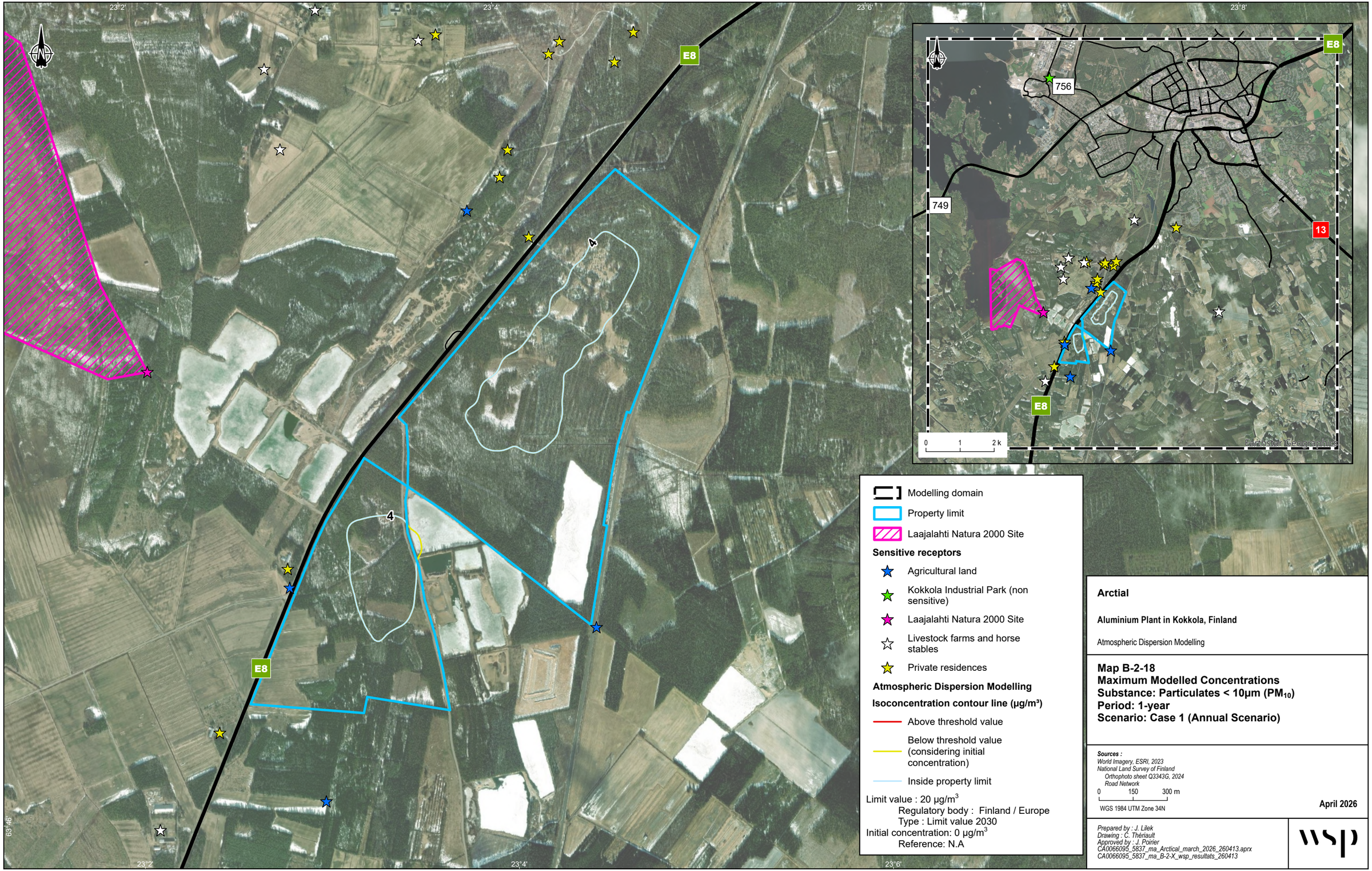

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-18
Maximum Modelled Concentrations
Substance: Particulates < 10µm (PM_{10})
Period: 1-year
Scenario: Case 1 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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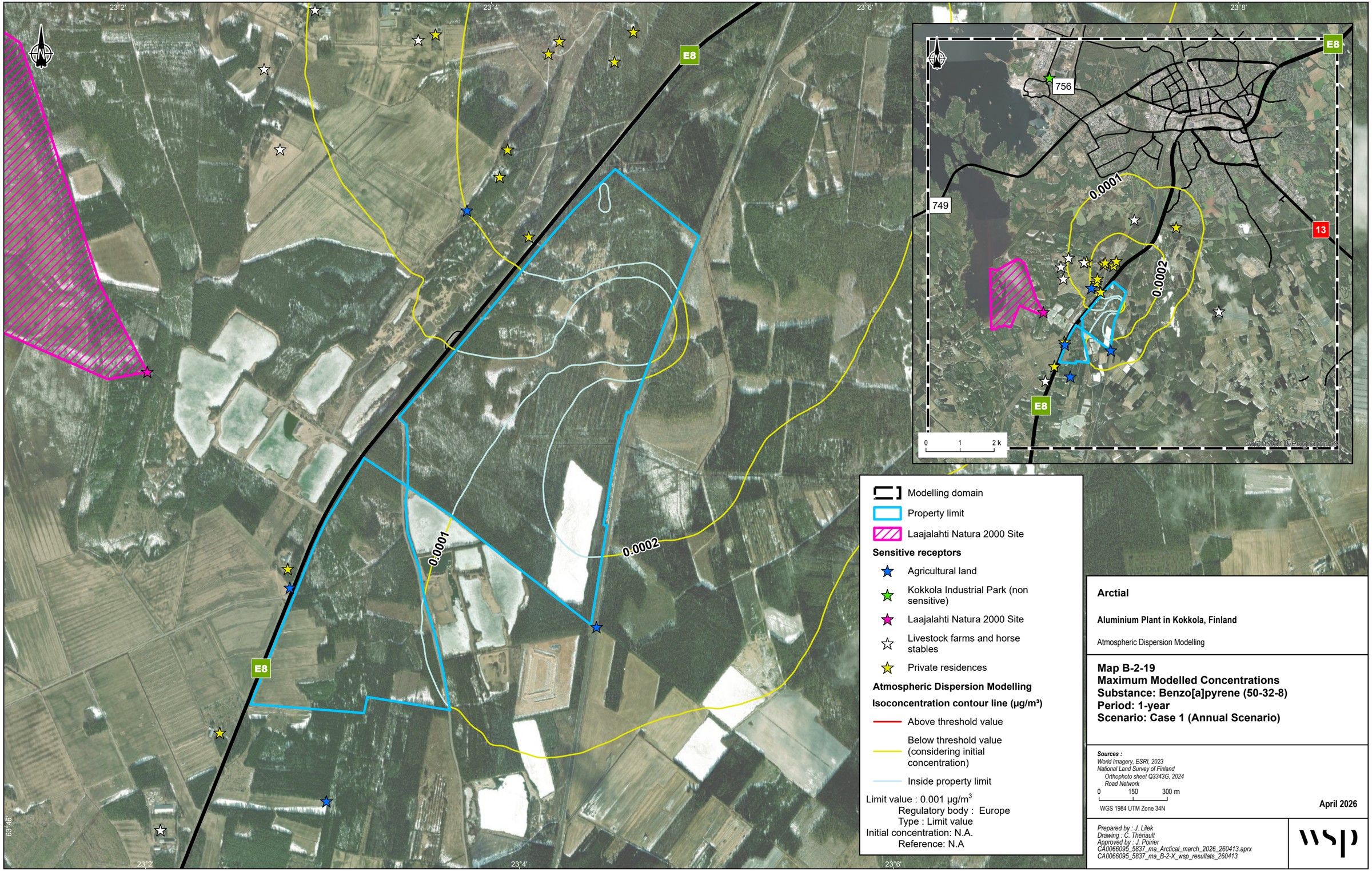

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-19
Maximum Modelled Concentrations
Substance: Benzo[a]pyrene (50-32-8)
Period: 1-year
Scenario: Case 1 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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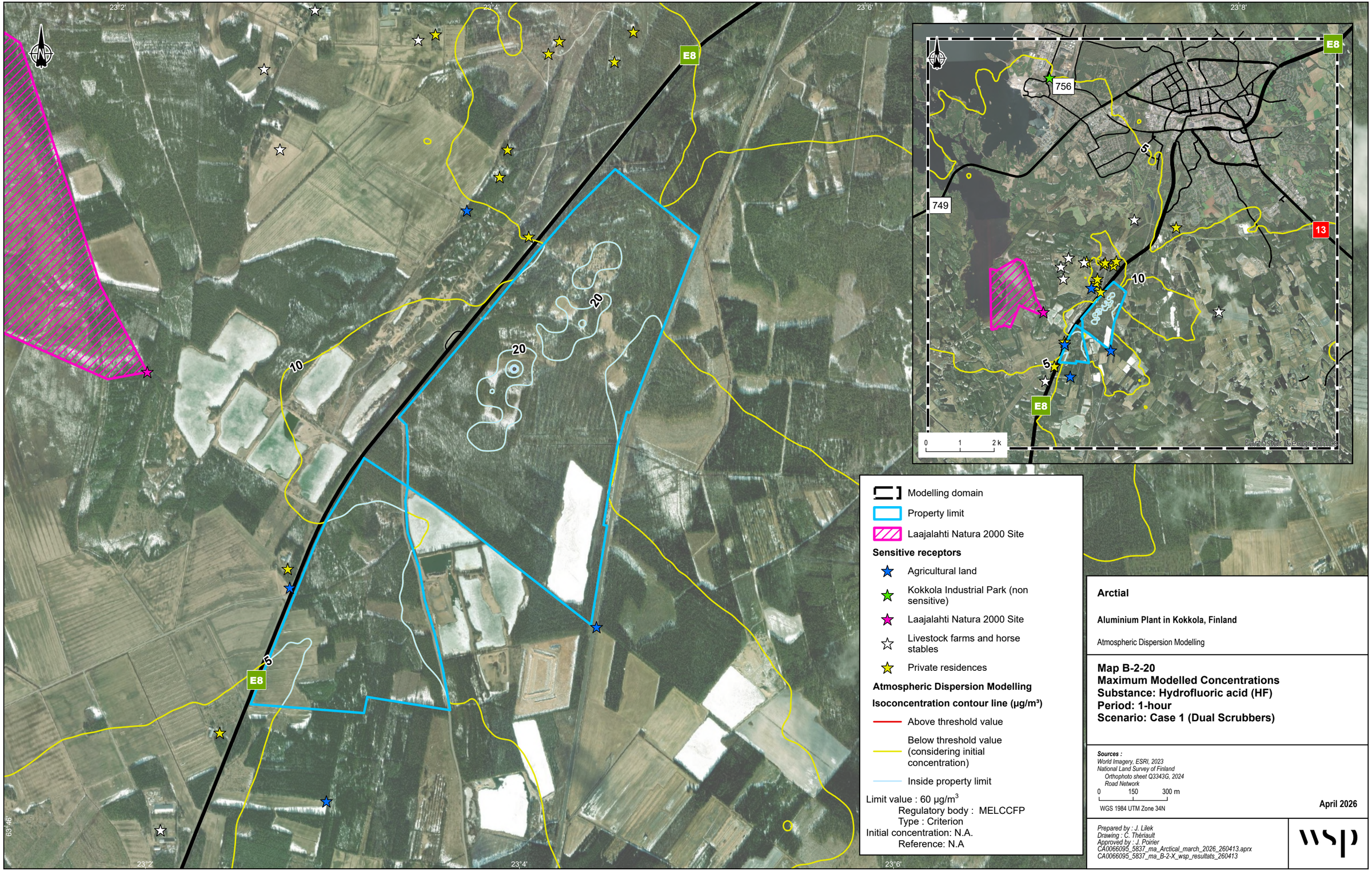

Modelling domain
Property limit
Laajalahti Natura 2000 Site

Sensitive receptors

- Agricultural land
- Kokkola Industrial Park (non sensitive)
- Laajalahti Natura 2000 Site
- Livestock farms and horse stables
- Private residences

Atmospheric Dispersion Modelling

Isoconcentration contour line (µg/m³)

- Above threshold value
- Below threshold value (considering initial concentration)
- Inside property limit

Limit value : 60 µg/m^3
Regulatory body : MELCCFP
Type : Criterion
Initial concentration: N.A.
Reference: N.A

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-20
Maximum Modelled Concentrations
Substance: Hydrofluoric acid (HF)
Period: 1-hour
Scenario: Case 1 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

wsp

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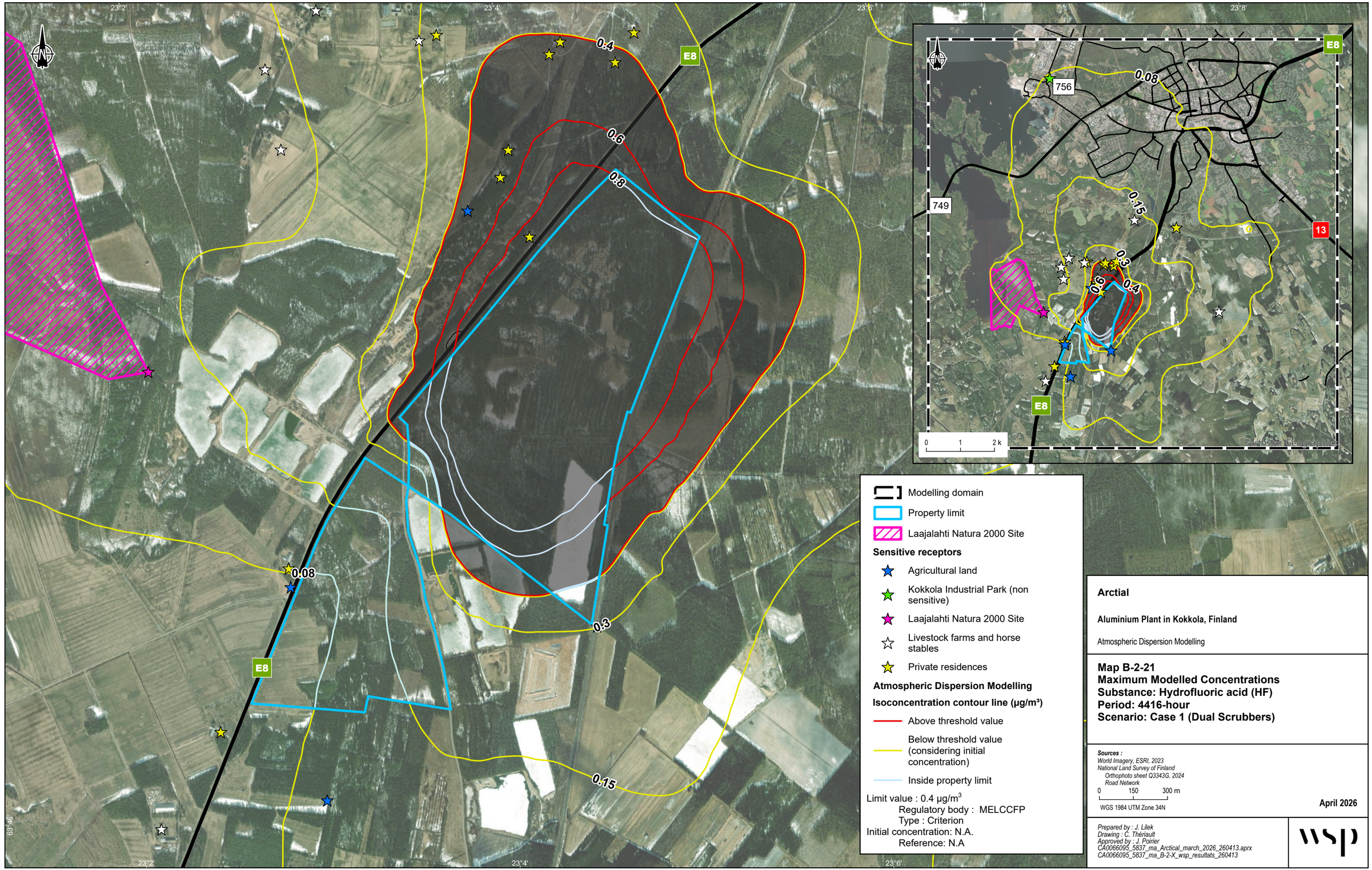

Modelling domain
Property limit
Laajalahti Natura 2000 Site

Sensitive receptors

- Agricultural land
- Kokkola Industrial Park (non sensitive)
- Laajalahti Natura 2000 Site
- Livestock farms and horse stables
- Private residences

Atmospheric Dispersion Modelling

Isoconcentration contour line (µg/m³)

- Above threshold value
- Below threshold value (considering initial concentration)
- Inside property limit

Limit value : 0.4 µg/m³
Regulatory body : MELCCFP
Type : Criterion
Initial concentration: N.A.
Reference: N.A

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-21
Maximum Modelled Concentrations
Substance: Hydrofluoric acid (HF)
Period: 4416-hour
Scenario: Case 1 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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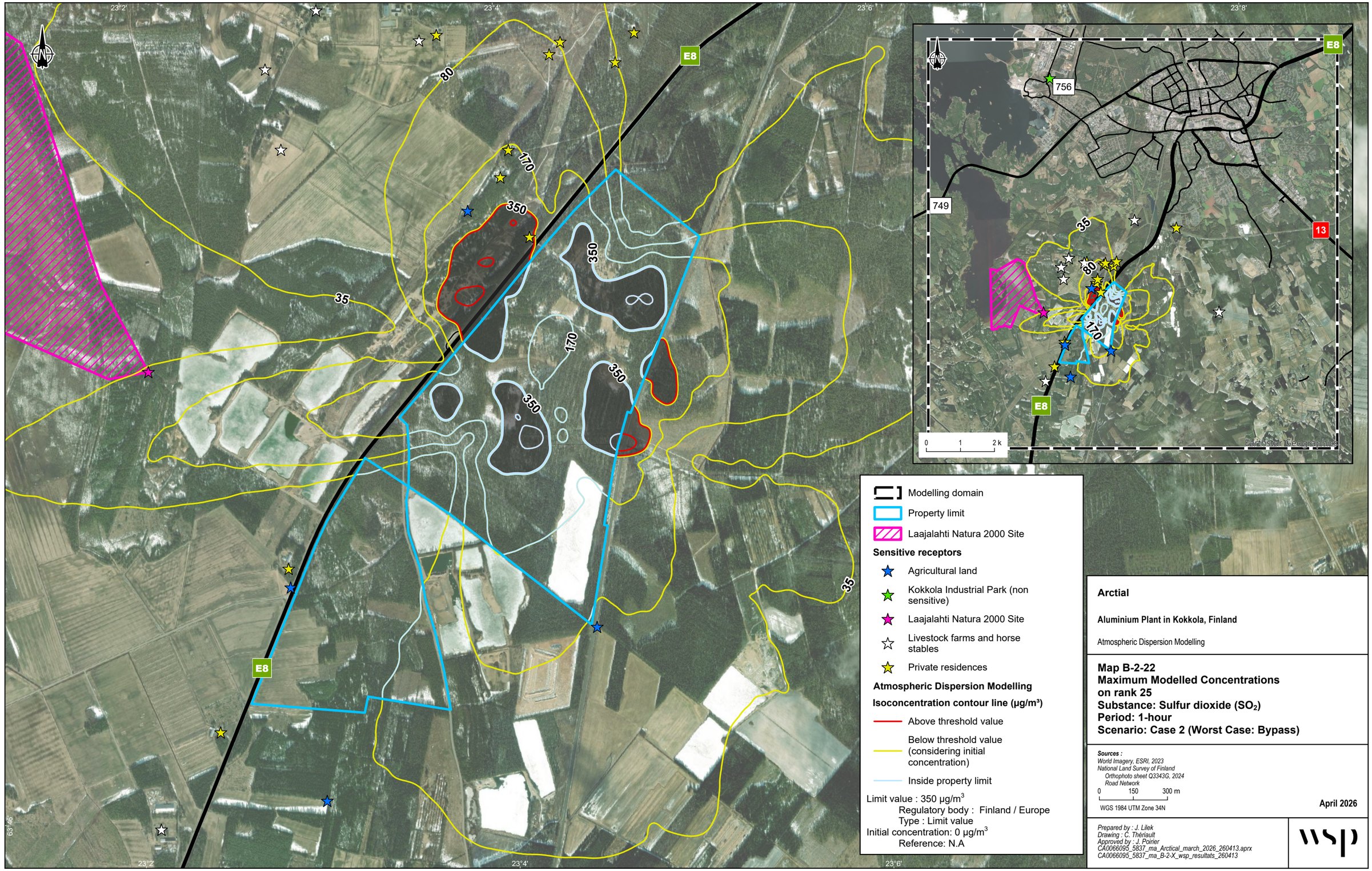

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-22
Maximum Modelled Concentrations on rank 25
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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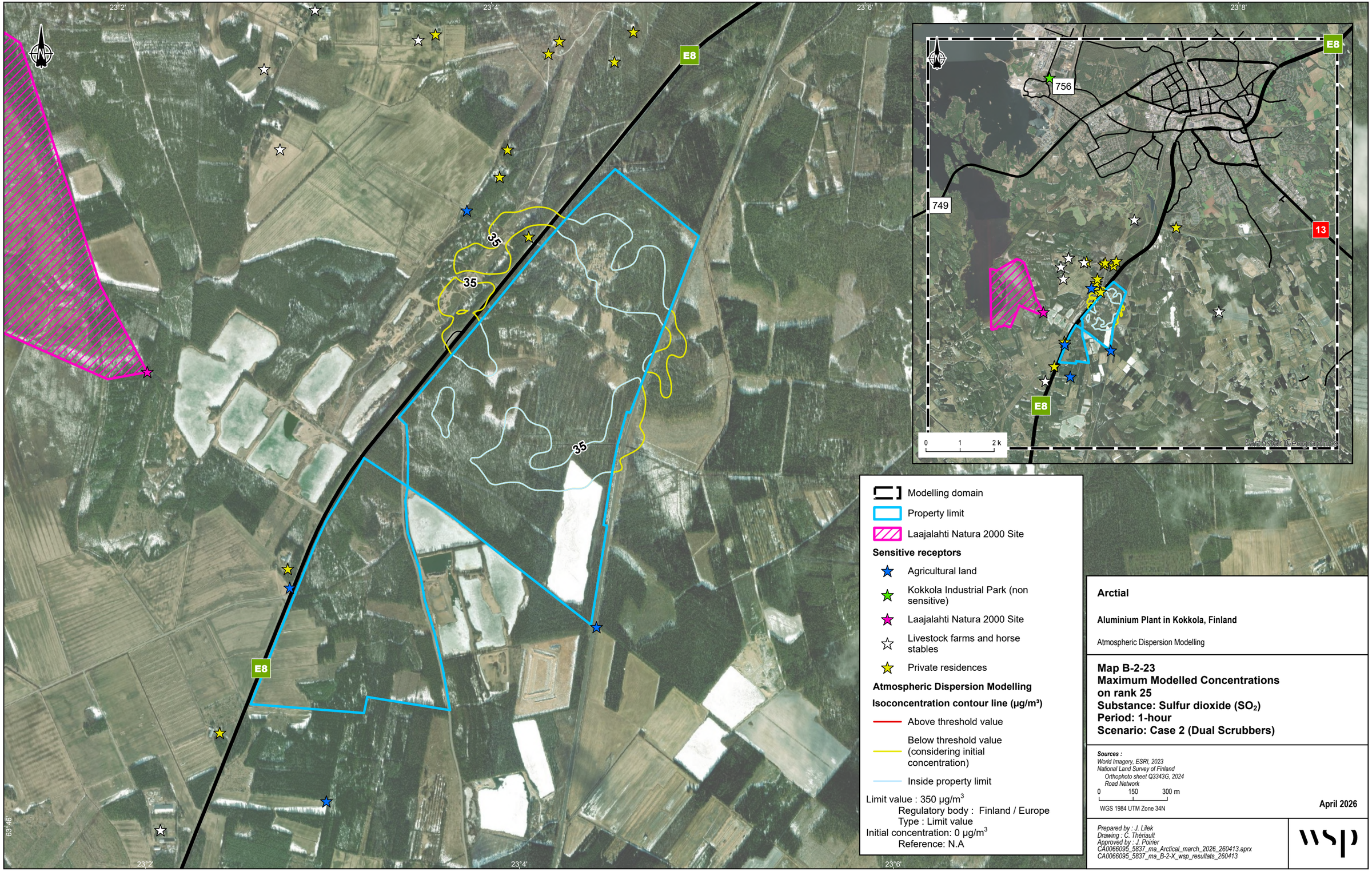

Modelling domain

Property limit

Laajalahti Natura 2000 Site

Sensitive receptors

Agricultural land

Kokkola Industrial Park (non sensitive)

Laajalahti Natura 2000 Site

Livestock farms and horse stables

Private residences

Atmospheric Dispersion Modelling

Isoconcentration contour line (µg/m³)

Above threshold value

Below threshold value (considering initial concentration)

Inside property limit

Limit value : 350 µg/m^3
Regulatory body : Finland / Europe
Type : Limit value
Initial concentration: 0 µg/m^3
Reference: N.A

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-23
Maximum Modelled Concentrations on rank 25
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 2 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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wsp

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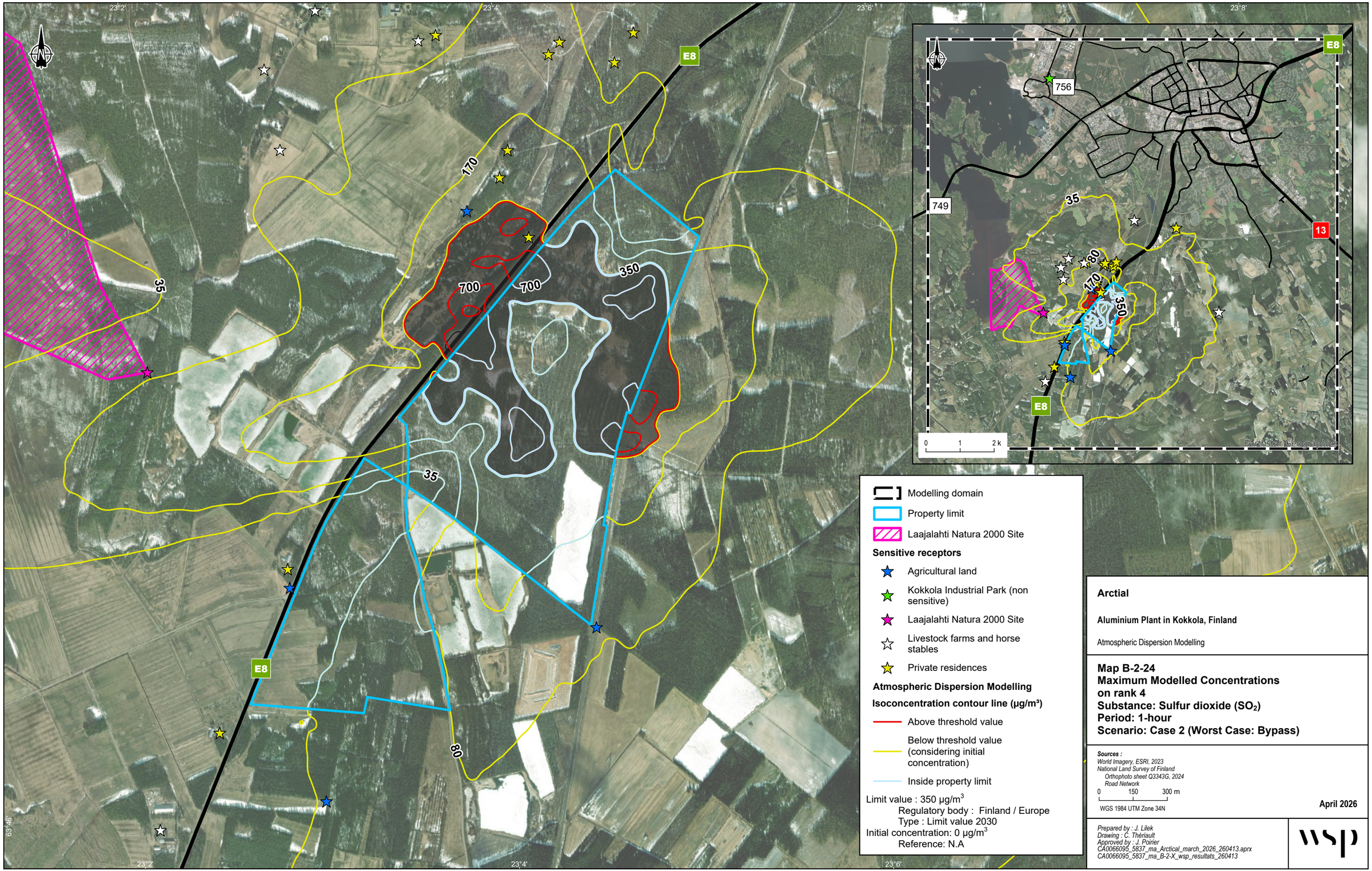

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-24
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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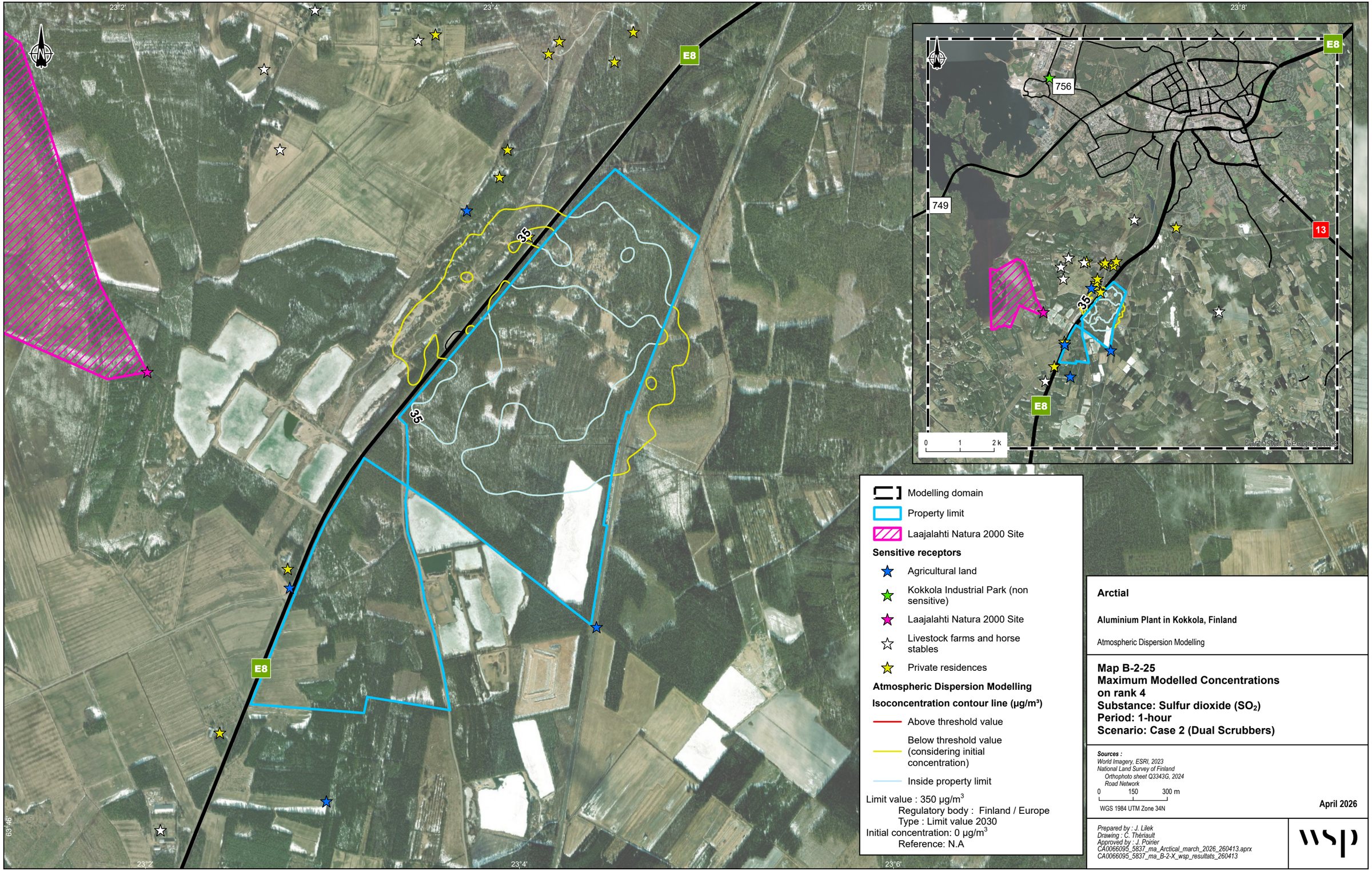

Modelling domain

Property limit

Laajalahti Natura 2000 Site

Sensitive receptors

Agricultural land

Kokkola Industrial Park (non sensitive)

Laajalahti Natura 2000 Site

Livestock farms and horse stables

Private residences

Atmospheric Dispersion Modelling

Isoconcentration contour line (µg/m³)

Above threshold value

Below threshold value (considering initial concentration)

Inside property limit

Limit value : 350 µg/m^3
Regulatory body : Finland / Europe
Type : Limit value 2030
Initial concentration: 0 µg/m^3
Reference: N.A

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-25
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 2 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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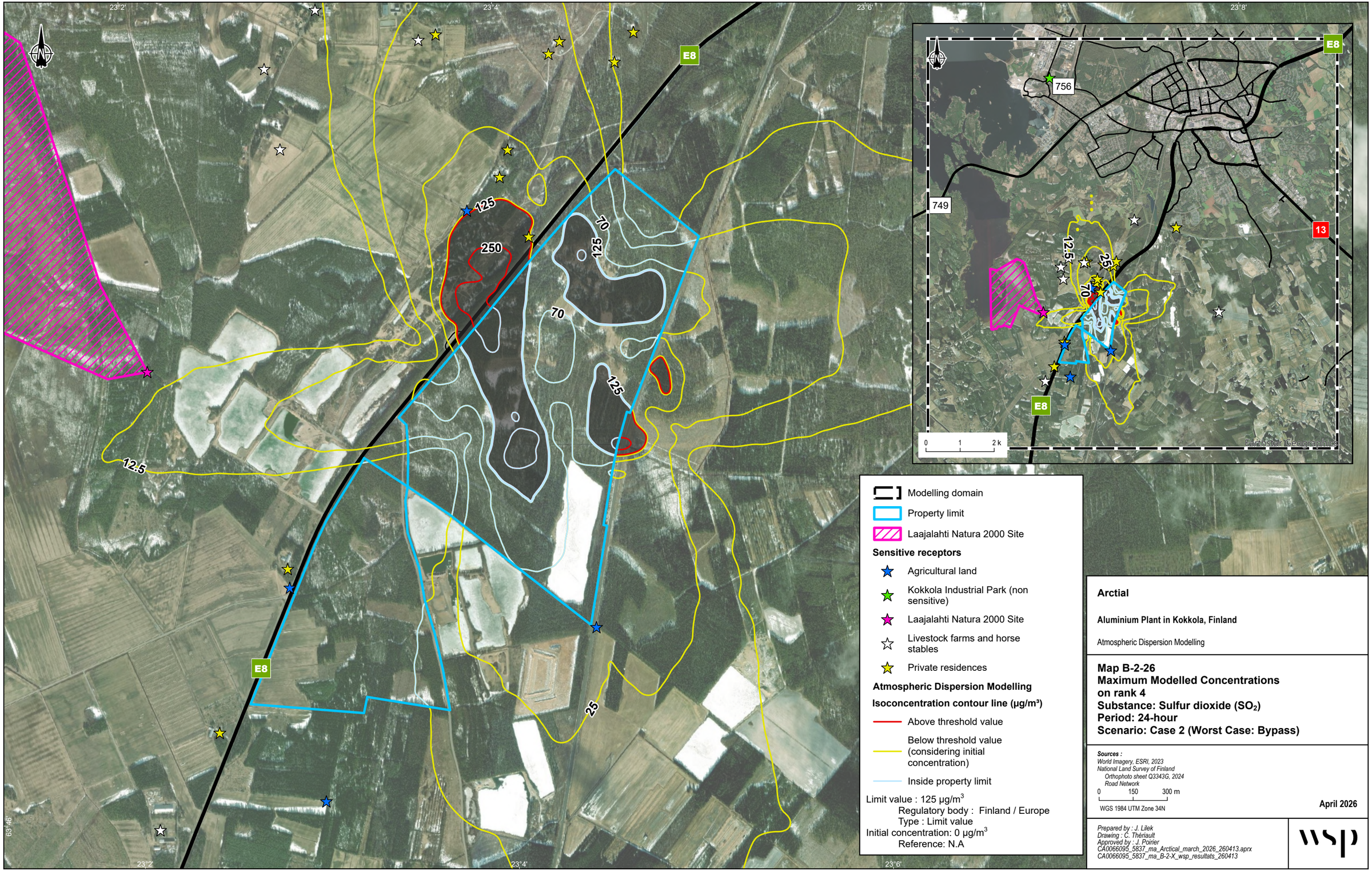

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-26
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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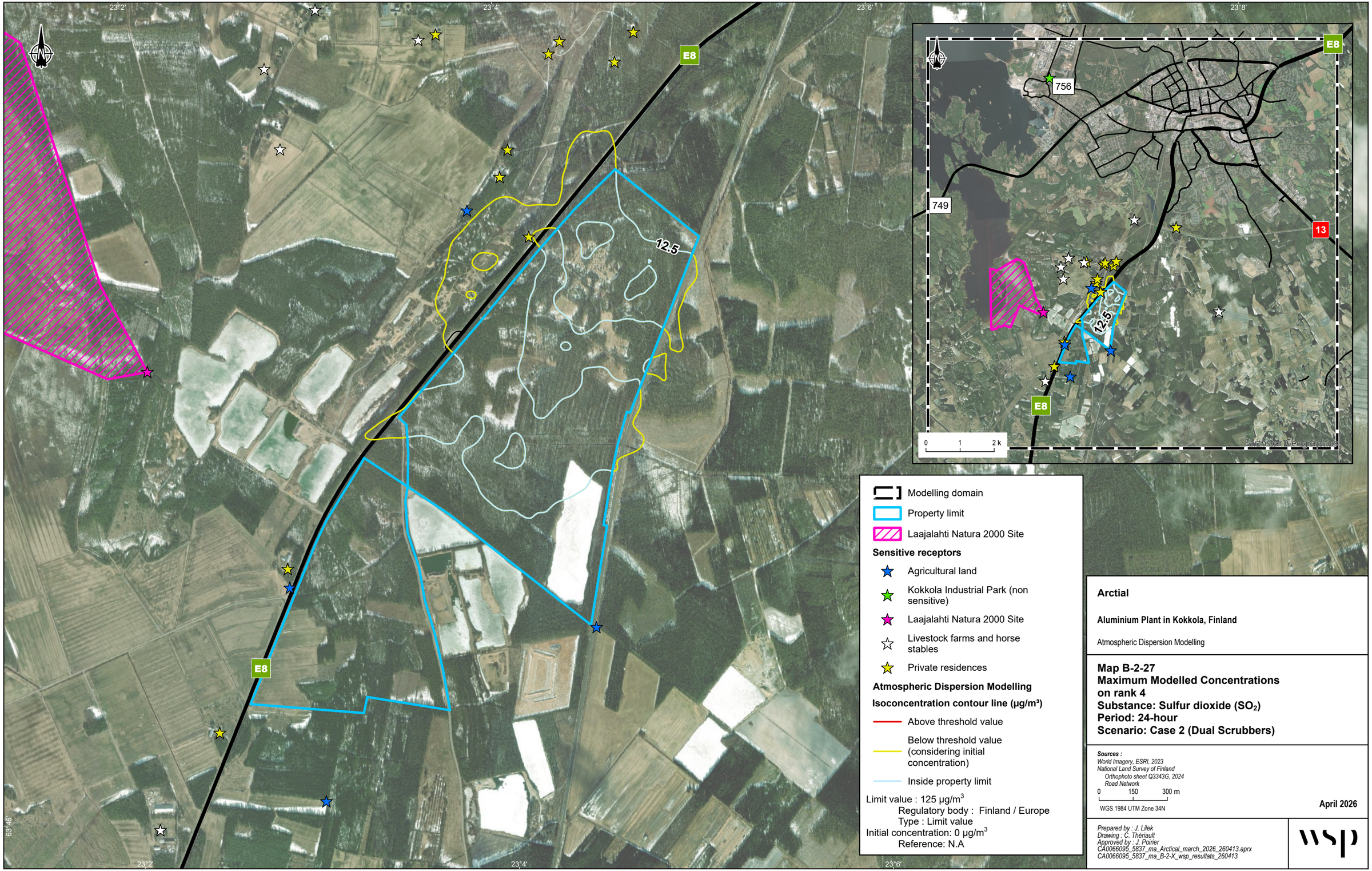

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-27
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 2 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
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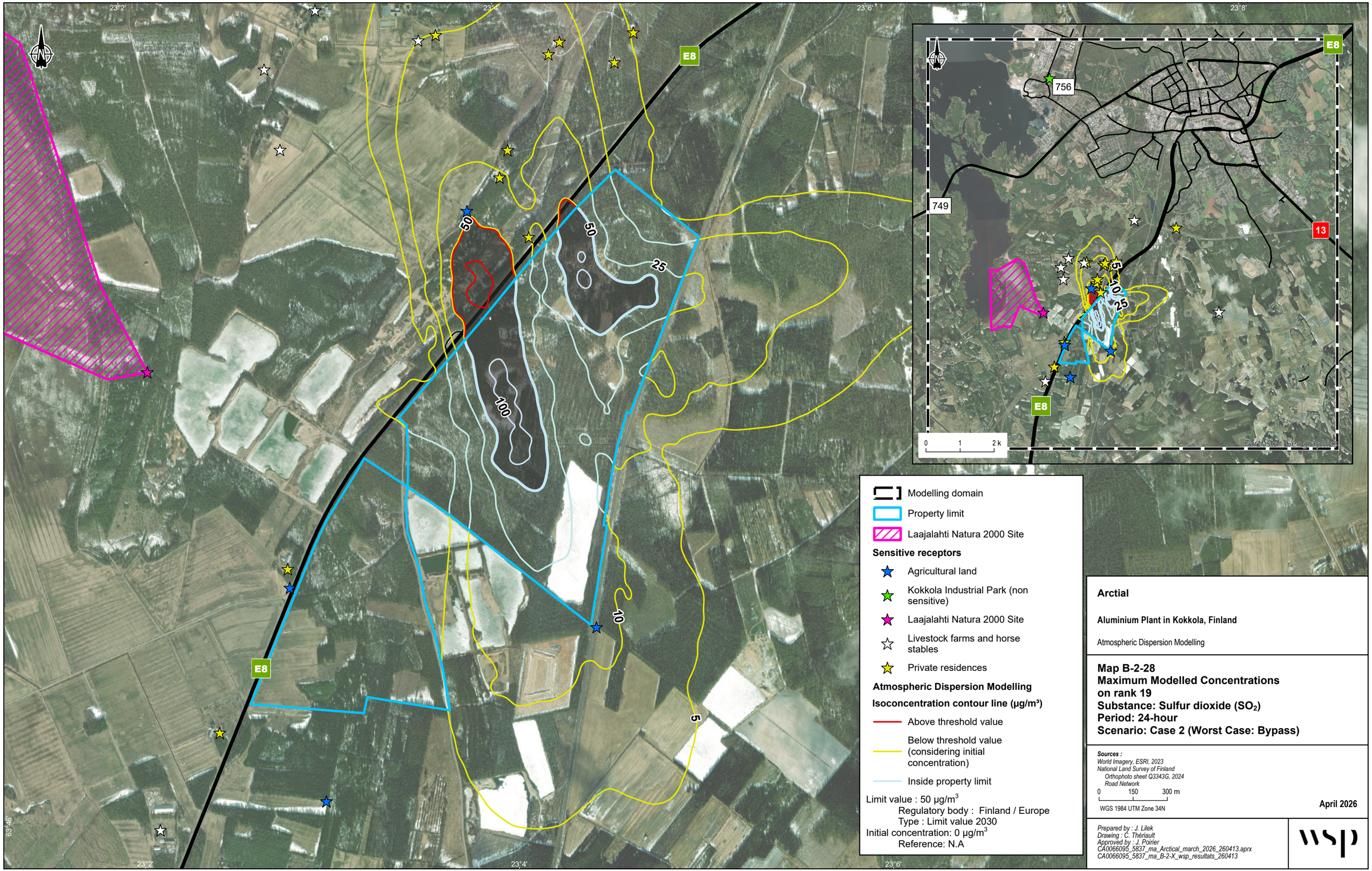

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-28
Maximum Modelled Concentrations on rank 19
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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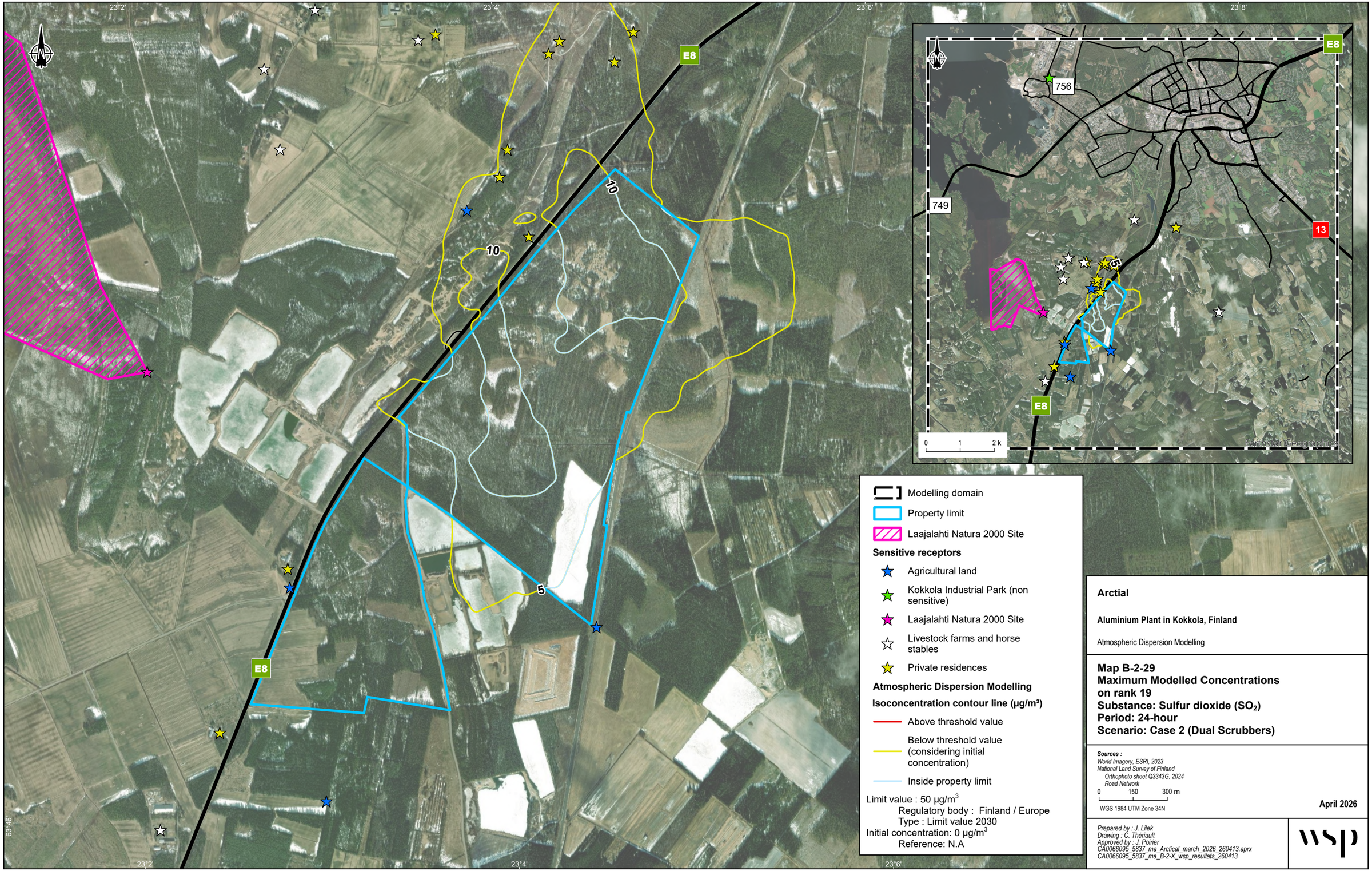

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-29
Maximum Modelled Concentrations on rank 19
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 2 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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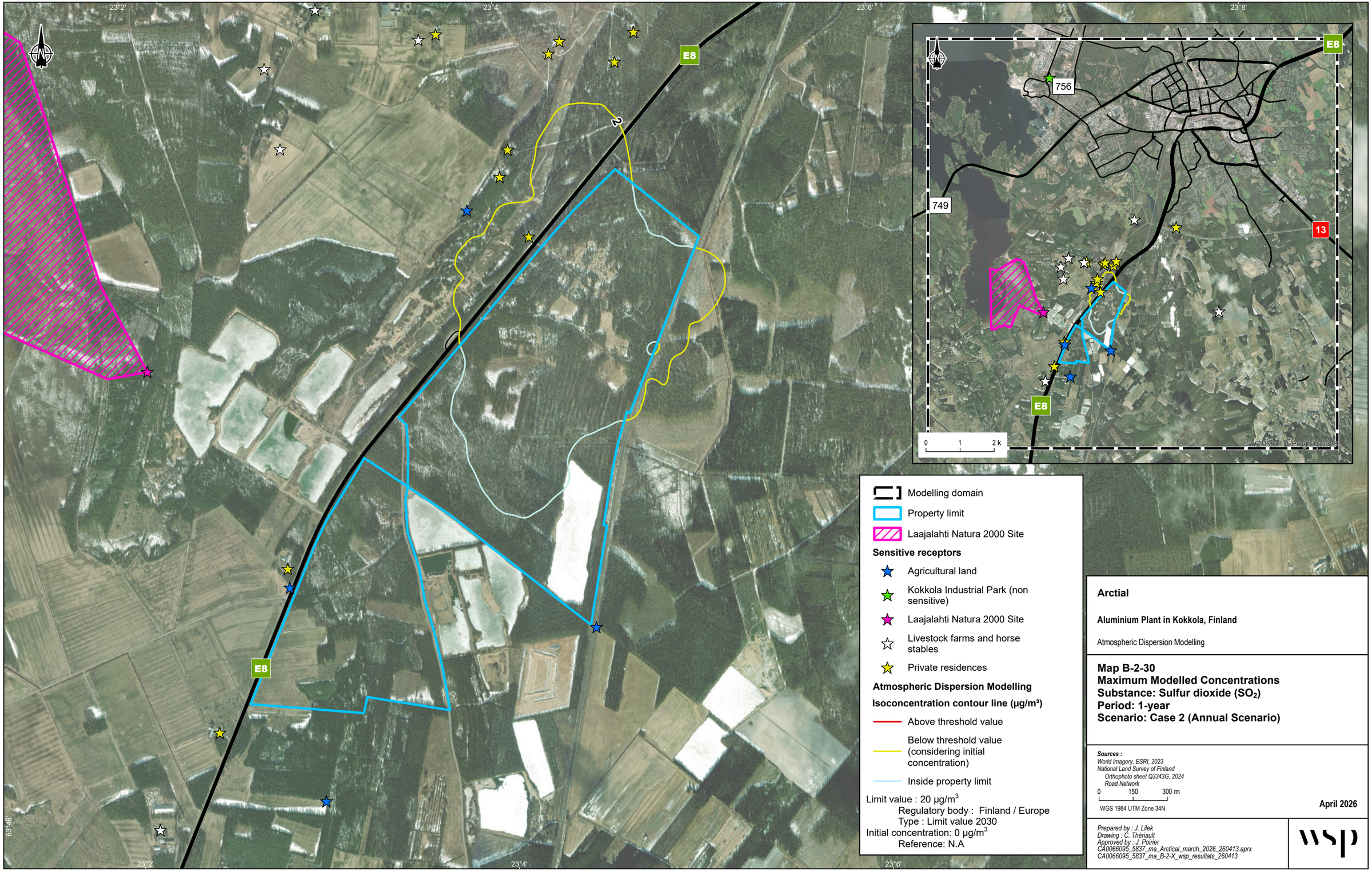

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-30
Maximum Modelled Concentrations
Substance: Sulfur dioxide (SO_2)
Period: 1-year
Scenario: Case 2 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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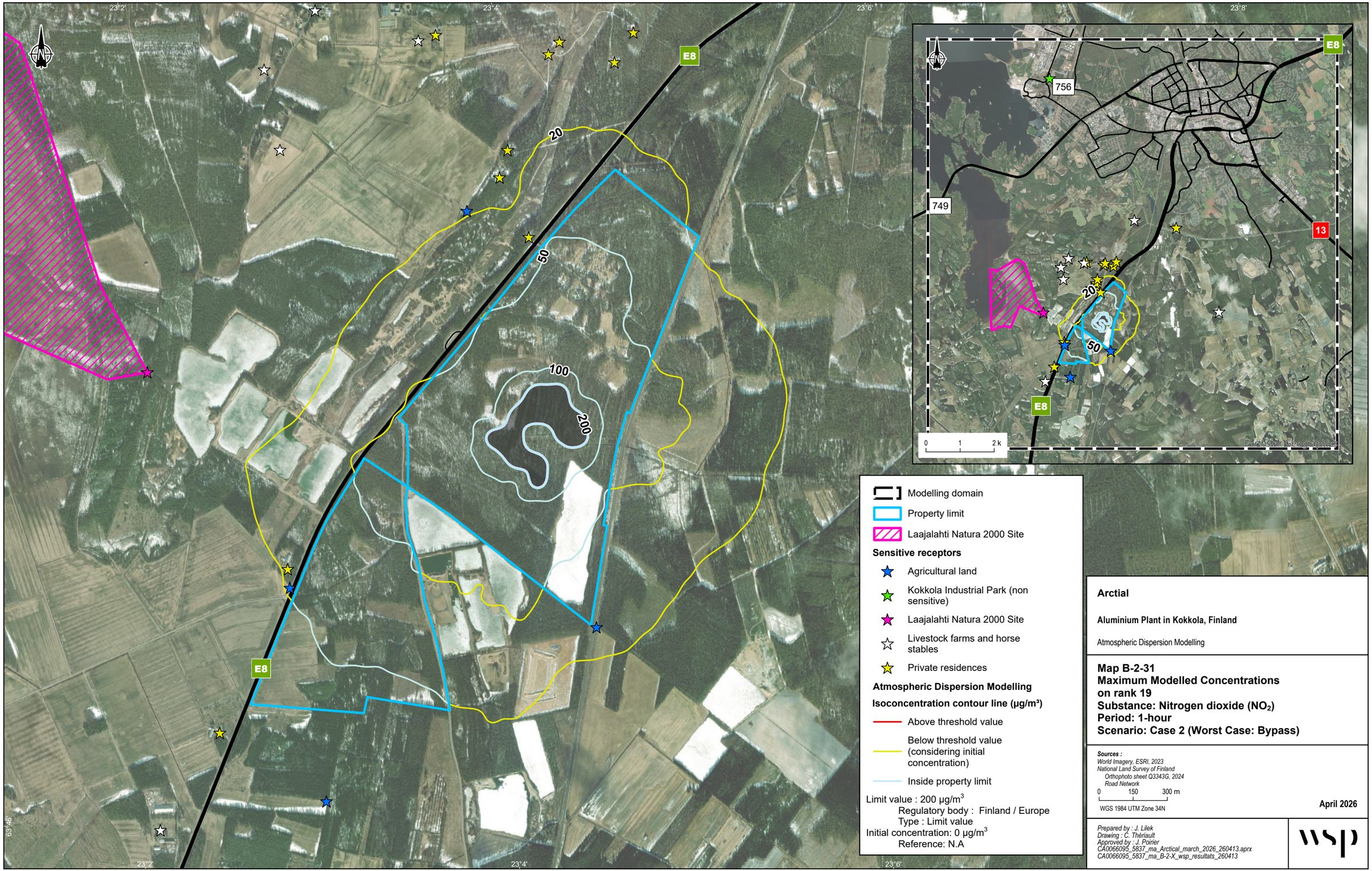

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-31
Maximum Modelled Concentrations on rank 19
Substance: Nitrogen dioxide (NO_2)
Period: 1-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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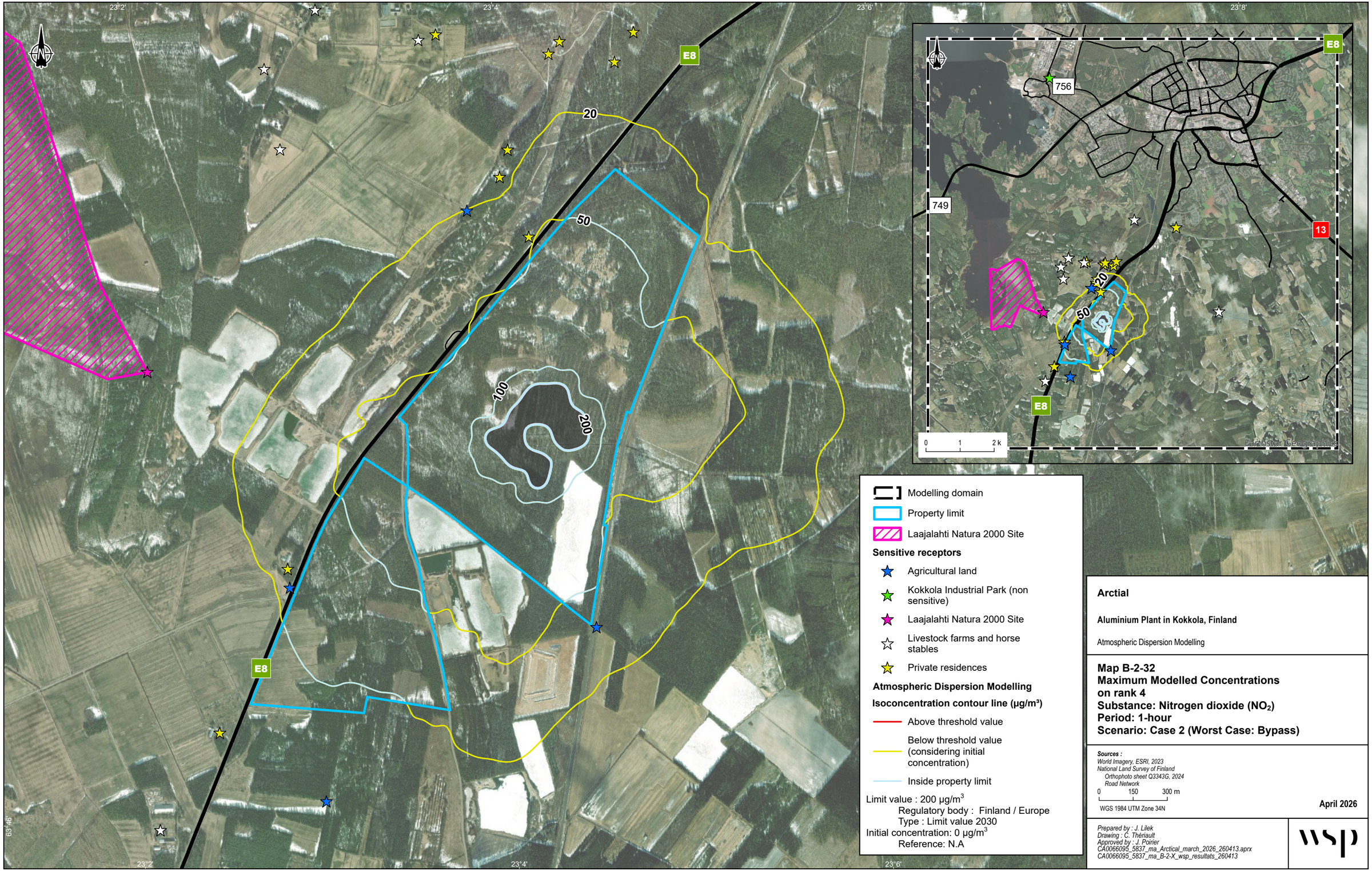

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-32
Maximum Modelled Concentrations on rank 4
Substance: Nitrogen dioxide (NO_2)
Period: 1-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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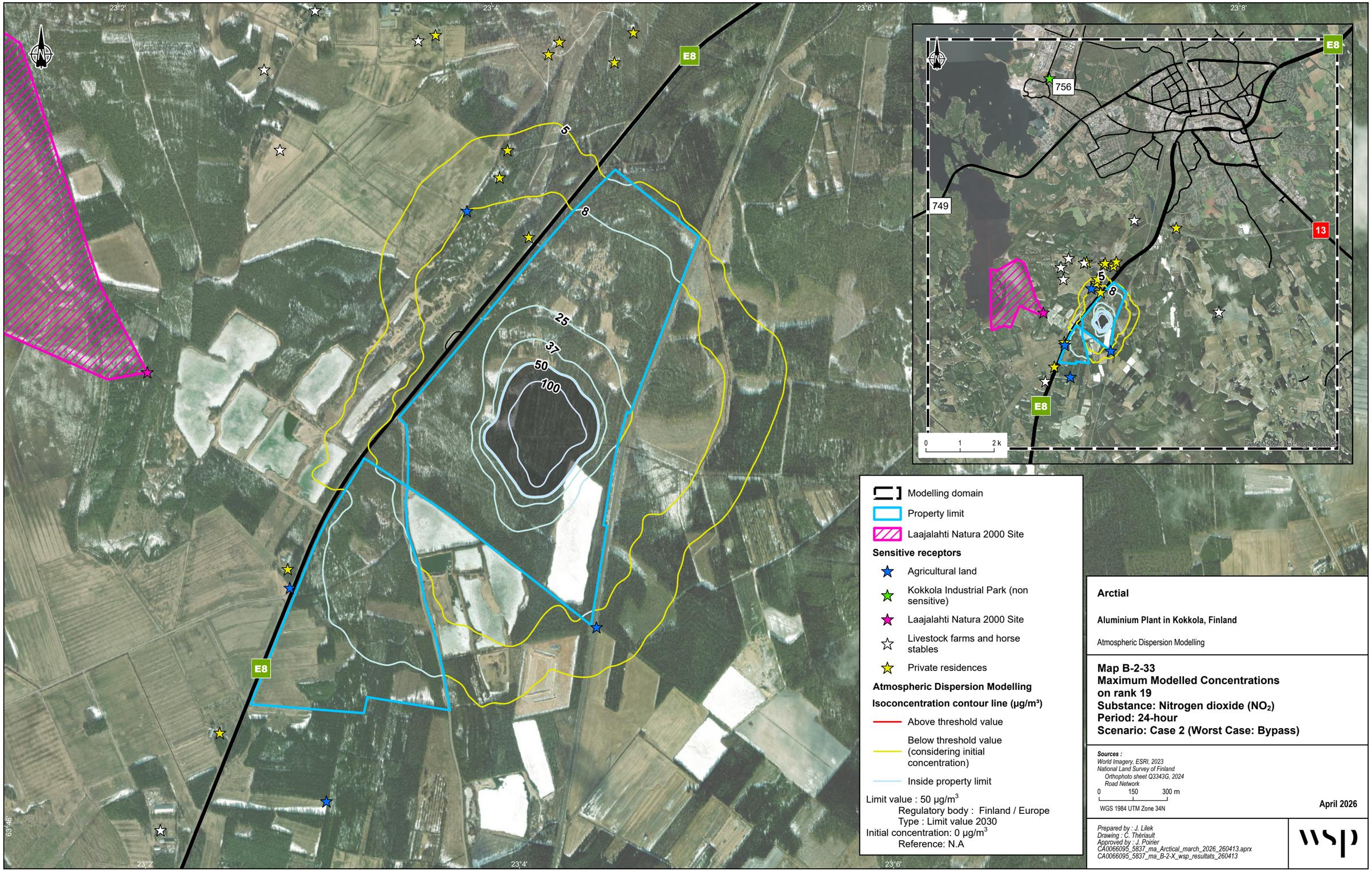

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-33
Maximum Modelled Concentrations on rank 19
Substance: Nitrogen dioxide (NO_2)
Period: 24-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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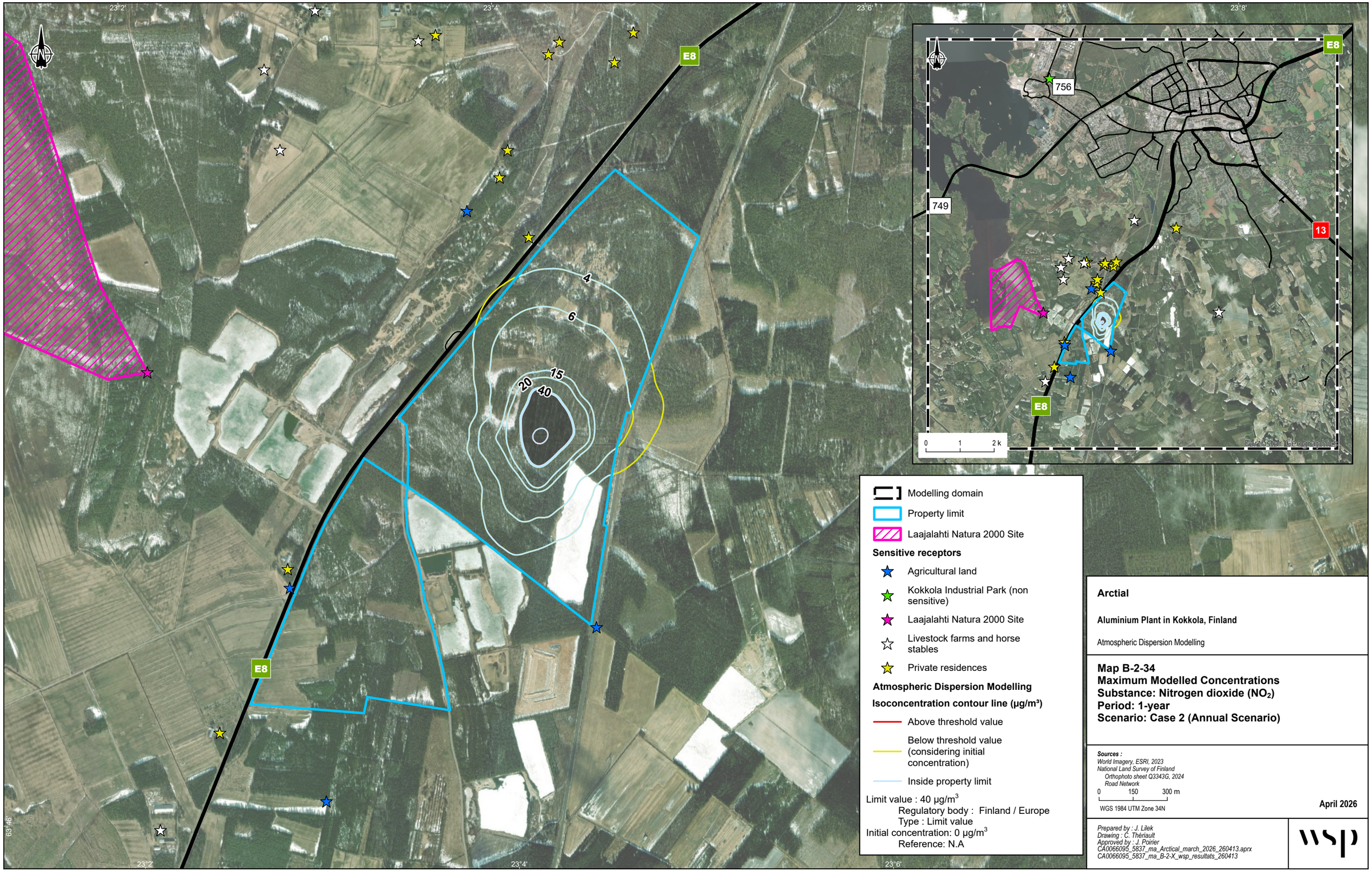

Modelling domain

Property limit

Laajalahti Natura 2000 Site

Sensitive receptors

Agricultural land

Kokkola Industrial Park (non sensitive)

Laajalahti Natura 2000 Site

Livestock farms and horse stables

Private residences

Atmospheric Dispersion Modelling

Isoconcentration contour line (µg/m³)

Above threshold value

Below threshold value (considering initial concentration)

Inside property limit

Limit value : 40 µg/m^3
Regulatory body : Finland / Europe
Type : Limit value
Initial concentration: 0 µg/m^3
Reference: N.A

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-34
Maximum Modelled Concentrations
Substance: Nitrogen dioxide (NO_2)
Period: 1-year
Scenario: Case 2 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

wsp

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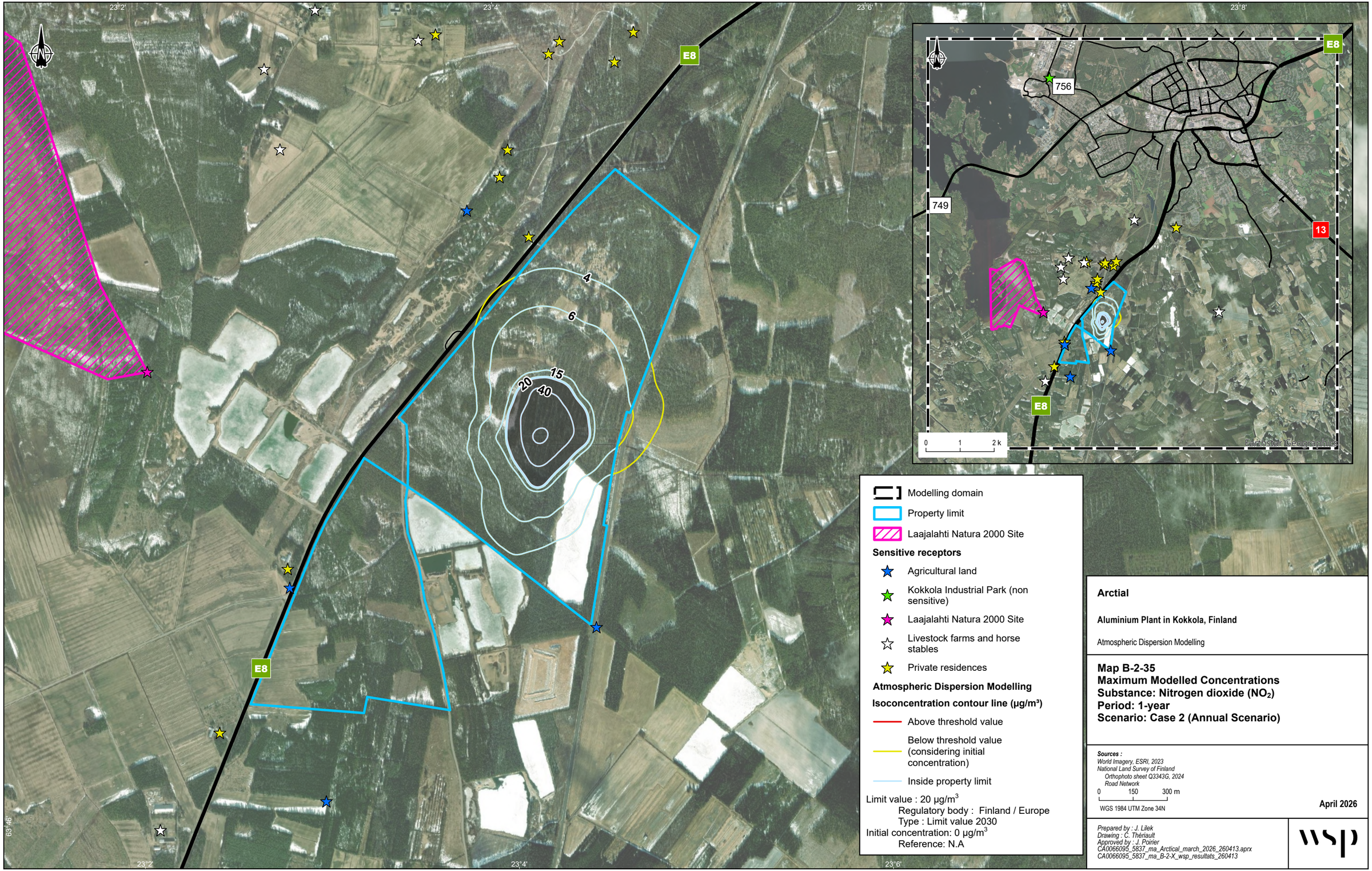

- Modelling domain
- Property limit
- Laajalahti Natura 2000 Site

Sensitive receptors

- Agricultural land
- Kokkola Industrial Park (non sensitive)
- Laajalahti Natura 2000 Site
- Livestock farms and horse stables
- Private residences

Atmospheric Dispersion Modelling

Isoconcentration contour line (µg/m³)

- Above threshold value
- Below threshold value (considering initial concentration)
- Inside property limit

Limit value : 20 µg/m^3
Regulatory body : Finland / Europe
Type : Limit value 2030
Initial concentration: 0 µg/m^3
Reference: N.A

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-35
Maximum Modelled Concentrations
Substance: Nitrogen dioxide (NO_2)
Period: 1-year
Scenario: Case 2 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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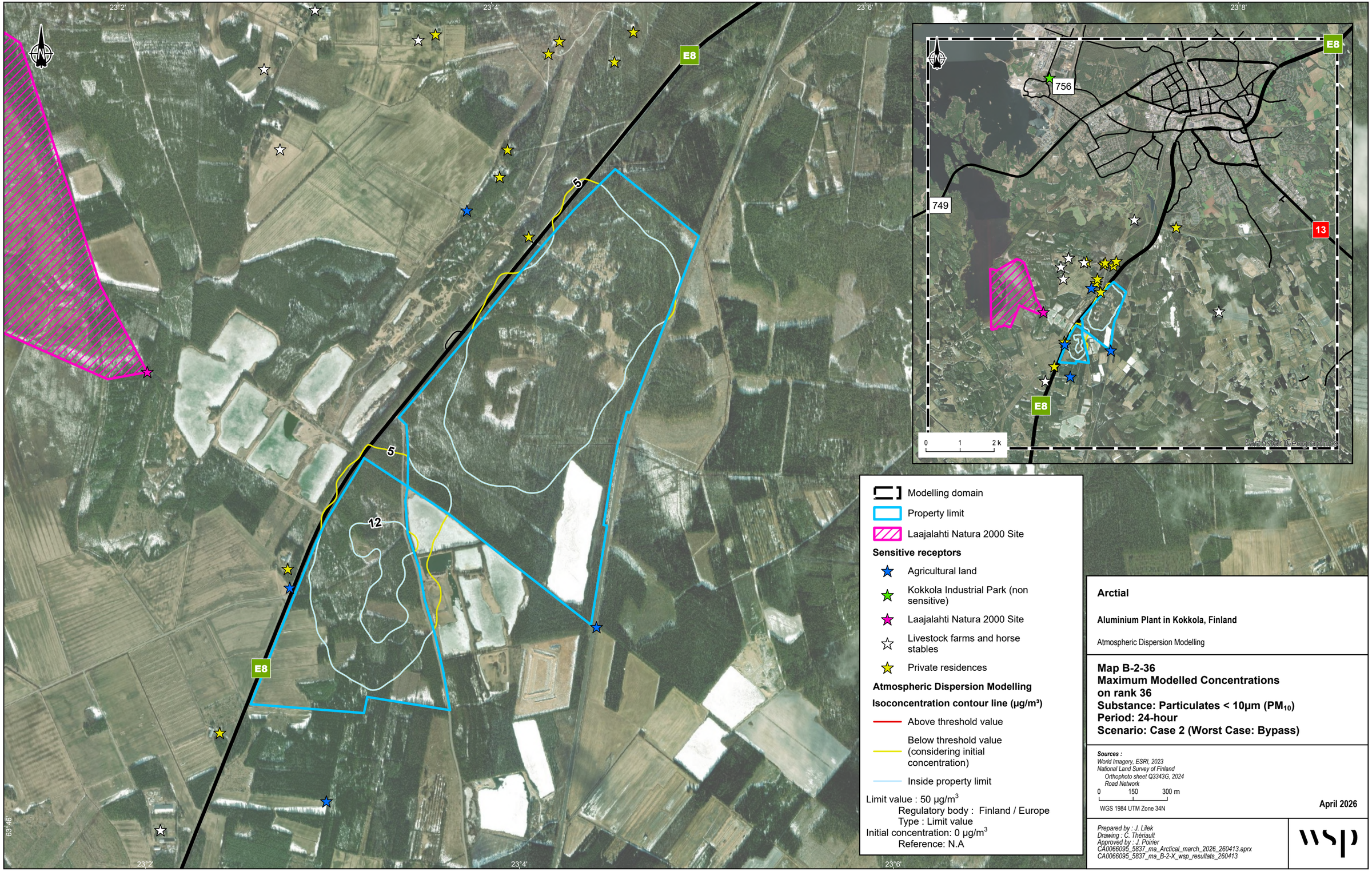

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-36
Maximum Modelled Concentrations on rank 36
Substance: Particulates < 10µm (PM_{10})
Period: 24-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

wsp

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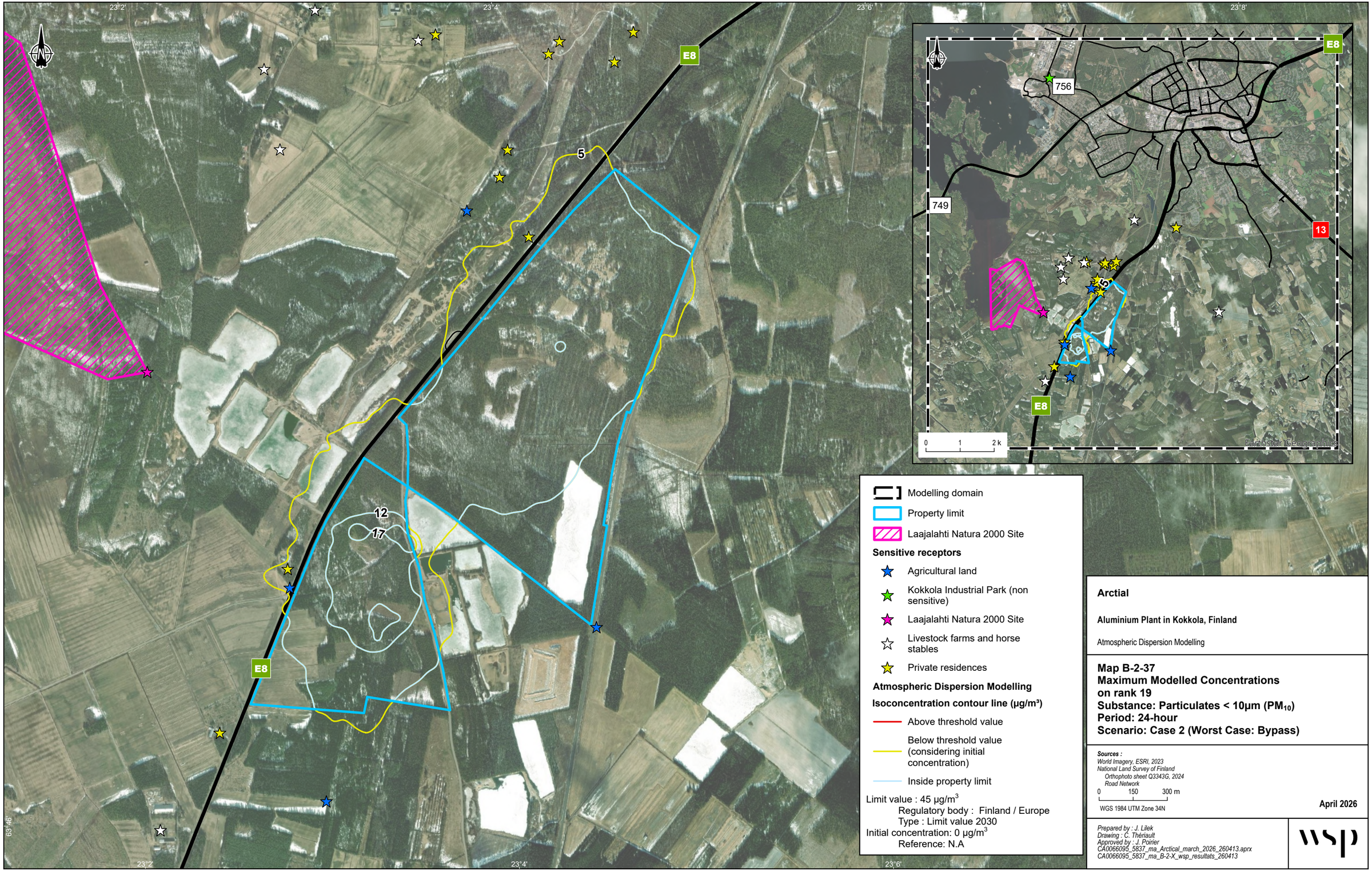

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-37
Maximum Modelled Concentrations on rank 19
Substance: Particulates < 10µm (PM_{10})
Period: 24-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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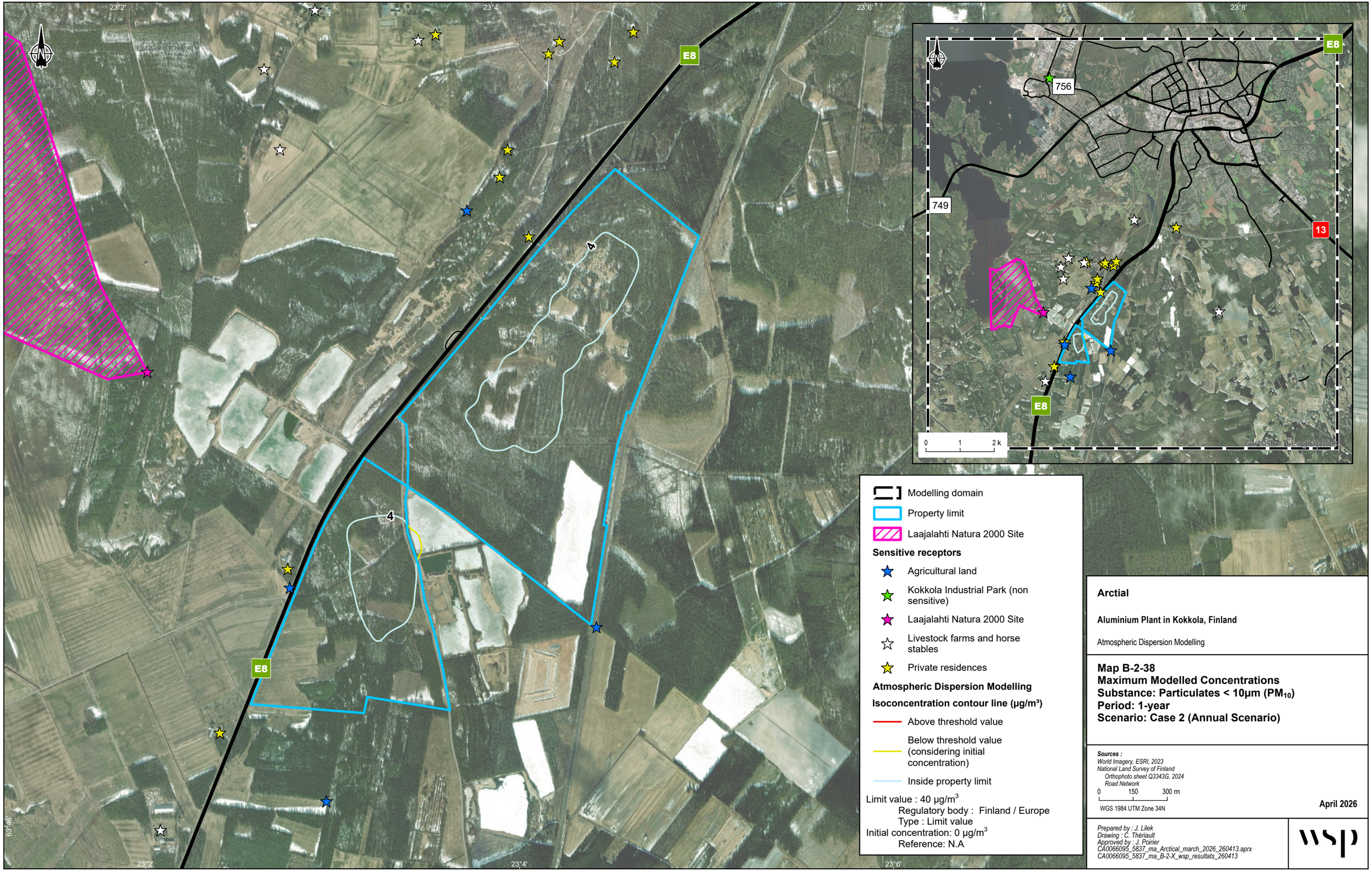

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-38
Maximum Modelled Concentrations
Substance: Particulates < 10µm (PM_{10})
Period: 1-year
Scenario: Case 2 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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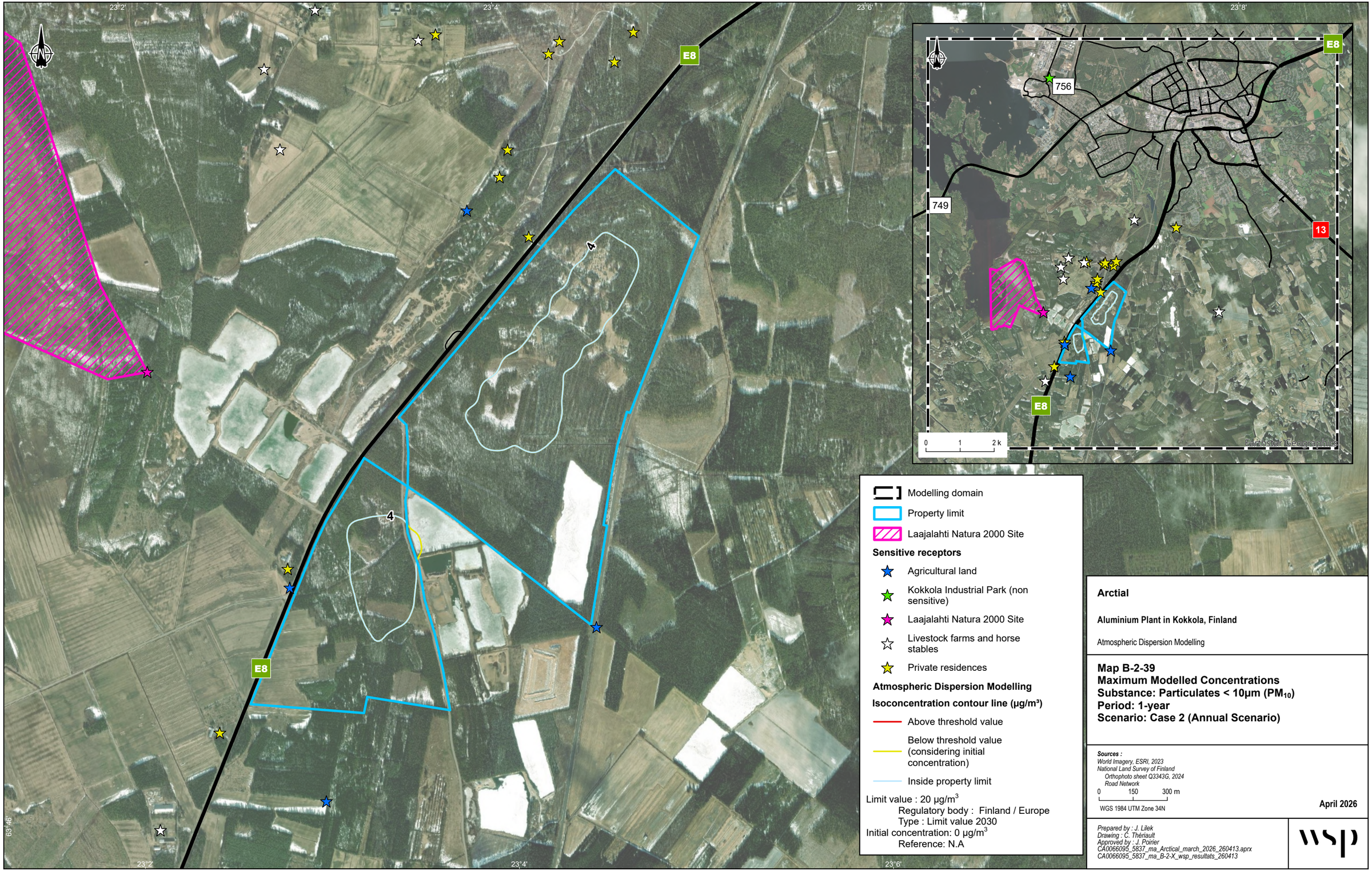

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-39
Maximum Modelled Concentrations
Substance: Particulates < 10µm (PM_{10})
Period: 1-year
Scenario: Case 2 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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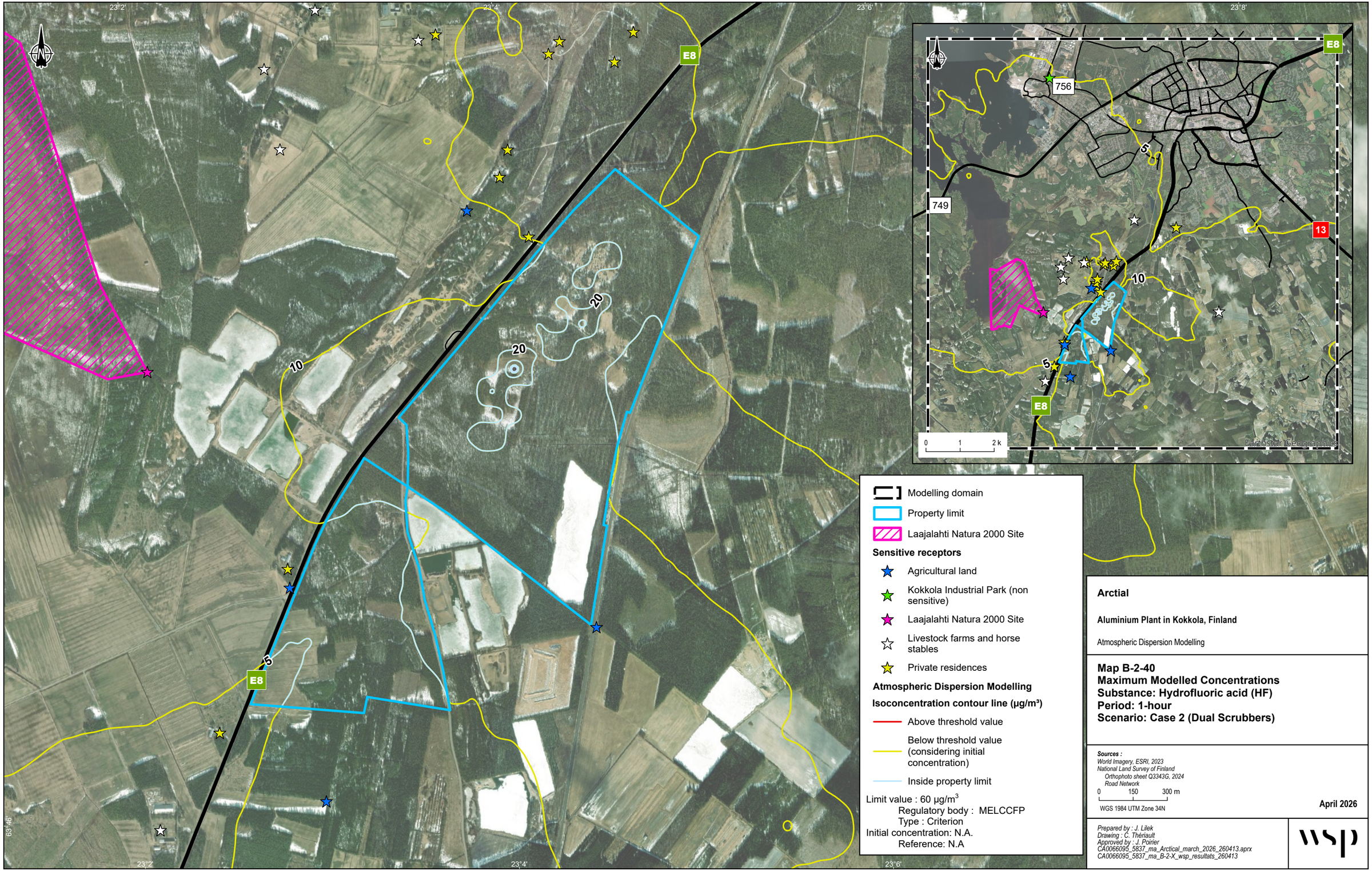

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-40
Maximum Modelled Concentrations
Substance: Hydrofluoric acid (HF)
Period: 1-hour
Scenario: Case 2 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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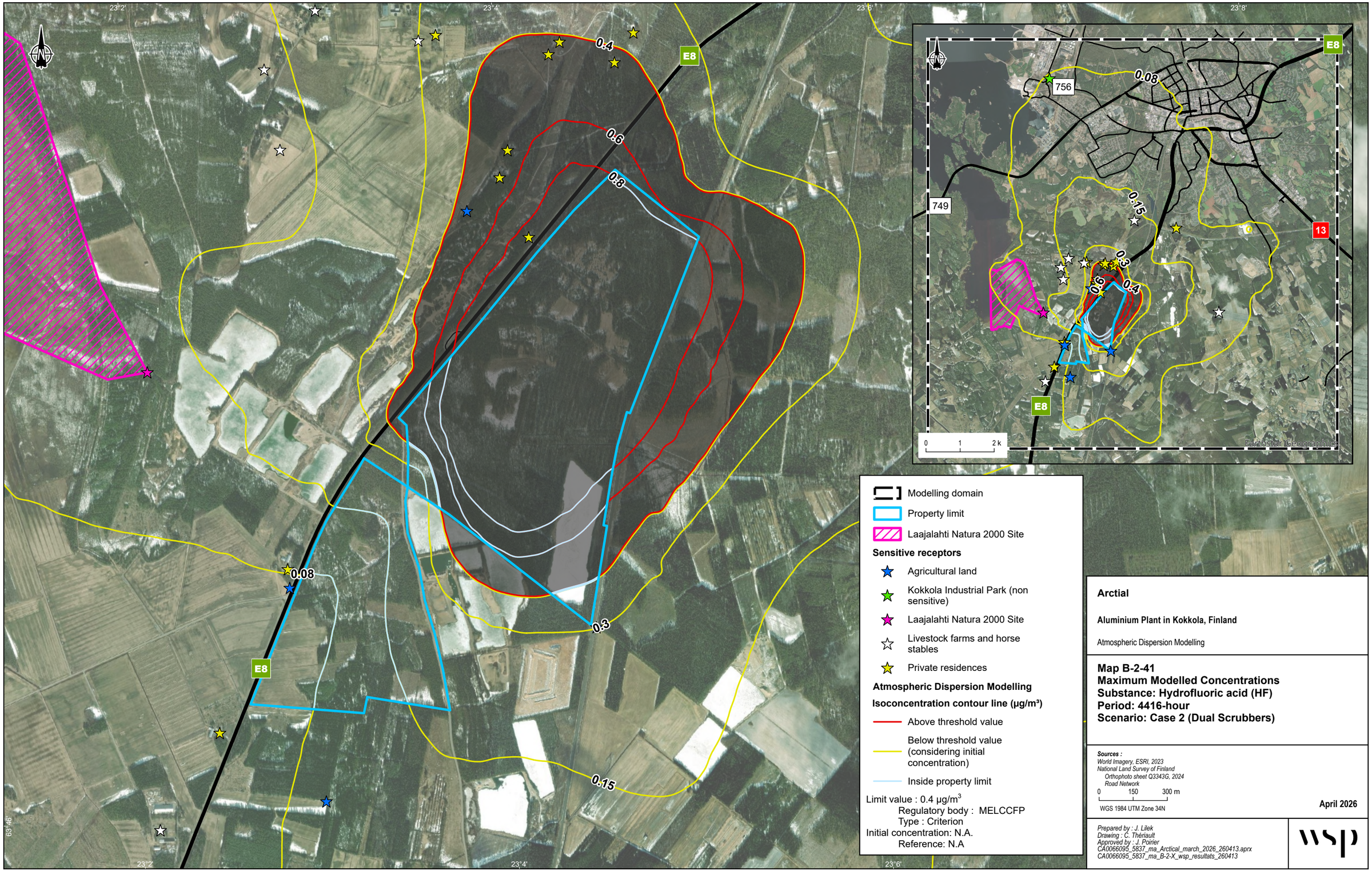

Modelling domain
Property limit
Laajalahti Natura 2000 Site

Sensitive receptors

Agricultural land
Kokkola Industrial Park (non sensitive)
Laajalahti Natura 2000 Site
Livestock farms and horse stables
Private residences

Atmospheric Dispersion Modelling

Isoconcentration contour line (µg/m³)

Above threshold value
Below threshold value (considering initial concentration)
Inside property limit

Limit value : 0.4 µg/m³
Regulatory body : MELCCFP
Type : Criterion
Initial concentration: N.A.
Reference: N.A

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-41
Maximum Modelled Concentrations
Substance: Hydrofluoric acid (HF)
Period: 4416-hour
Scenario: Case 2 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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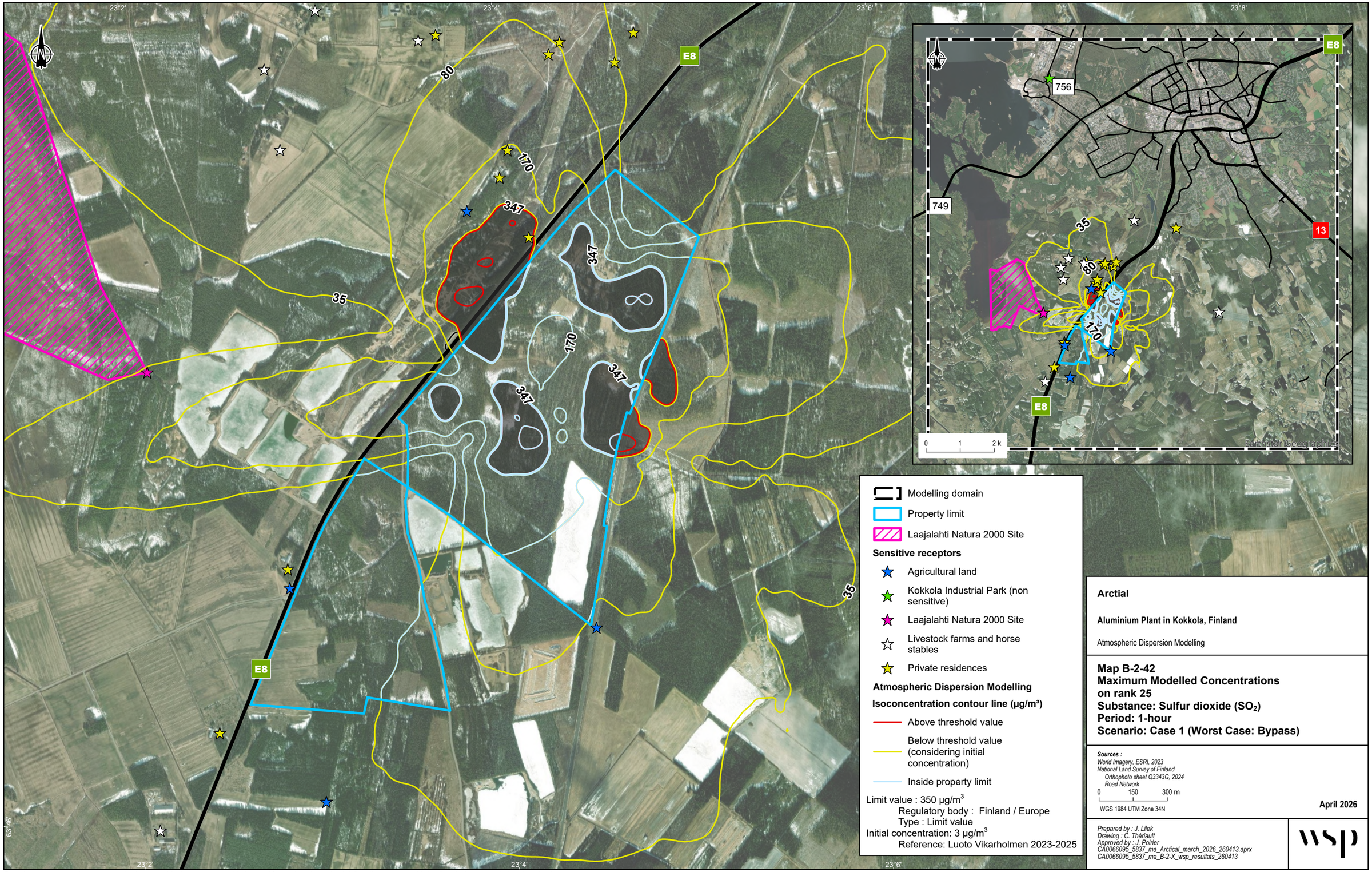

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-42
Maximum Modelled Concentrations on rank 25
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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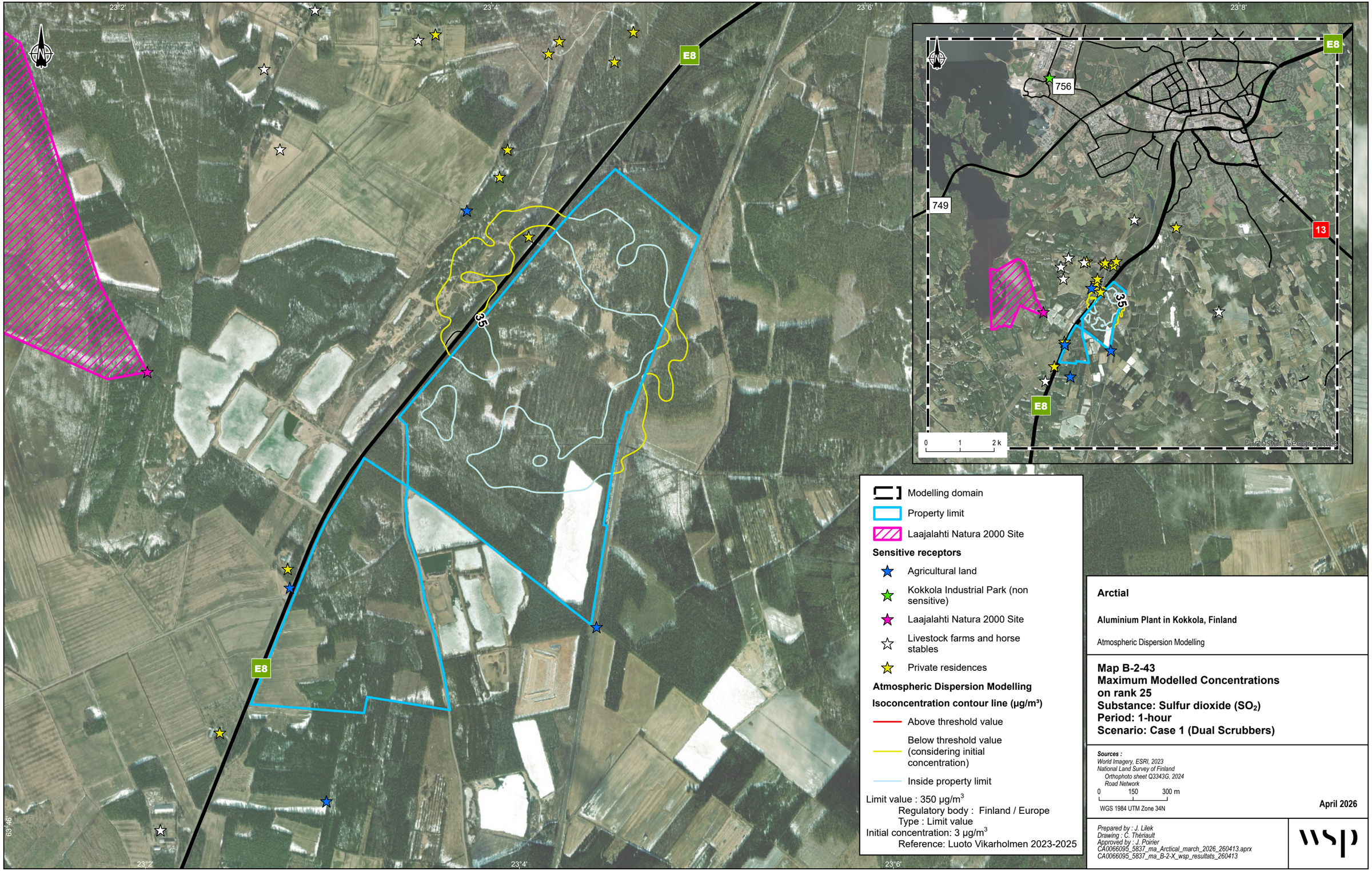

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-43
Maximum Modelled Concentrations on rank 25
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 1 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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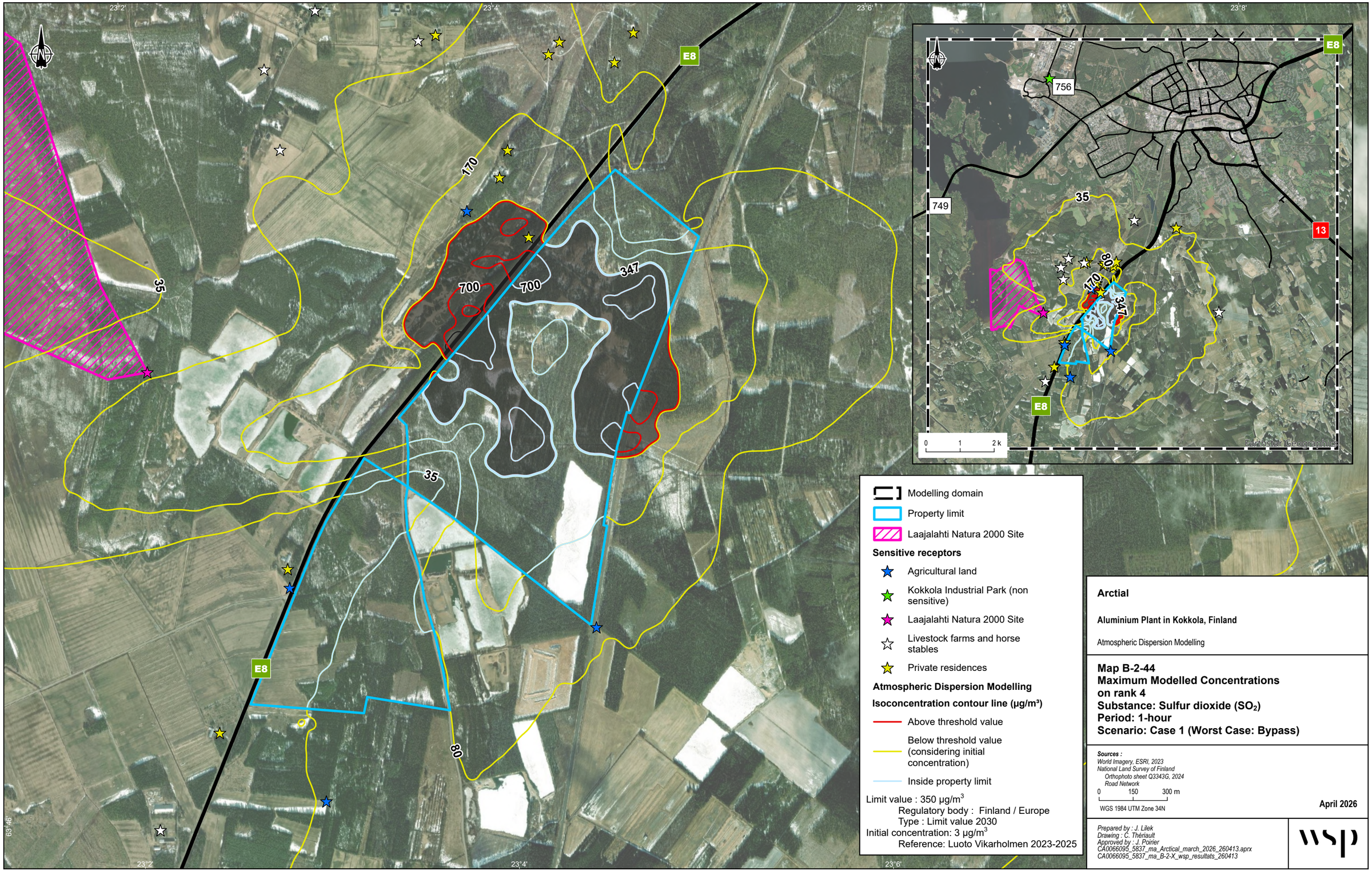

Modelling domain
Property limit
Laajalahti Natura 2000 Site

Sensitive receptors

Agricultural land
Kokkola Industrial Park (non sensitive)
Laajalahti Natura 2000 Site
Livestock farms and horse stables
Private residences

Atmospheric Dispersion Modelling

Isoconcentration contour line (µg/m³)

Above threshold value
Below threshold value (considering initial concentration)
Inside property limit

Limit value : 350 µg/m³
Regulatory body : Finland / Europe
Type : Limit value 2030
Initial concentration: 3 µg/m³
Reference: Luoto Vikarholmen 2023-2025

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-44
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

wsp

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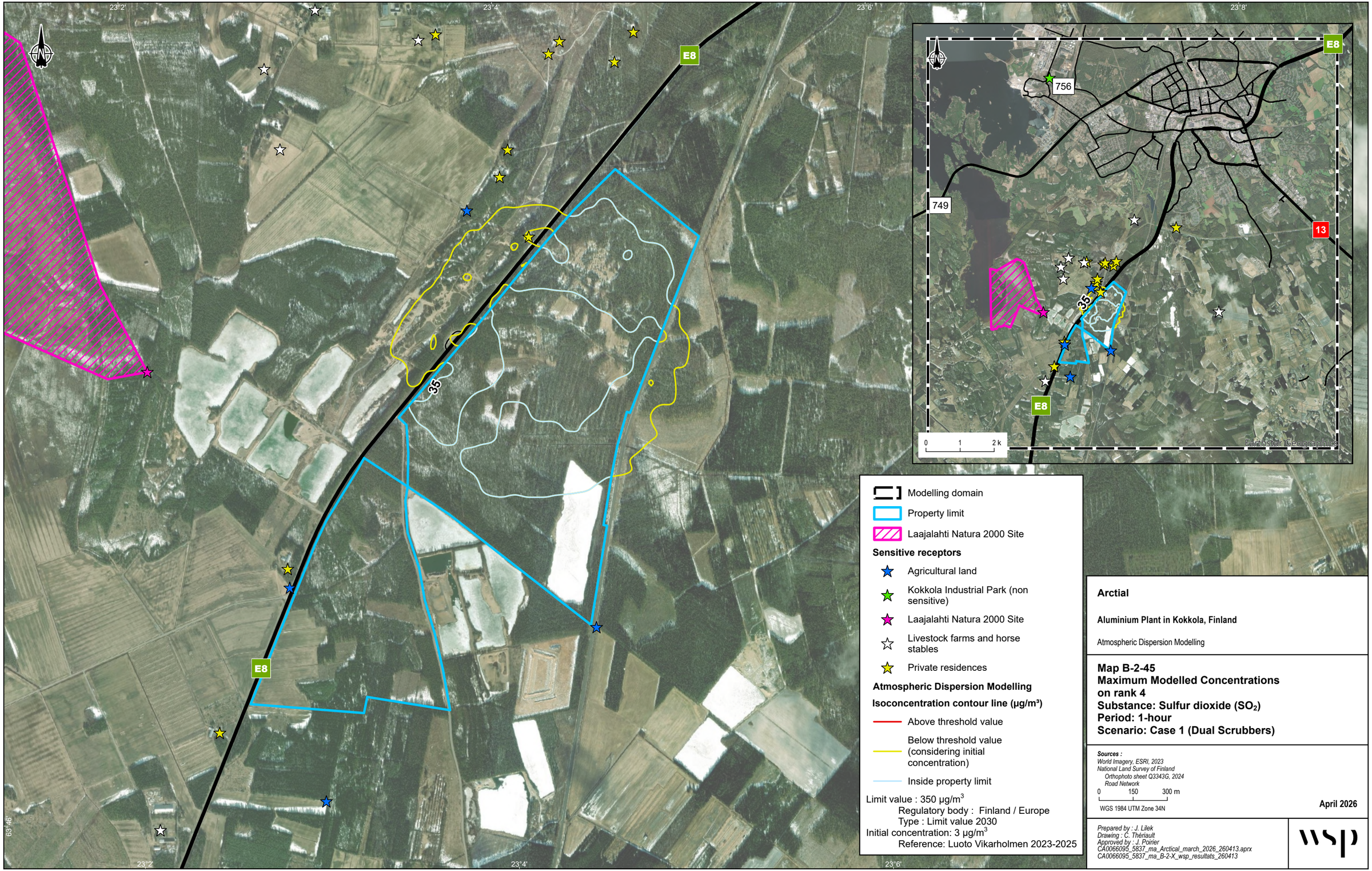

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-45
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 1 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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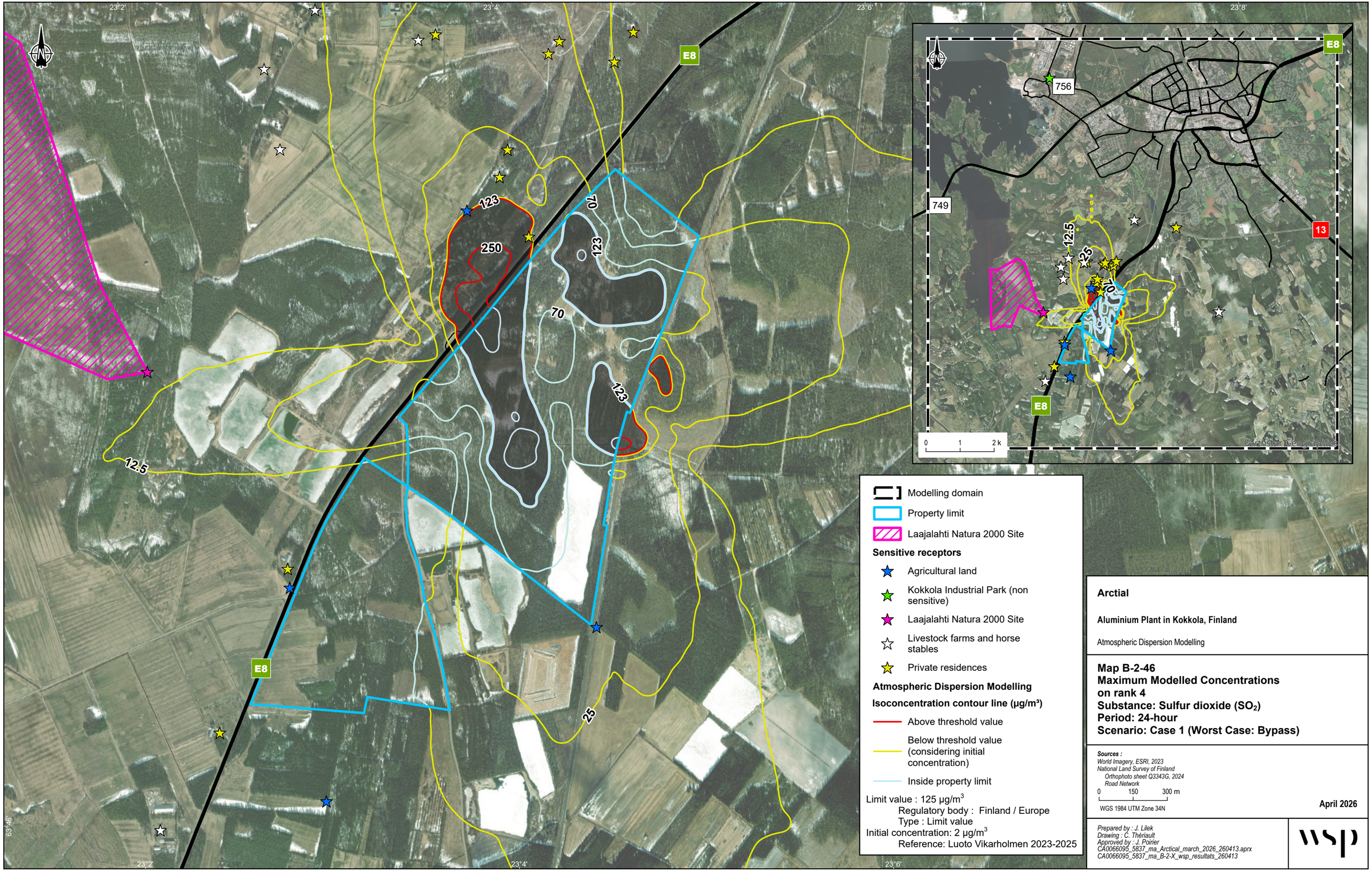

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-46
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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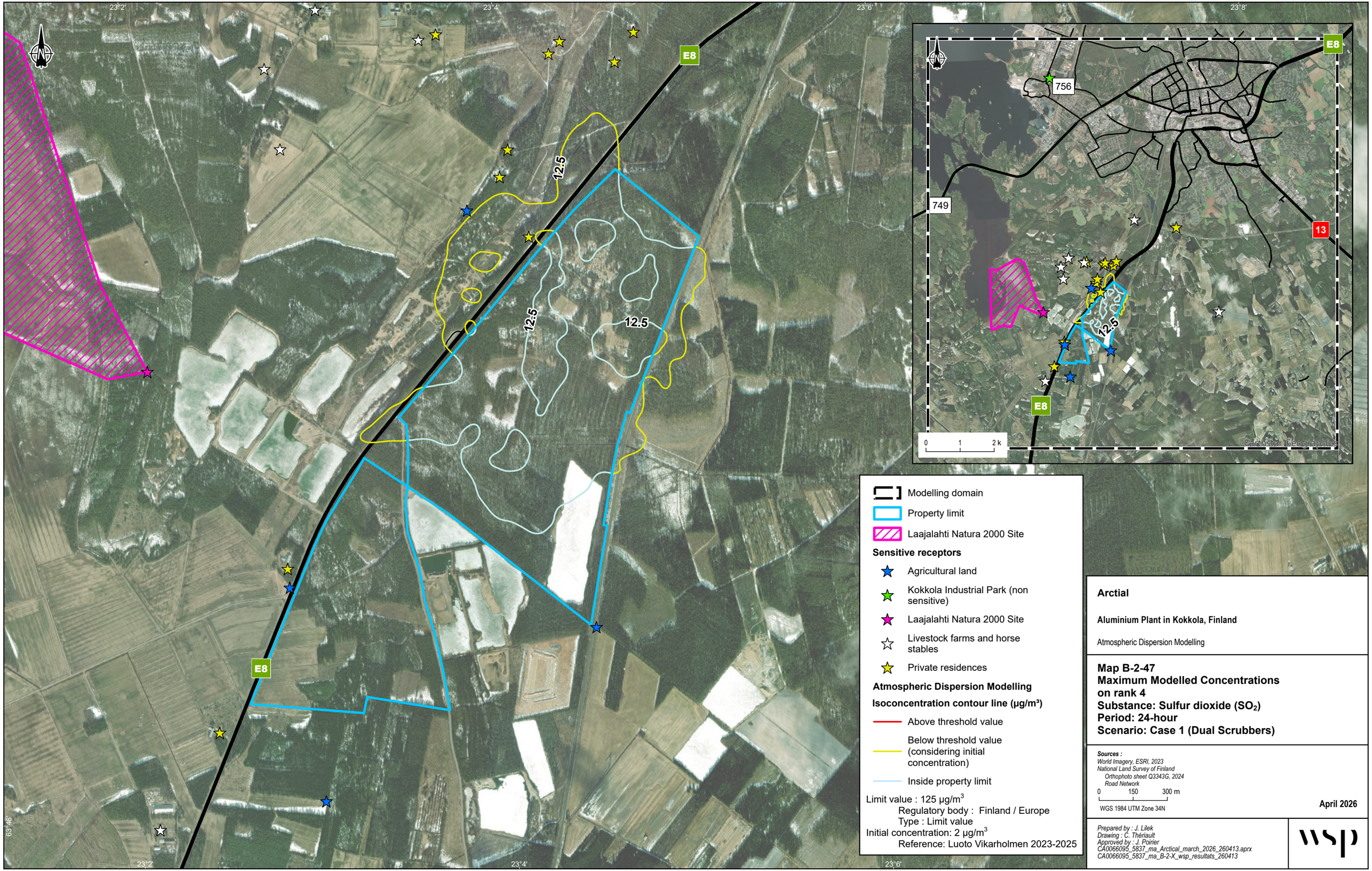

Modelling domain

Property limit

Laajalahti Natura 2000 Site

Sensitive receptors

Agricultural land

Kokkola Industrial Park (non sensitive)

Laajalahti Natura 2000 Site

Livestock farms and horse stables

Private residences

Atmospheric Dispersion Modelling

Isoconcentration contour line (µg/m³)

Above threshold value

Below threshold value (considering initial concentration)

Inside property limit

Limit value : 125 µg/m^3
Regulatory body : Finland / Europe
Type : Limit value
Initial concentration: 2 µg/m^3
Reference: Luoto Vikarholmen 2023-2025

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-47
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 1 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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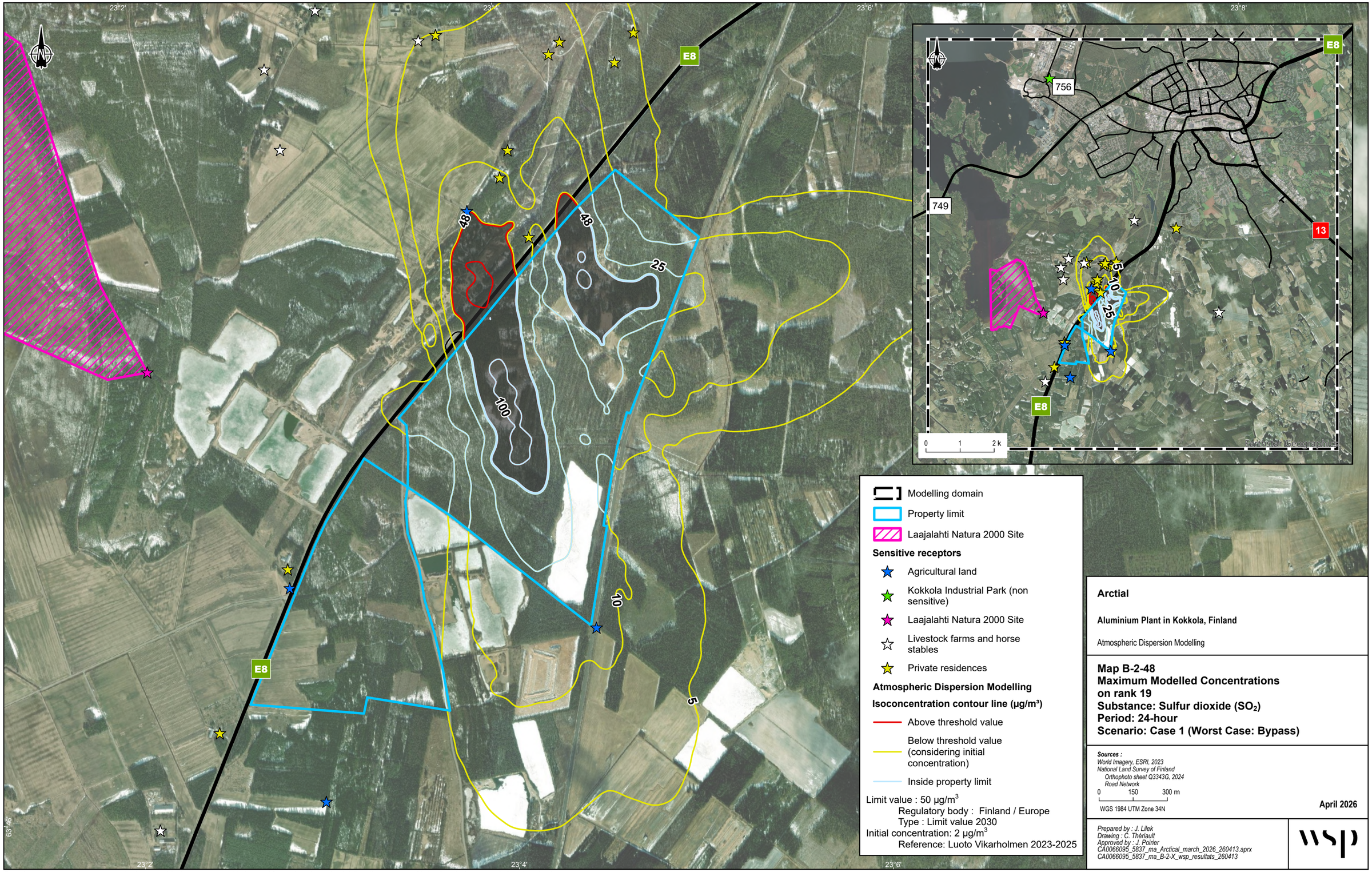

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-48
Maximum Modelled Concentrations on rank 19
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
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CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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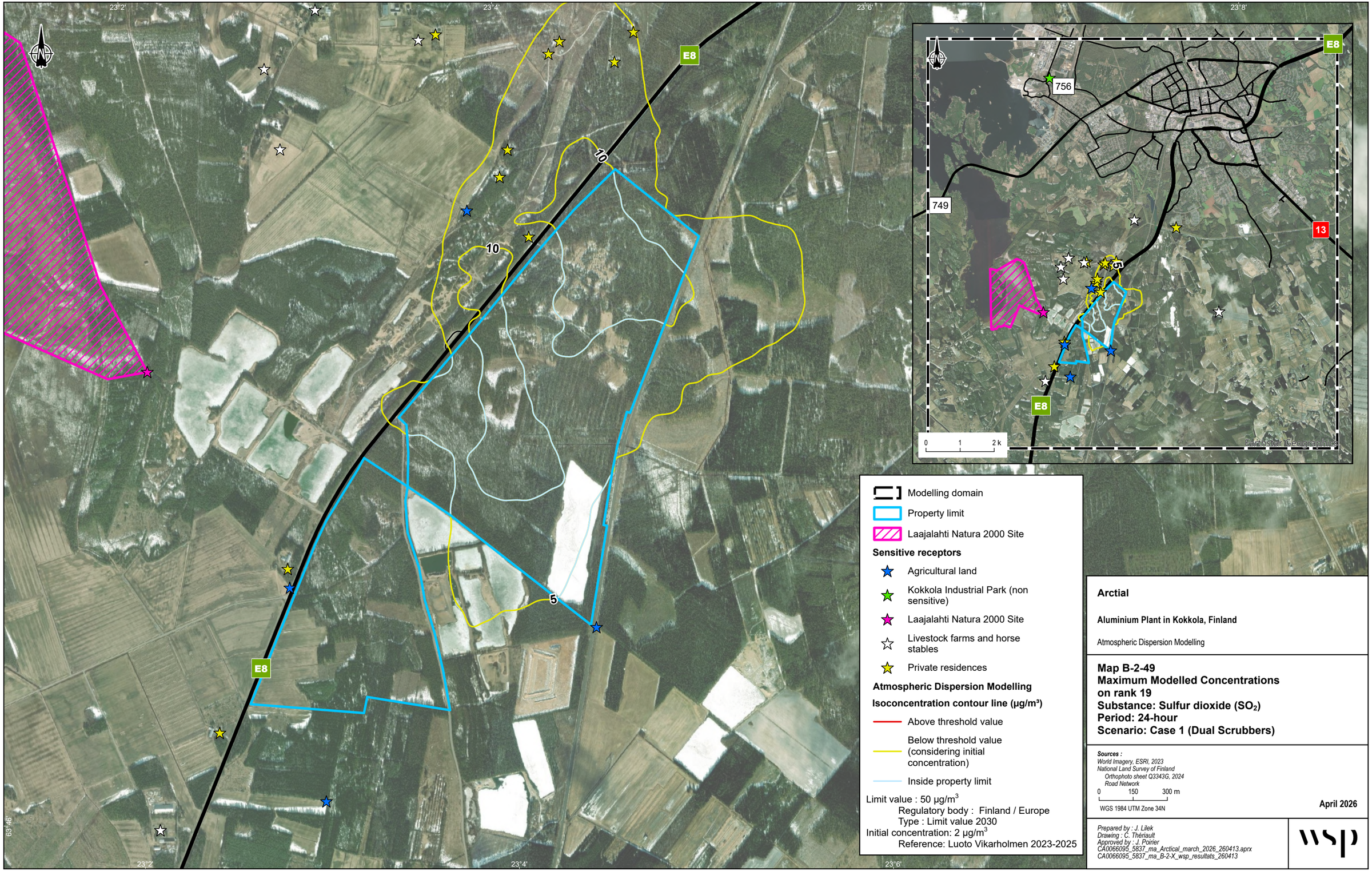

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-49
Maximum Modelled Concentrations on rank 19
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 1 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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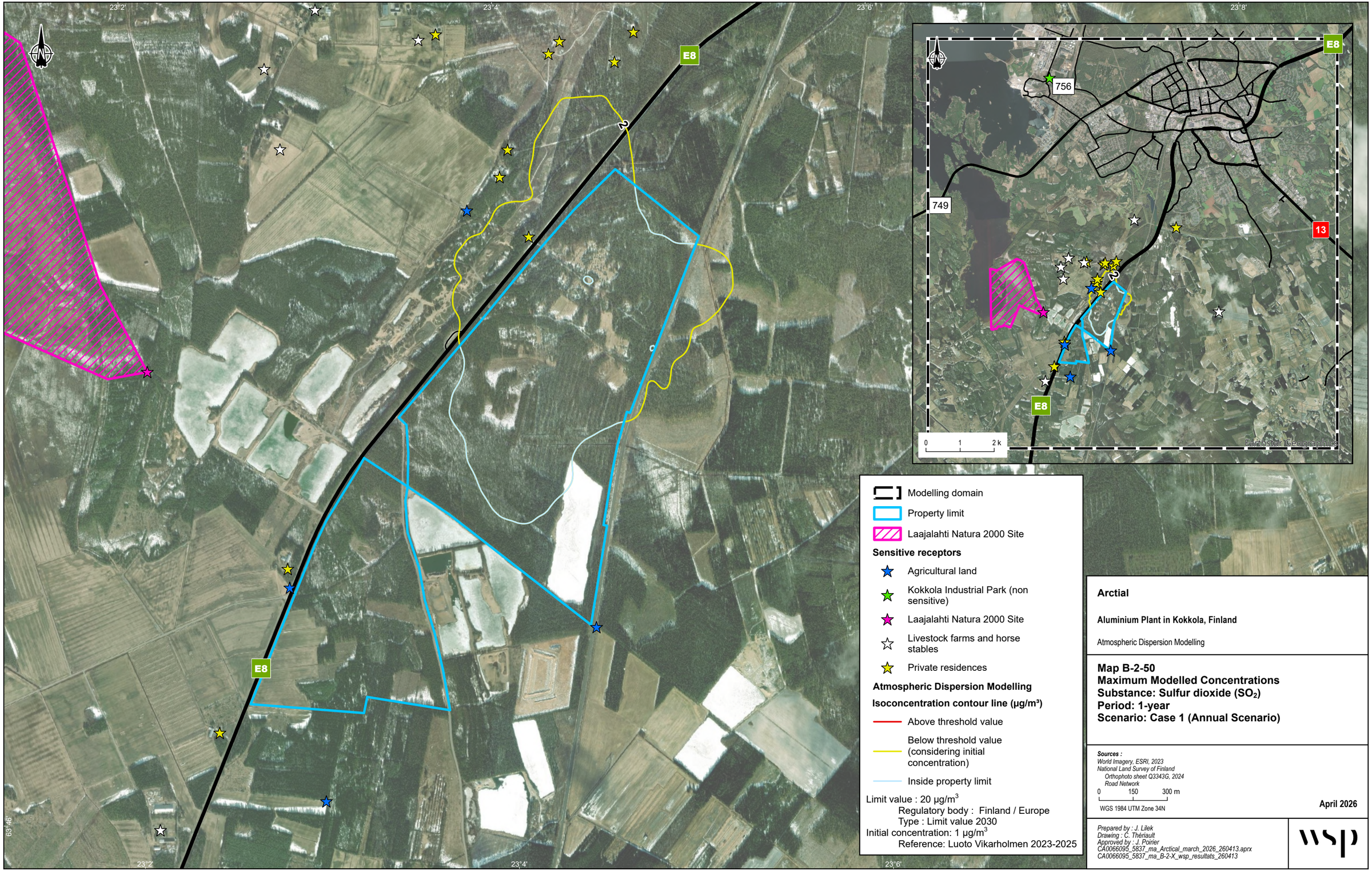

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-50
Maximum Modelled Concentrations
Substance: Sulfur dioxide (SO_2)
Period: 1-year
Scenario: Case 1 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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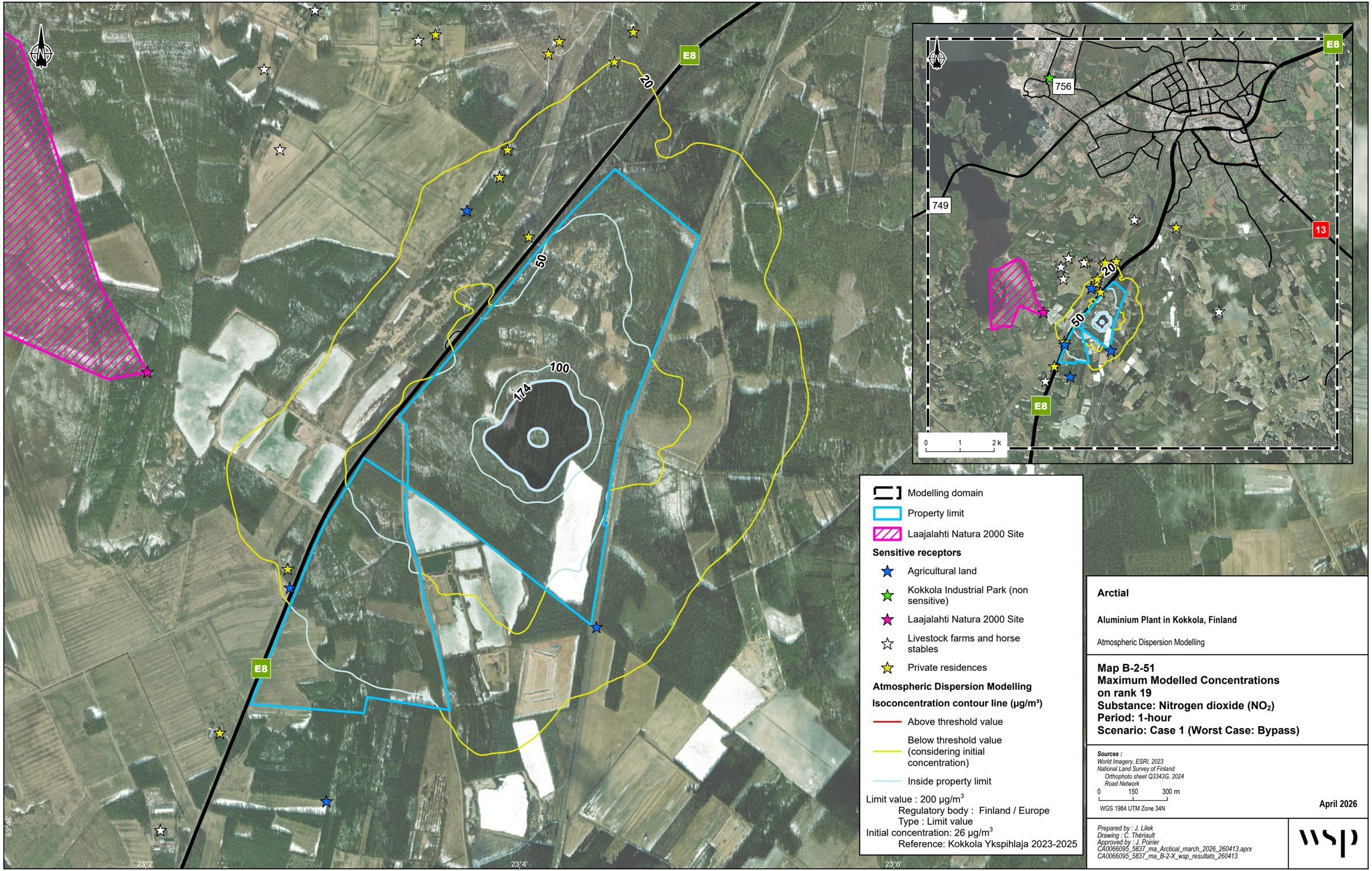

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-51
Maximum Modelled Concentrations on rank 19
Substance: Nitrogen dioxide (NO_2)
Period: 1-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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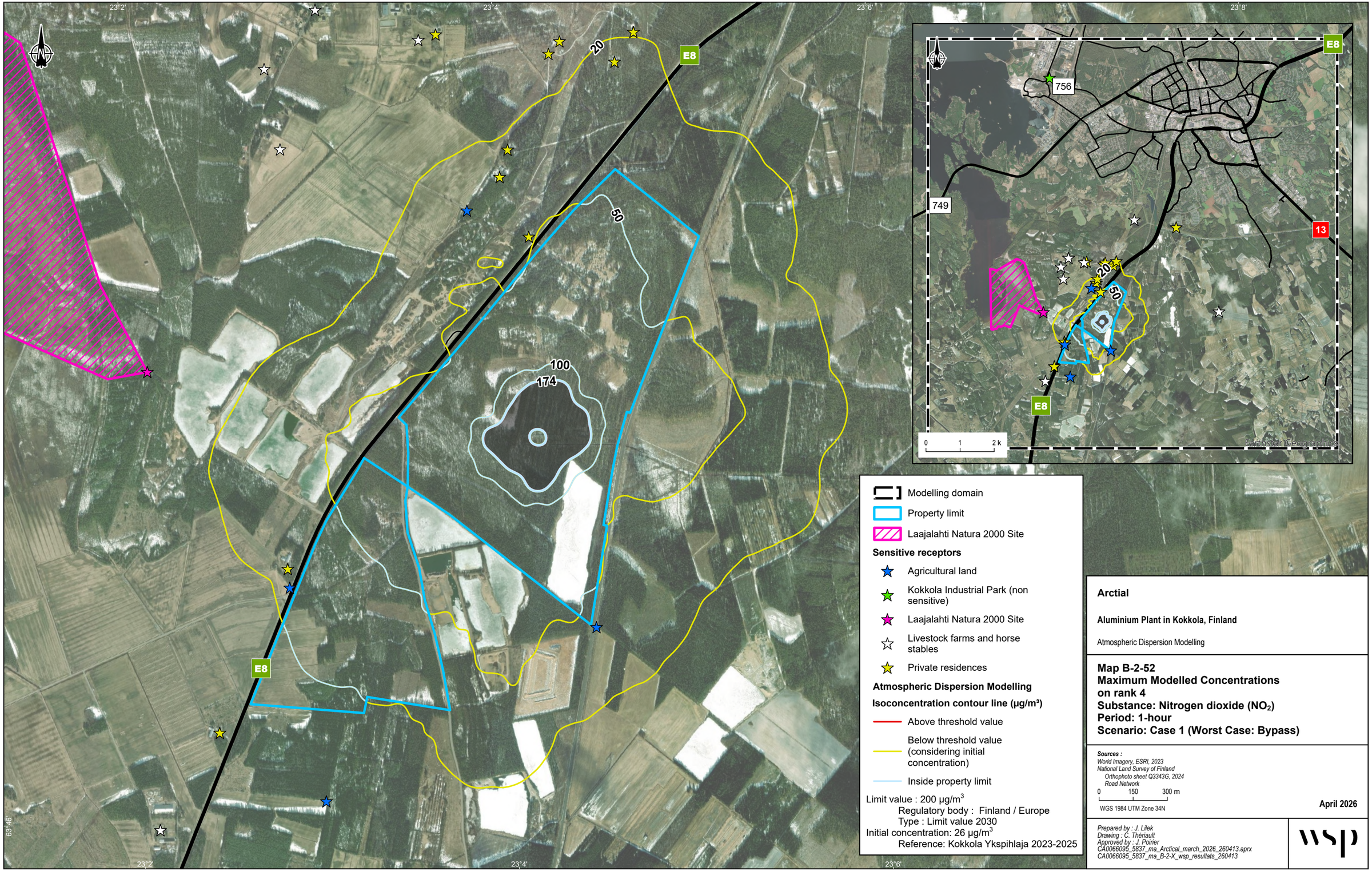

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-52
Maximum Modelled Concentrations on rank 4
Substance: Nitrogen dioxide (NO_2)
Period: 1-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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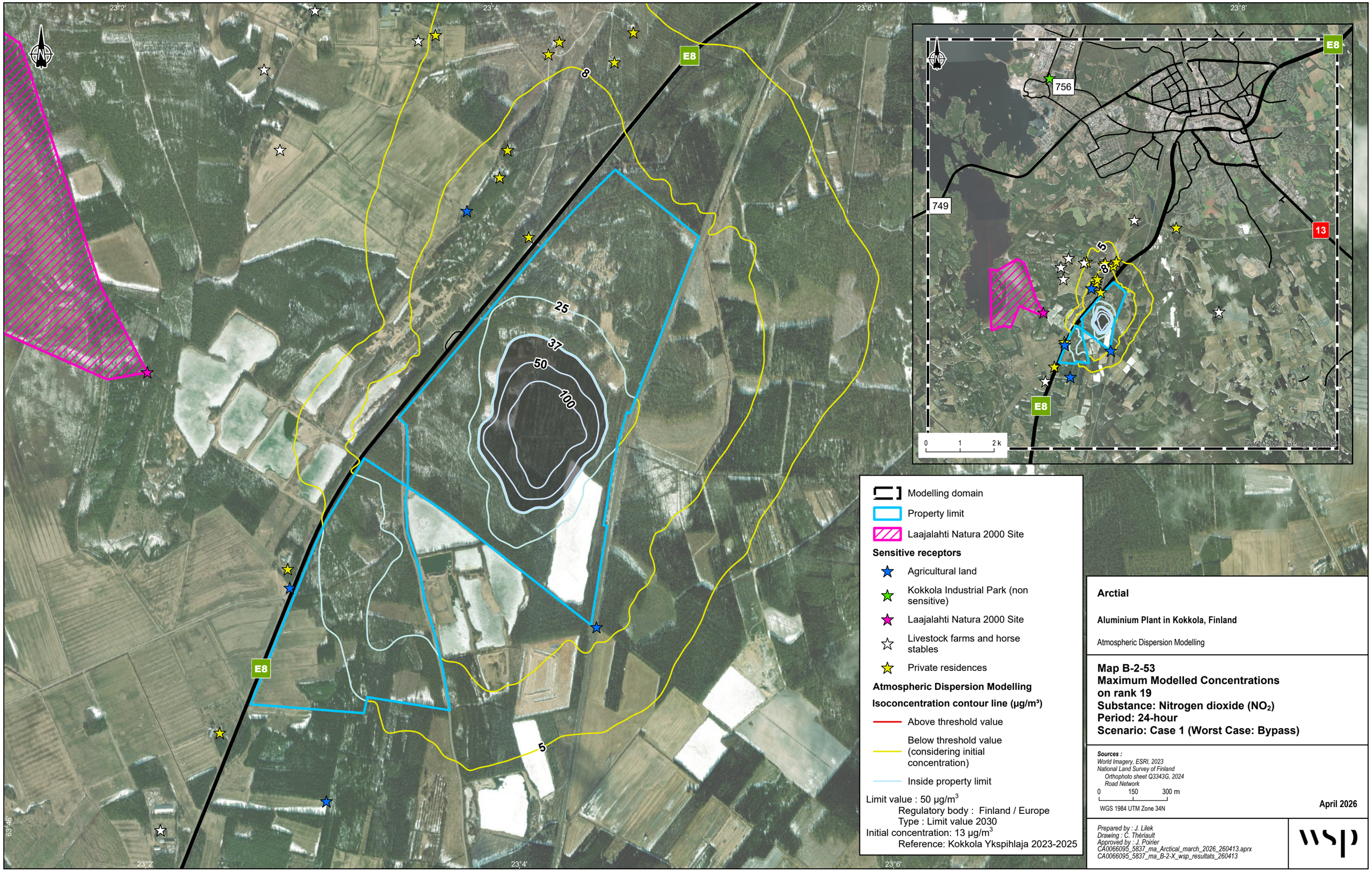

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-53
Maximum Modelled Concentrations on rank 19
Substance: Nitrogen dioxide (NO_2)
Period: 24-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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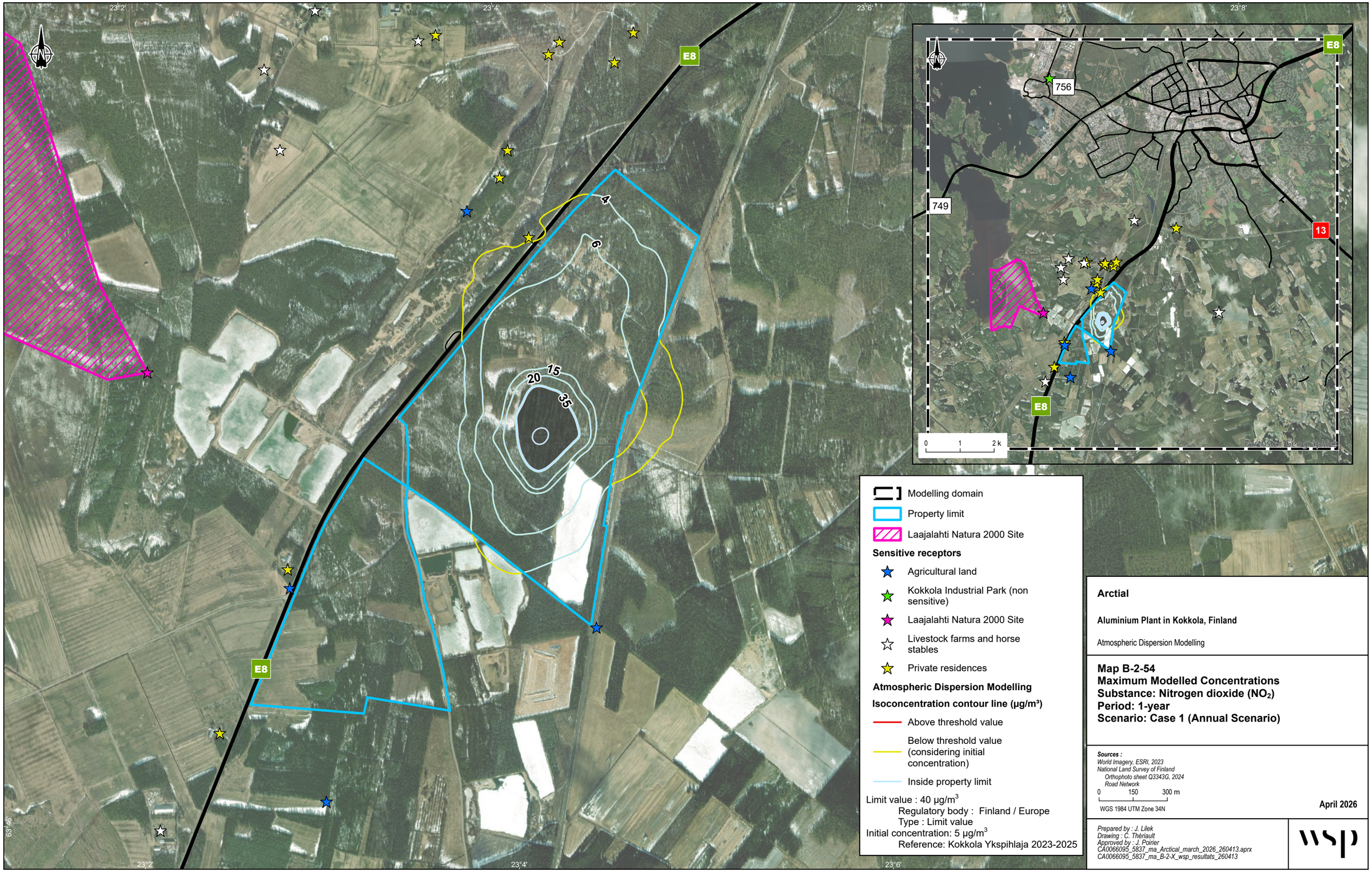

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-54
Maximum Modelled Concentrations
Substance: Nitrogen dioxide (NO_2)
Period: 1-year
Scenario: Case 1 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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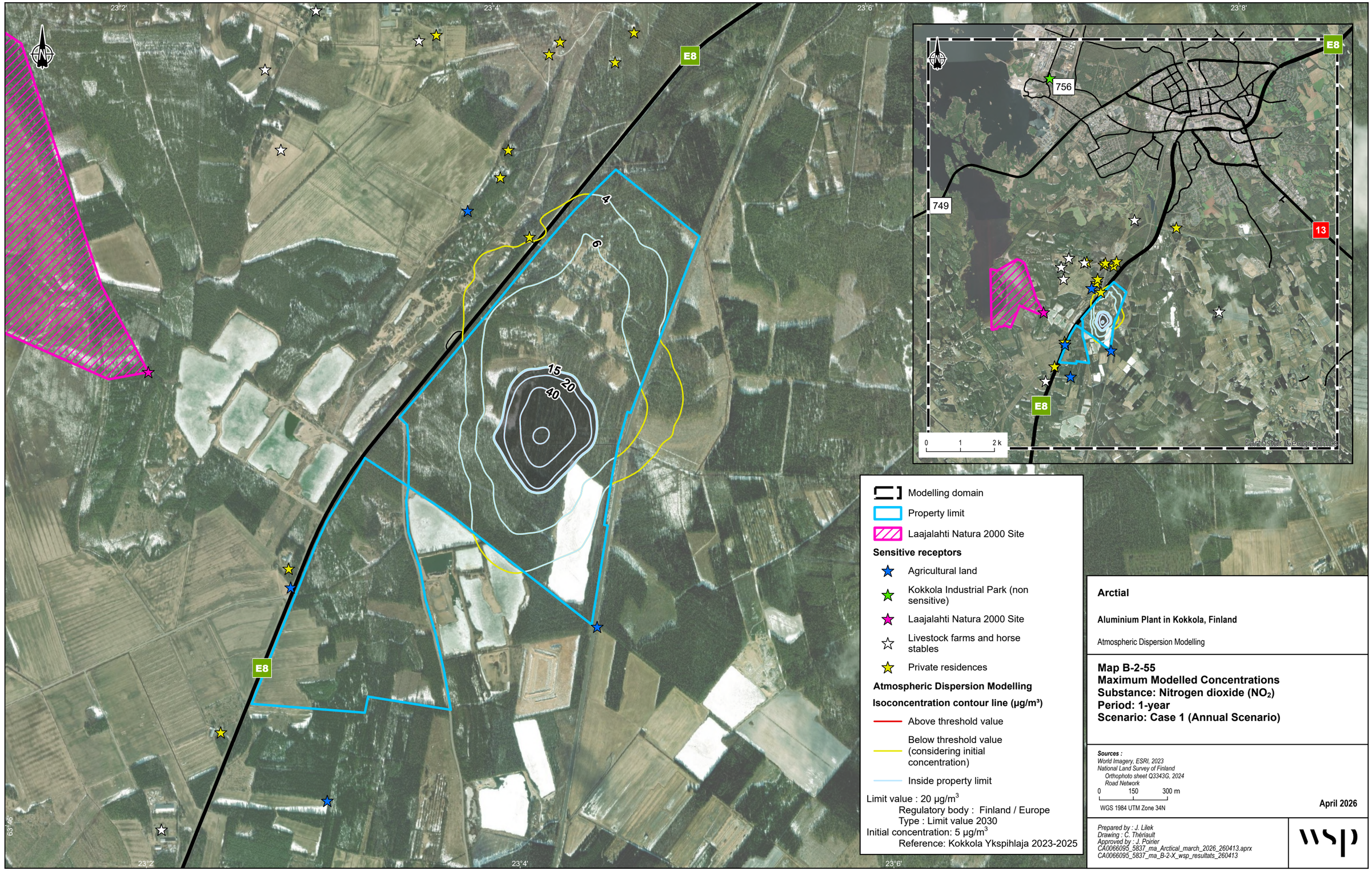

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-55
Maximum Modelled Concentrations
Substance: Nitrogen dioxide (NO_2)
Period: 1-year
Scenario: Case 1 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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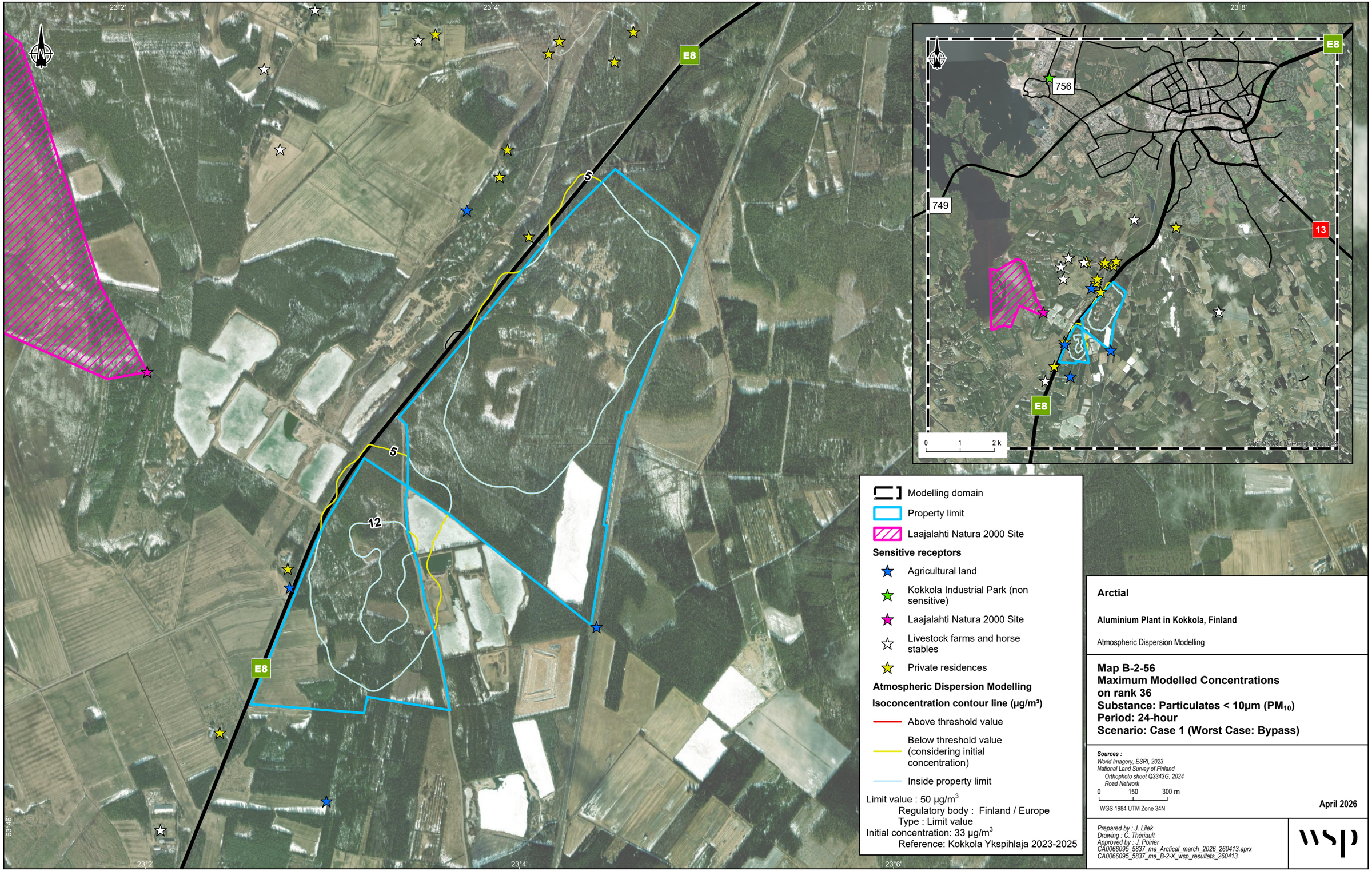

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-56
Maximum Modelled Concentrations on rank 36
Substance: Particulates < 10µm (PM_{10})
Period: 24-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

wsp

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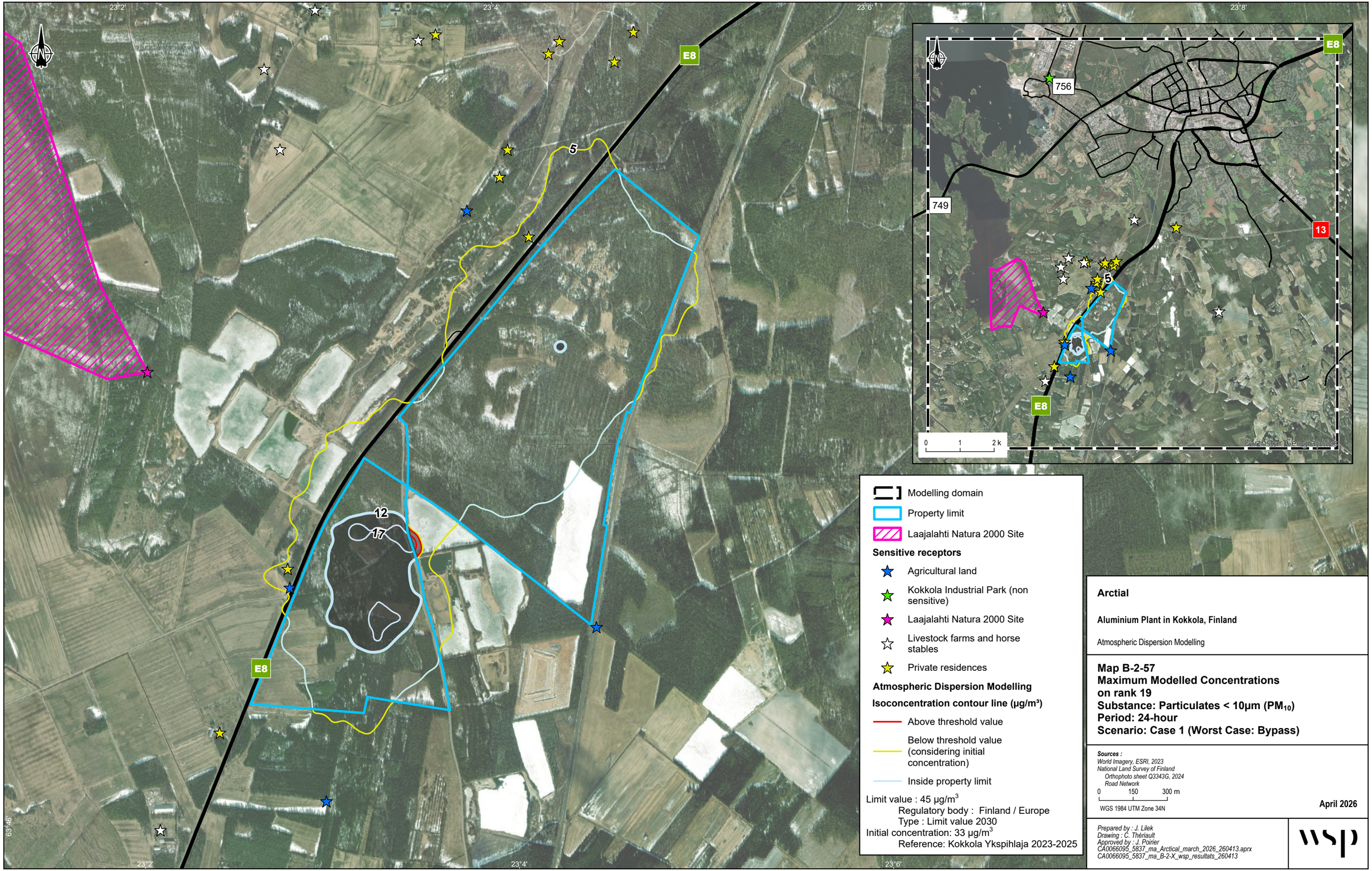

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-57
Maximum Modelled Concentrations on rank 19
Substance: Particulates < 10µm (PM_{10})
Period: 24-hour
Scenario: Case 1 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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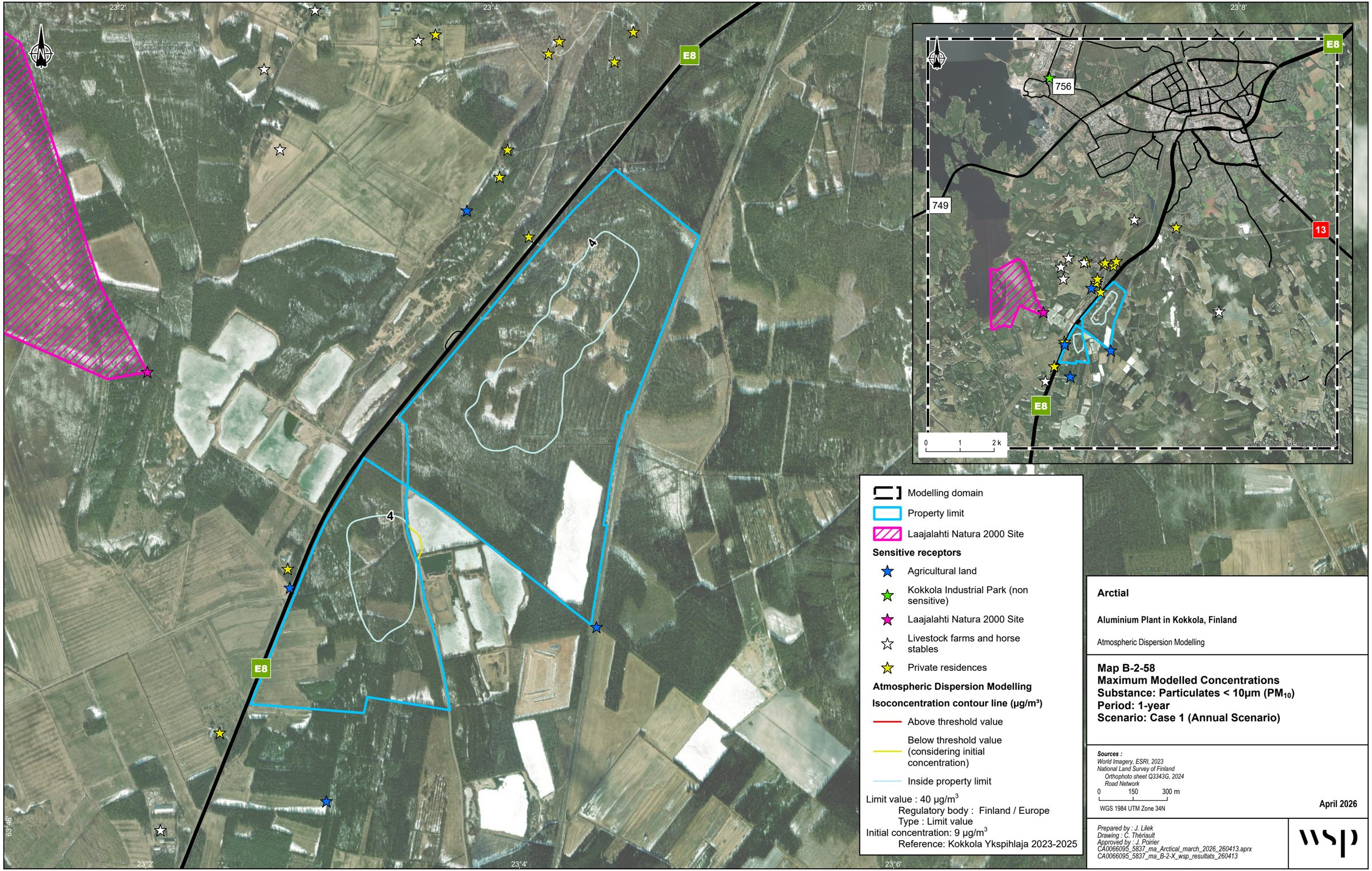

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-58
Maximum Modelled Concentrations
Substance: Particulates < 10µm (PM_{10})
Period: 1-year
Scenario: Case 1 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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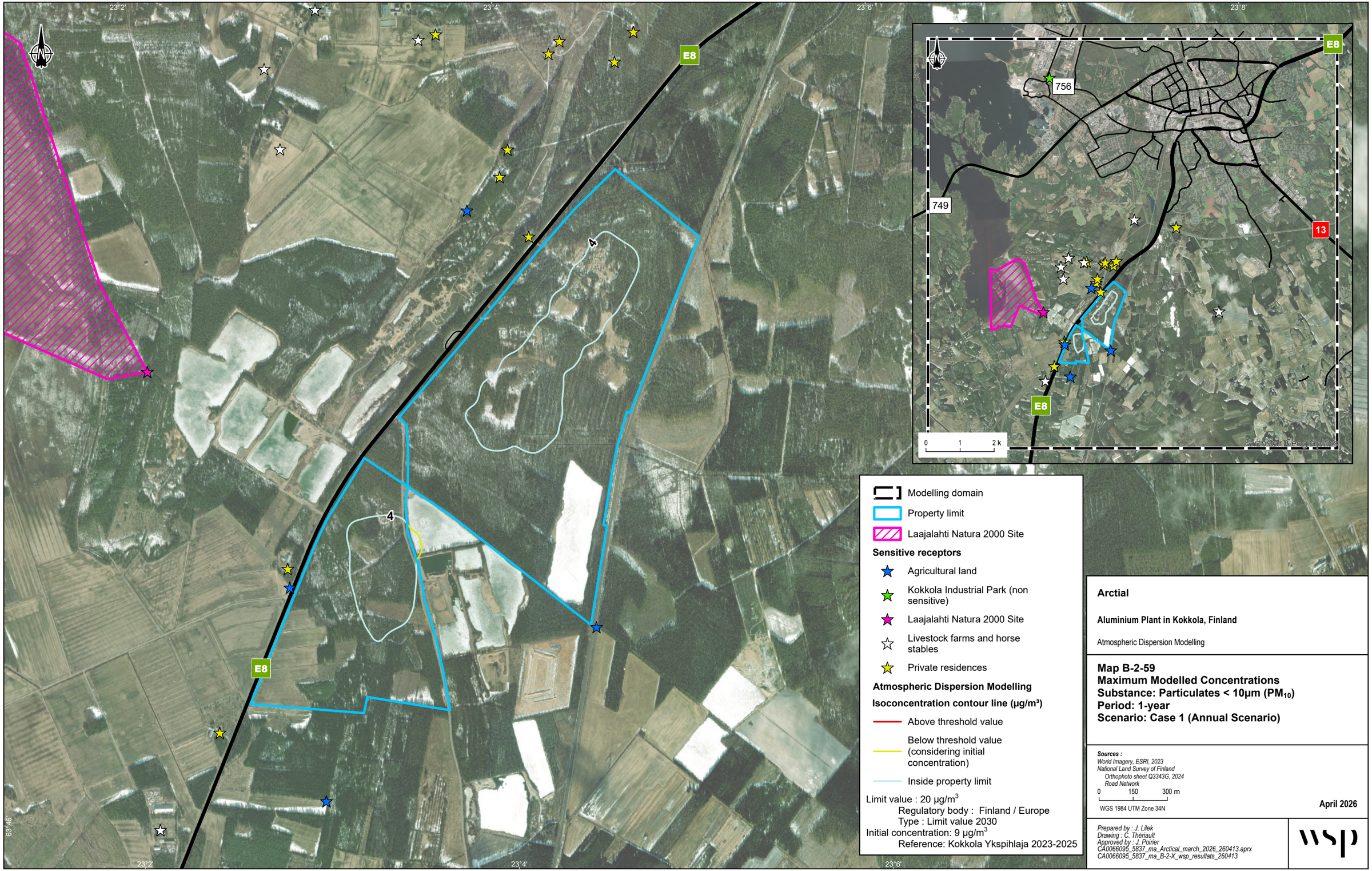

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-59
Maximum Modelled Concentrations
Substance: Particulates < 10µm (PM_{10})
Period: 1-year
Scenario: Case 1 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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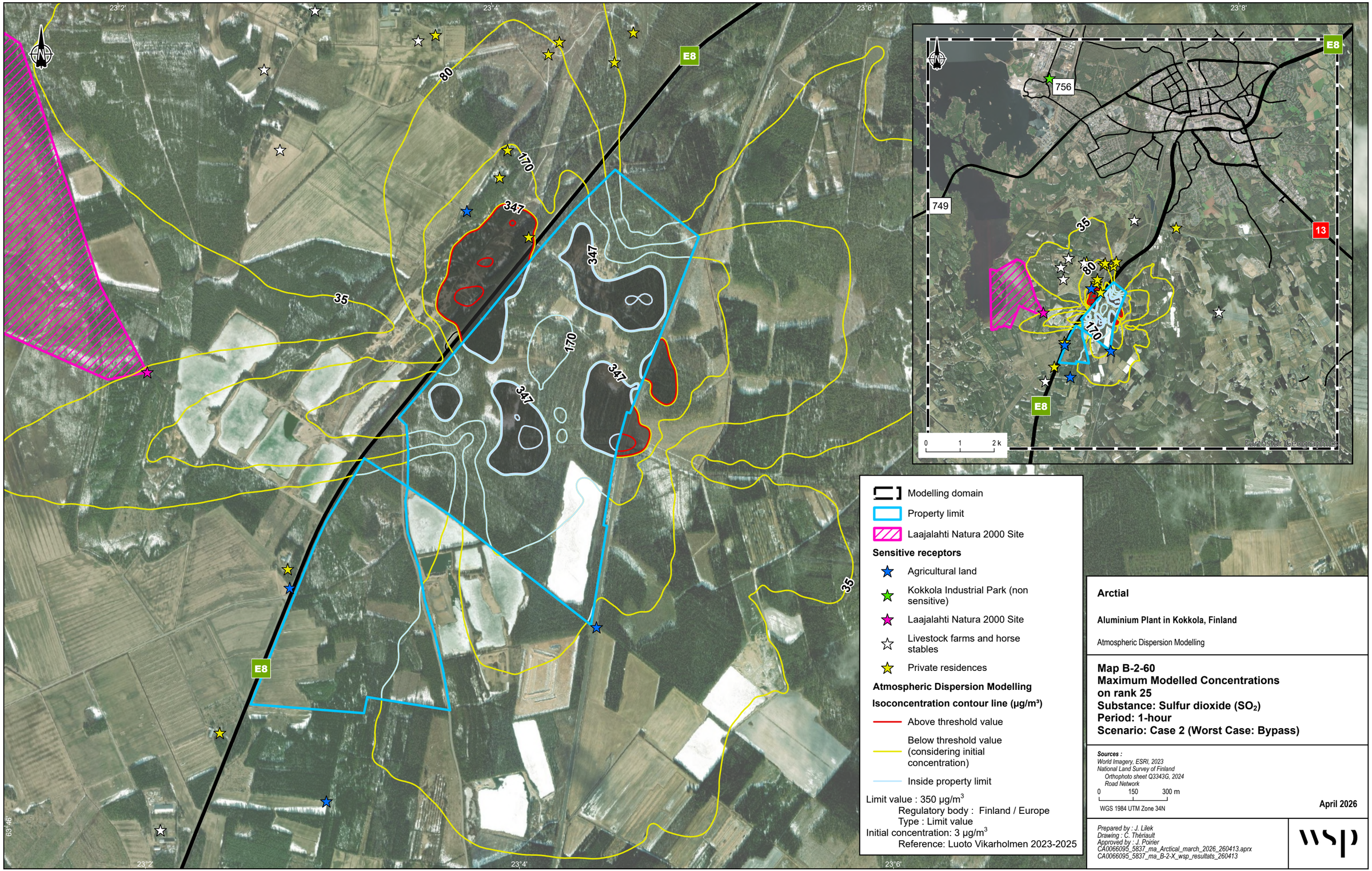

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-60
Maximum Modelled Concentrations
on rank 25
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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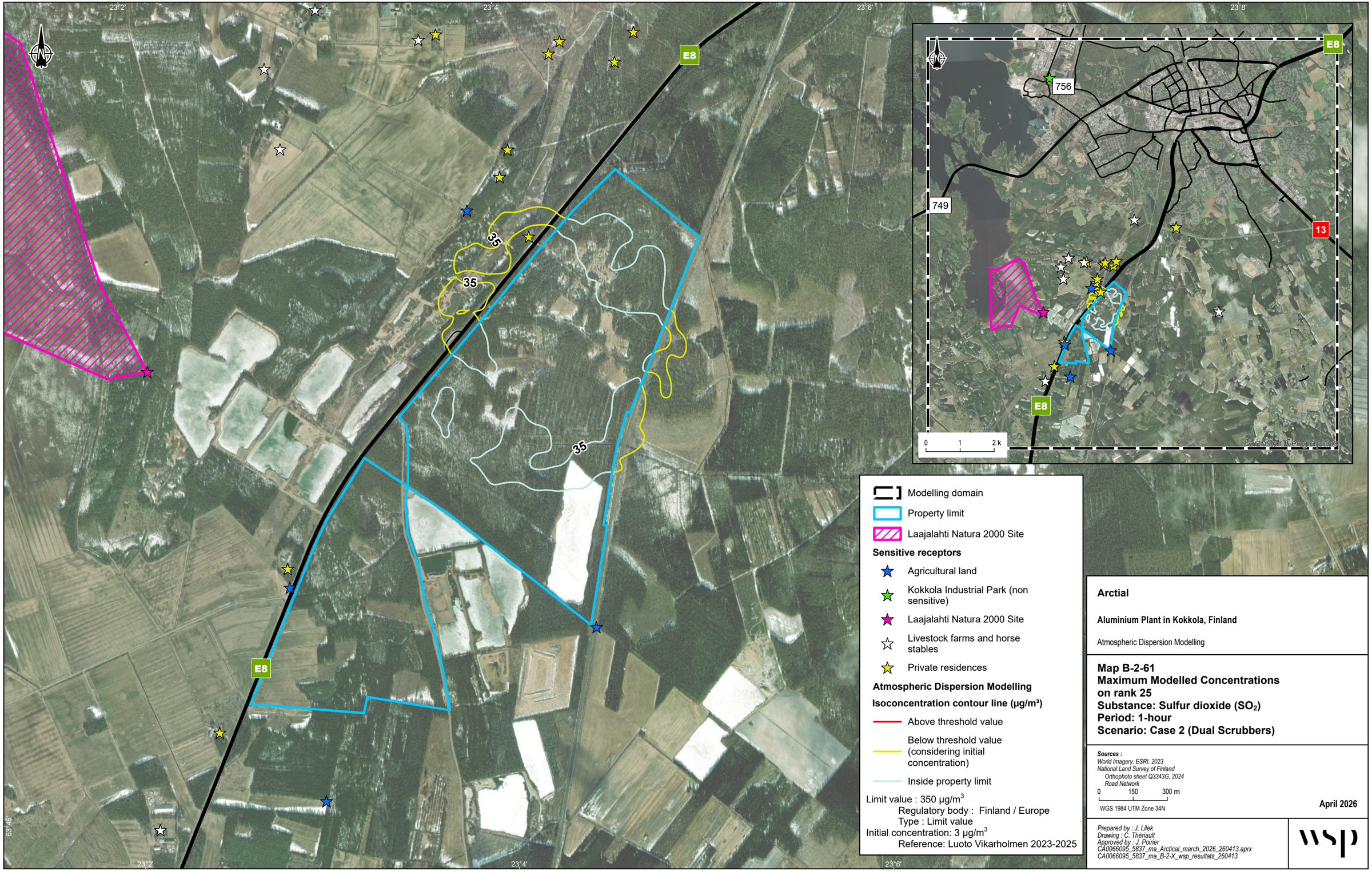

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-61
Maximum Modelled Concentrations on rank 25
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 2 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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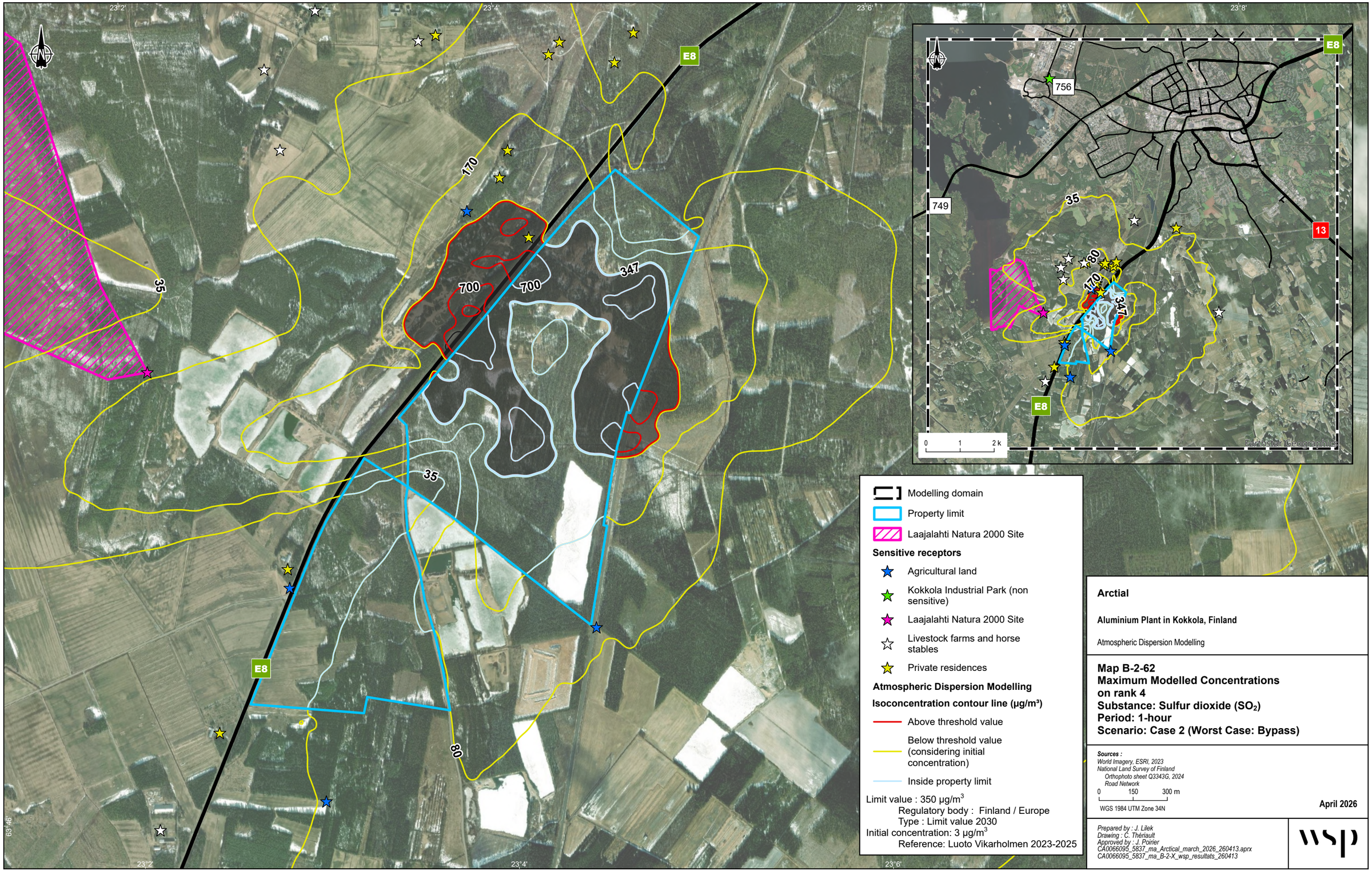

Modelling domain
Property limit
Laajalahti Natura 2000 Site

Sensitive receptors

Agricultural land
Kokkola Industrial Park (non sensitive)
Laajalahti Natura 2000 Site
Livestock farms and horse stables
Private residences

Atmospheric Dispersion Modelling

Isoconcentration contour line (µg/m³)

Above threshold value
Below threshold value (considering initial concentration)
Inside property limit

Limit value : 350 µg/m^3
Regulatory body : Finland / Europe
Type : Limit value 2030
Initial concentration: 3 µg/m^3
Reference: Luoto Vikarholmen 2023-2025

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-62
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

wsp

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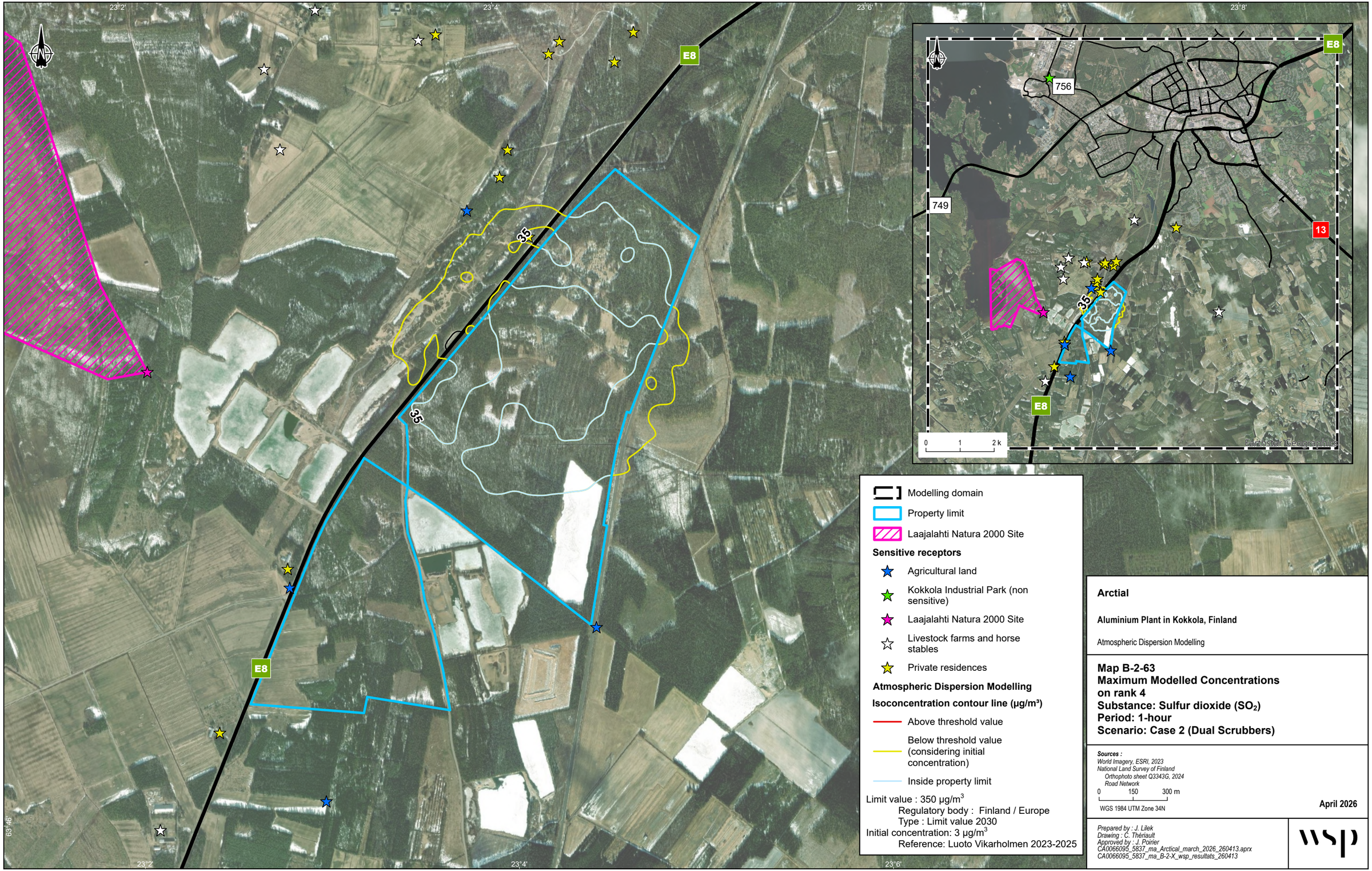

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-63
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 1-hour
Scenario: Case 2 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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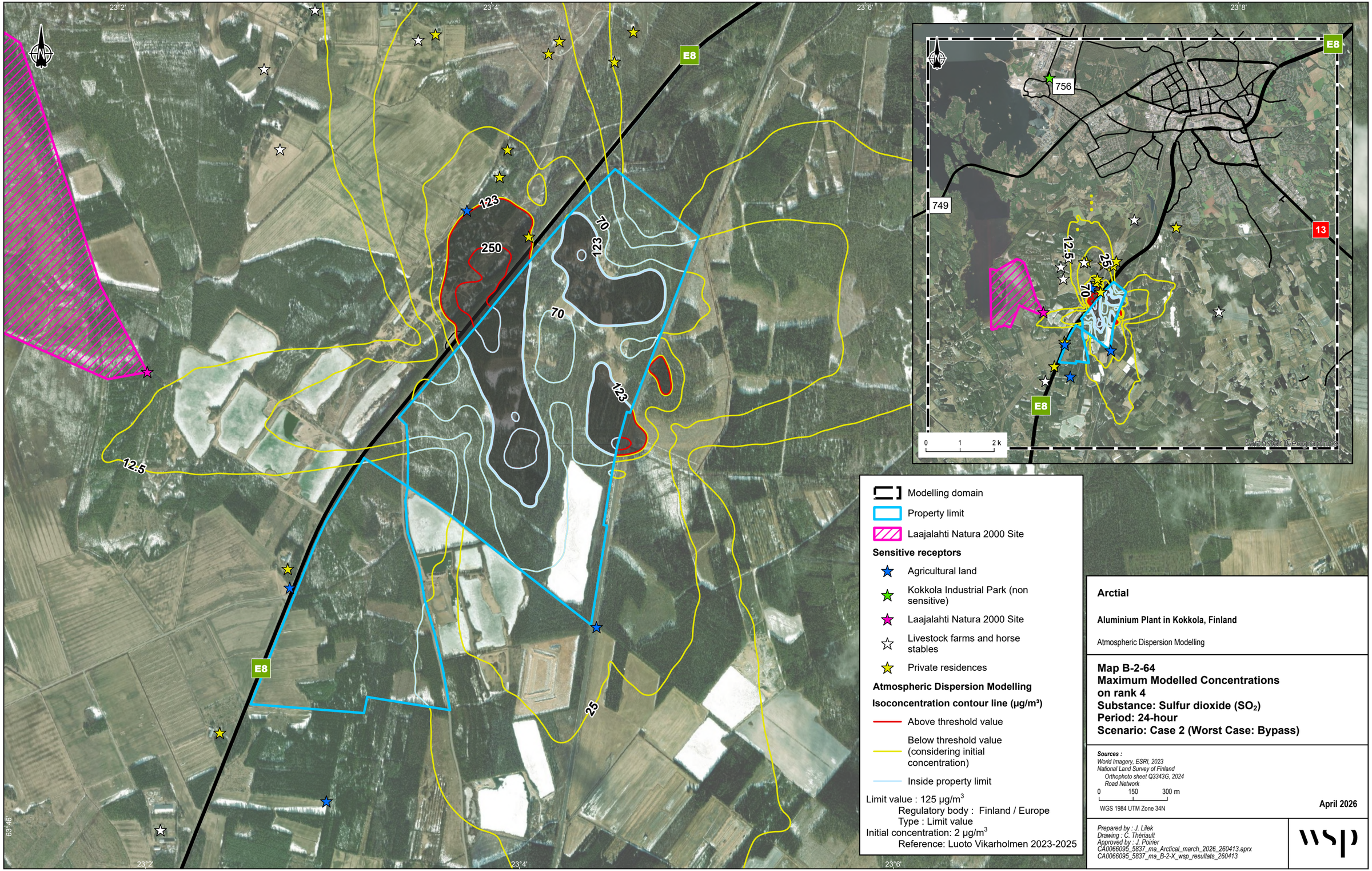

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-64
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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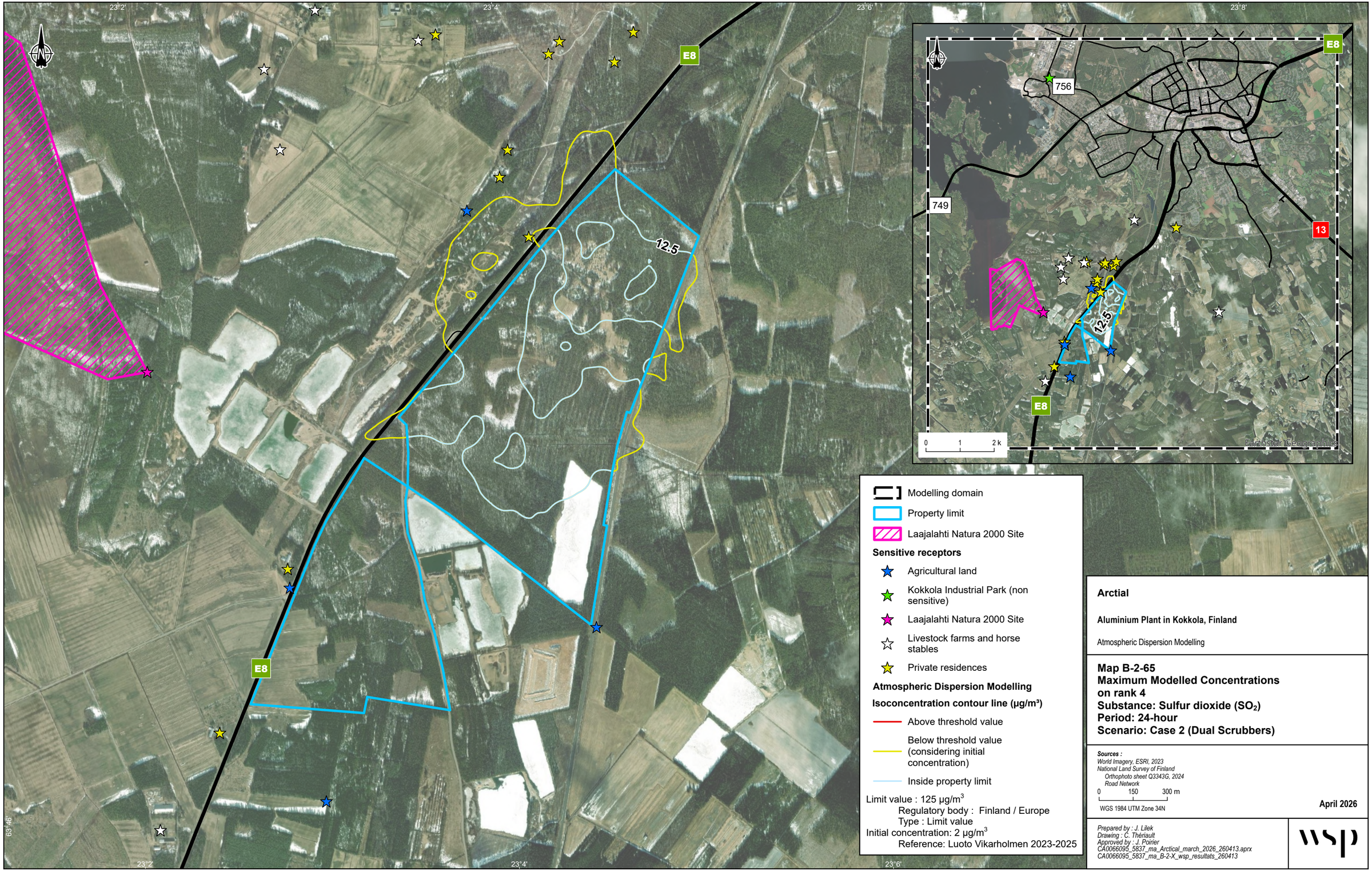

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-65
Maximum Modelled Concentrations on rank 4
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 2 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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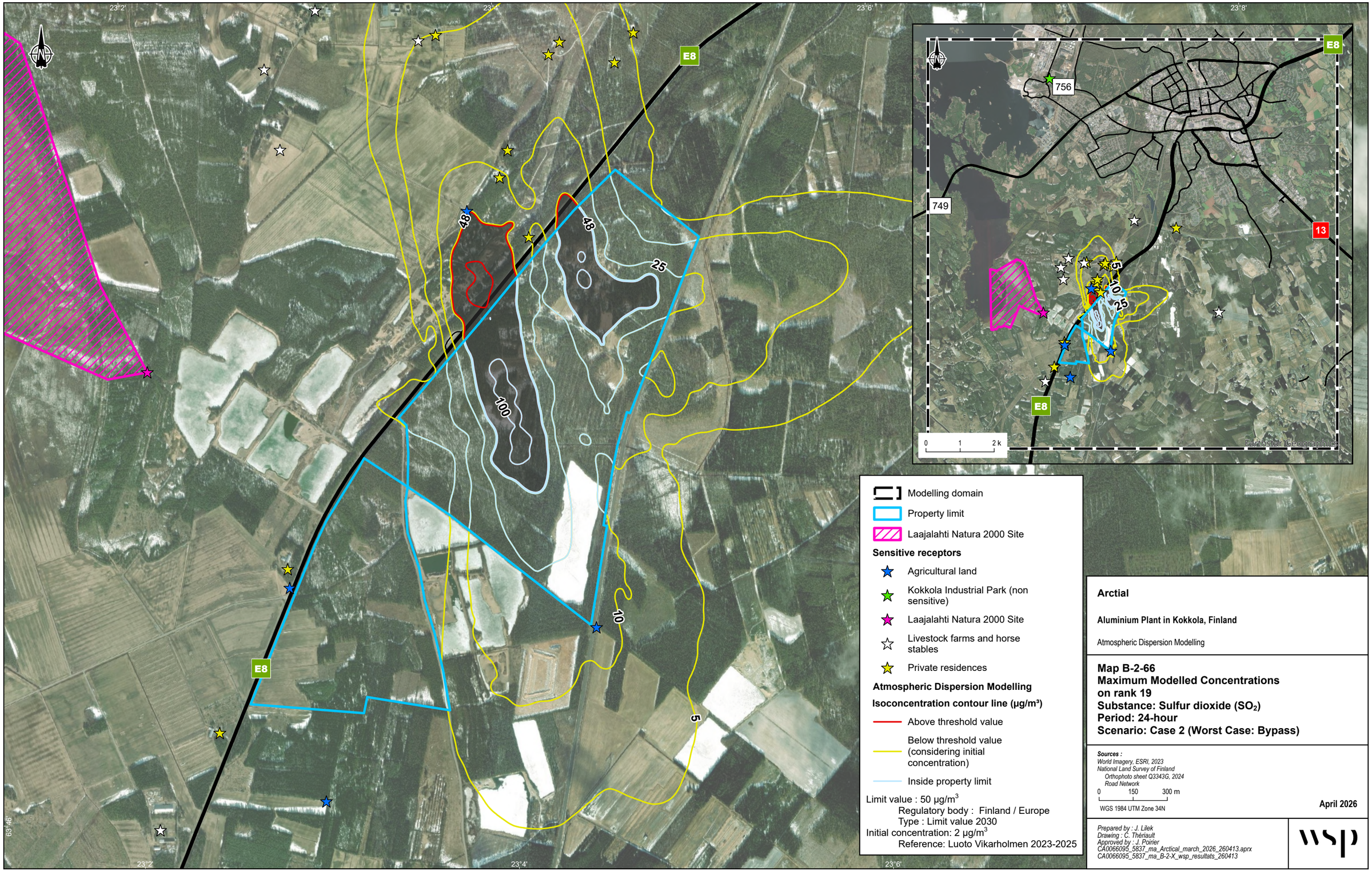

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-66
Maximum Modelled Concentrations on rank 19
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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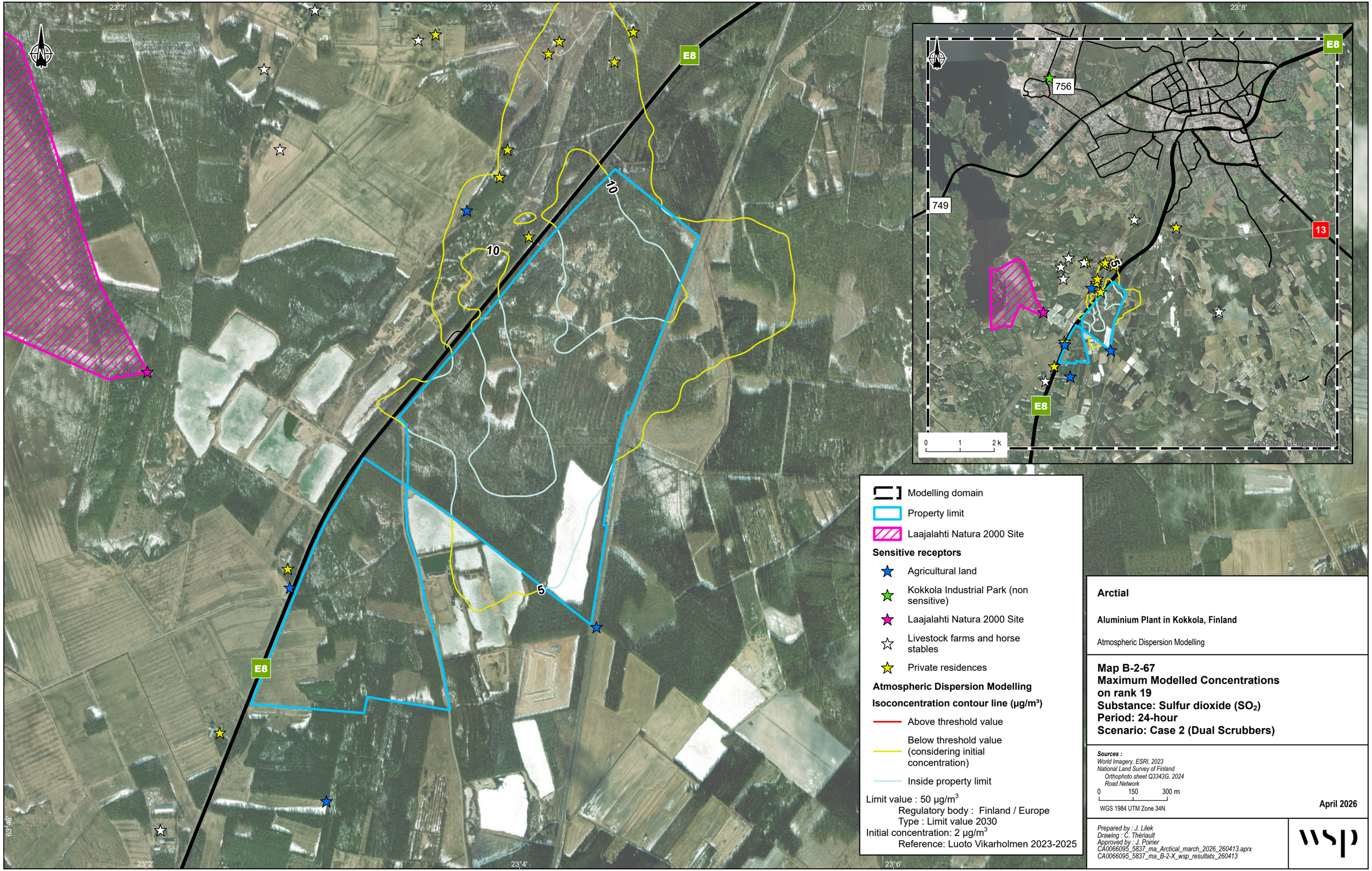

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-67
Maximum Modelled Concentrations on rank 19
Substance: Sulfur dioxide (SO_2)
Period: 24-hour
Scenario: Case 2 (Dual Scrubbers)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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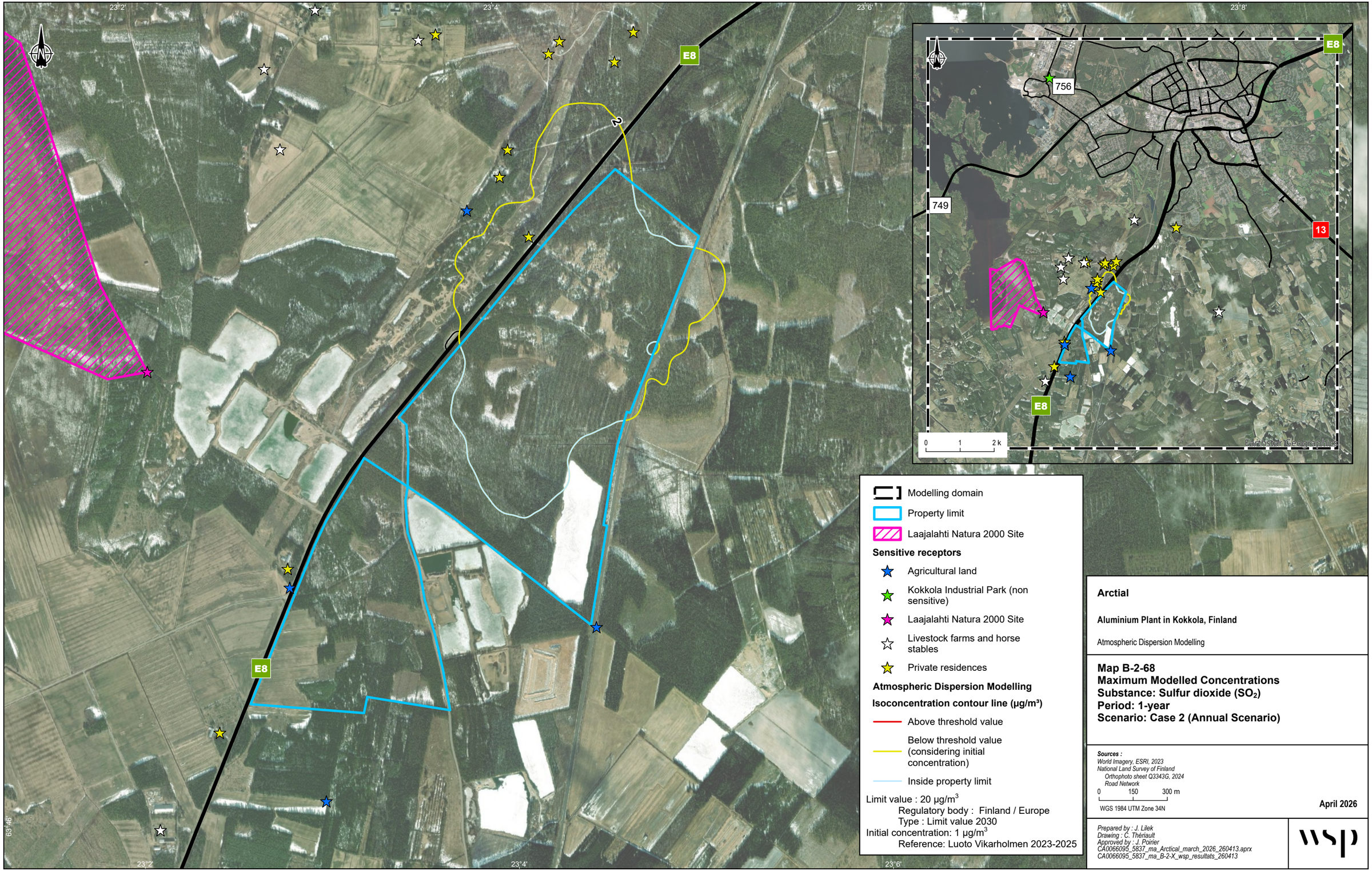

Modelling domain

Property limit

Laajalahti Natura 2000 Site

Sensitive receptors

Agricultural land

Kokkola Industrial Park (non sensitive)

Laajalahti Natura 2000 Site

Livestock farms and horse stables

Private residences

Atmospheric Dispersion Modelling

Isoconcentration contour line (µg/m³)

Above threshold value

Below threshold value (considering initial concentration)

Inside property limit

Limit value : 20 µg/m^3
Regulatory body : Finland / Europe
Type : Limit value 2030
Initial concentration: 1 µg/m^3
Reference: Luoto Vikarholmen 2023-2025

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-68
Maximum Modelled Concentrations
Substance: Sulfur dioxide (SO_2)
Period: 1-year
Scenario: Case 2 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
CA0066095_5837_ma_B-2-X_wsp_resultats_260413

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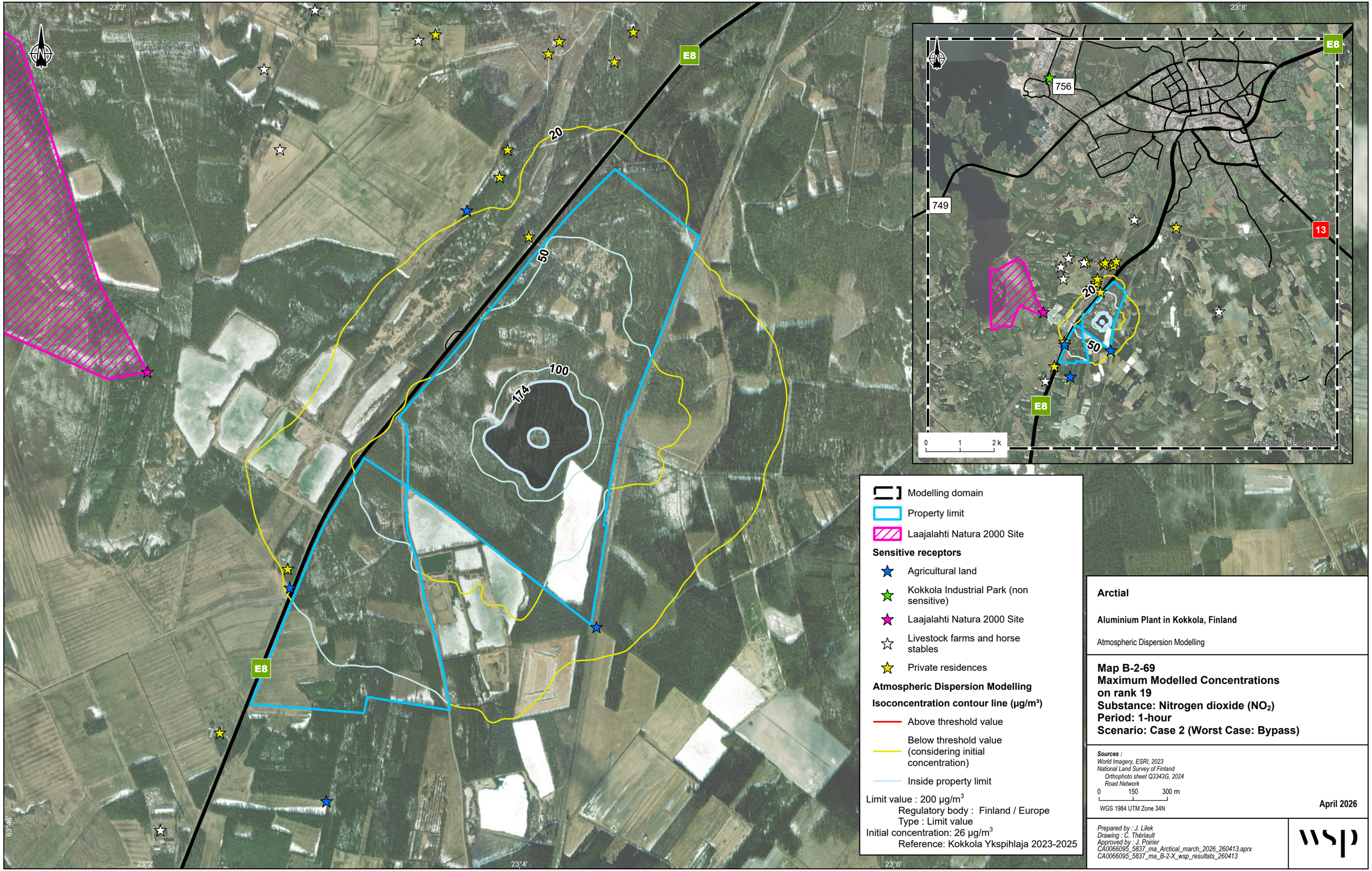

- Modelling domain
- Property limit
- Laajalahti Natura 2000 Site

Sensitive receptors

- Agricultural land
- Kokkola Industrial Park (non sensitive)
- Laajalahti Natura 2000 Site
- Livestock farms and horse stables
- Private residences

Atmospheric Dispersion Modelling

Isoconcentration contour line (µg/m³)

- Above threshold value
- Below threshold value (considering initial concentration)
- Inside property limit

Limit value : 200 µg/m³
Regulatory body : Finland / Europe
Type : Limit value
Initial concentration: 26 µg/m³
Reference: Kokkola Ykspihlaja 2023-2025

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-69
Maximum Modelled Concentrations on rank 19
Substance: Nitrogen dioxide (NO_2)
Period: 1-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
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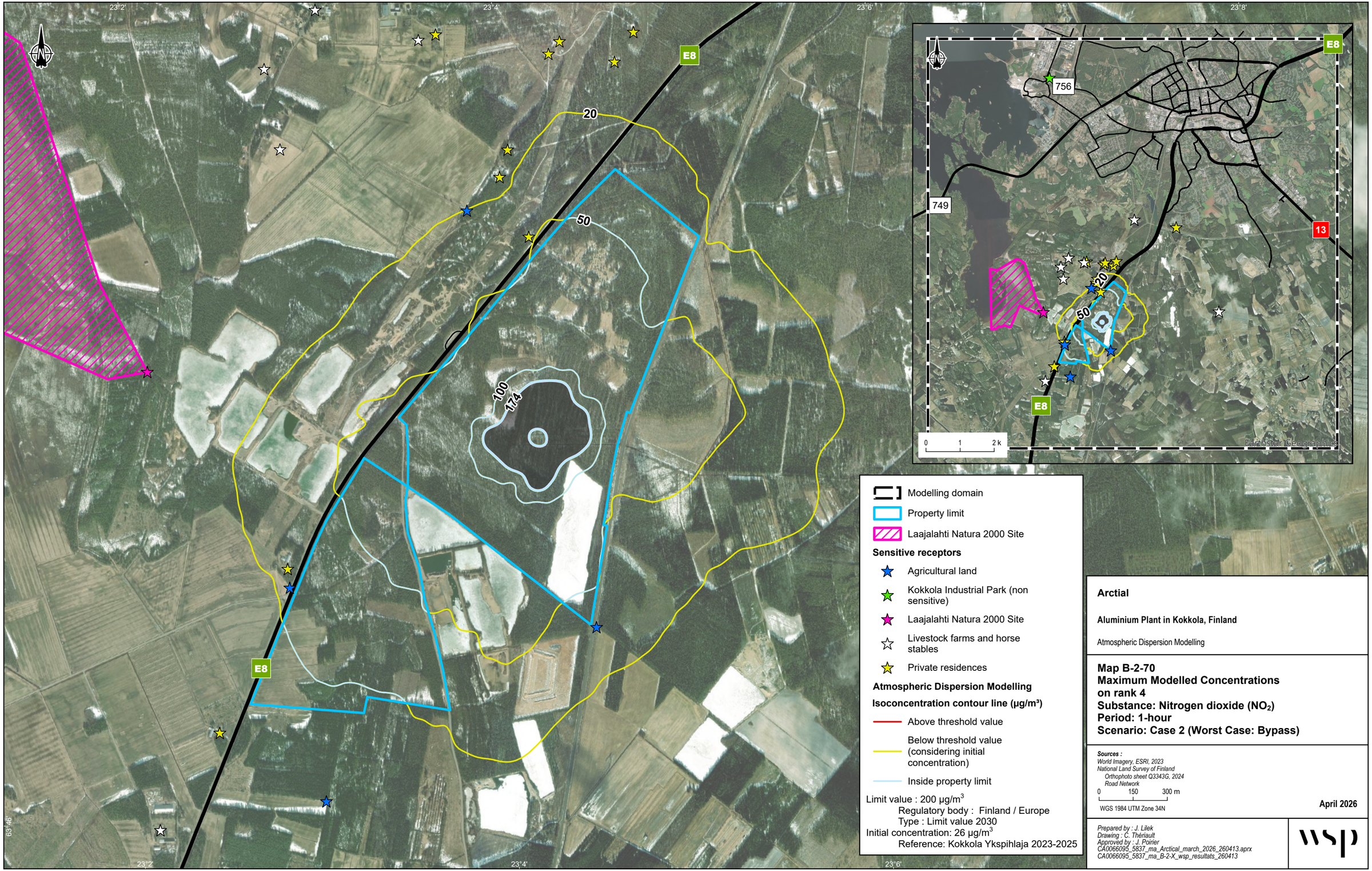

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-70
Maximum Modelled Concentrations on rank 4
Substance: Nitrogen dioxide (NO_2)
Period: 1-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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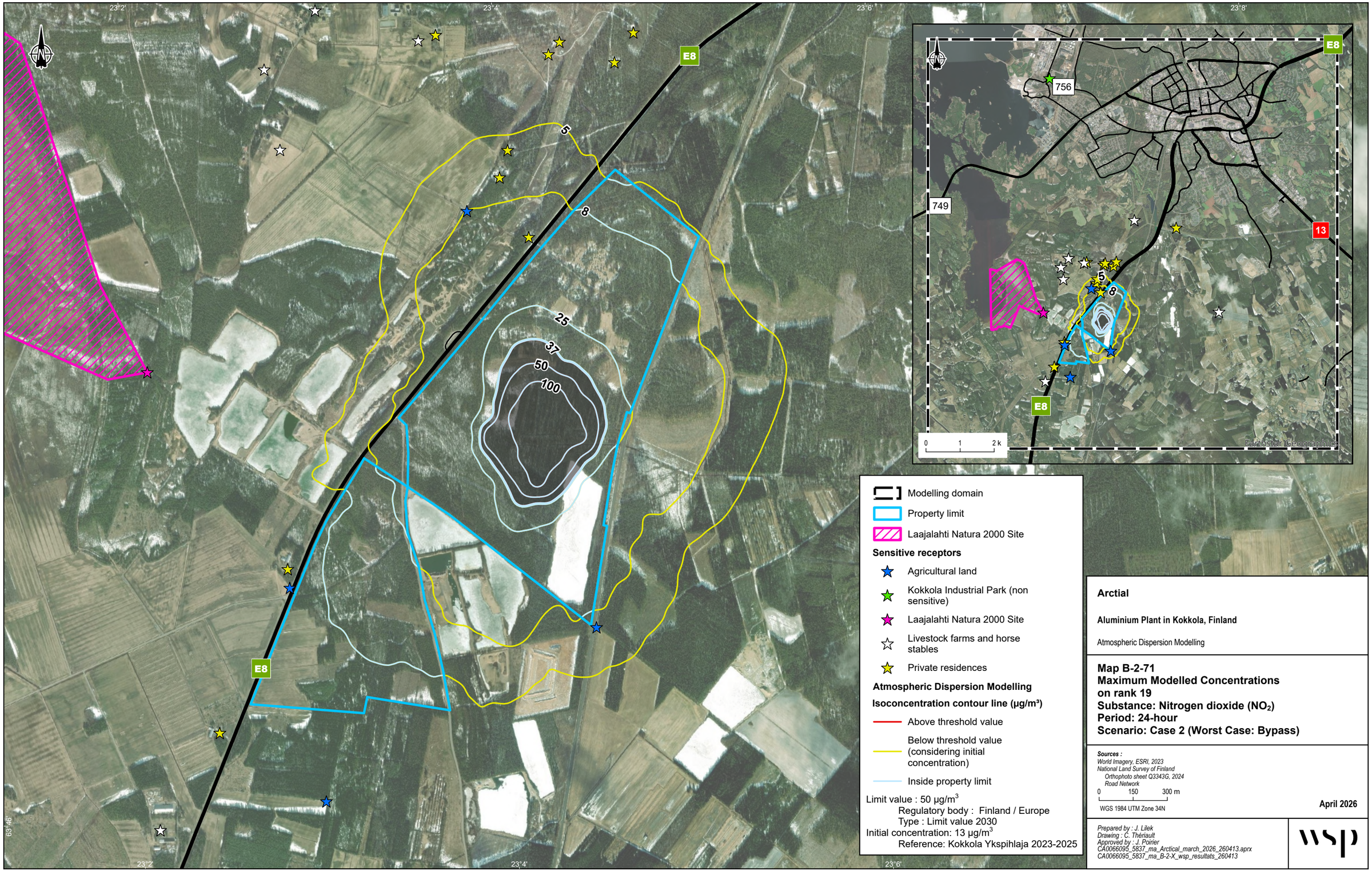

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-71
Maximum Modelled Concentrations on rank 19
Substance: Nitrogen dioxide (NO_2)
Period: 24-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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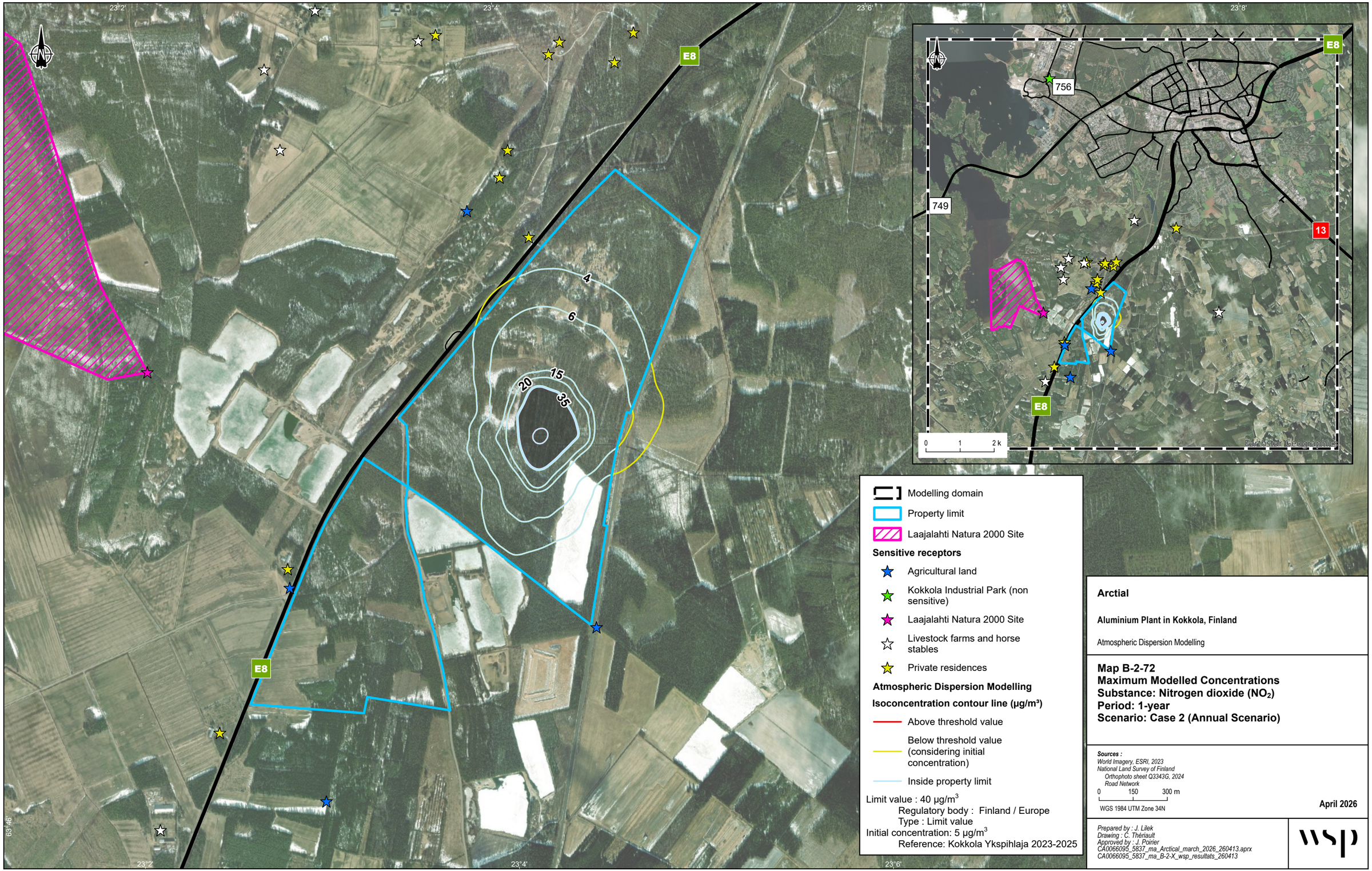

Modelling domain

Property limit

Laajalahti Natura 2000 Site

Sensitive receptors

Agricultural land

Kokkola Industrial Park (non sensitive)

Laajalahti Natura 2000 Site

Livestock farms and horse stables

Private residences

Atmospheric Dispersion Modelling

Isoconcentration contour line (µg/m³)

Above threshold value

Below threshold value (considering initial concentration)

Inside property limit

Limit value : 40 µg/m^3
Regulatory body : Finland / Europe
Type : Limit value

Initial concentration: 5 µg/m^3
Reference: Kokkola Ykspihlaja 2023-2025

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-72
Maximum Modelled Concentrations
Substance: Nitrogen dioxide (NO_2)
Period: 1-year
Scenario: Case 2 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
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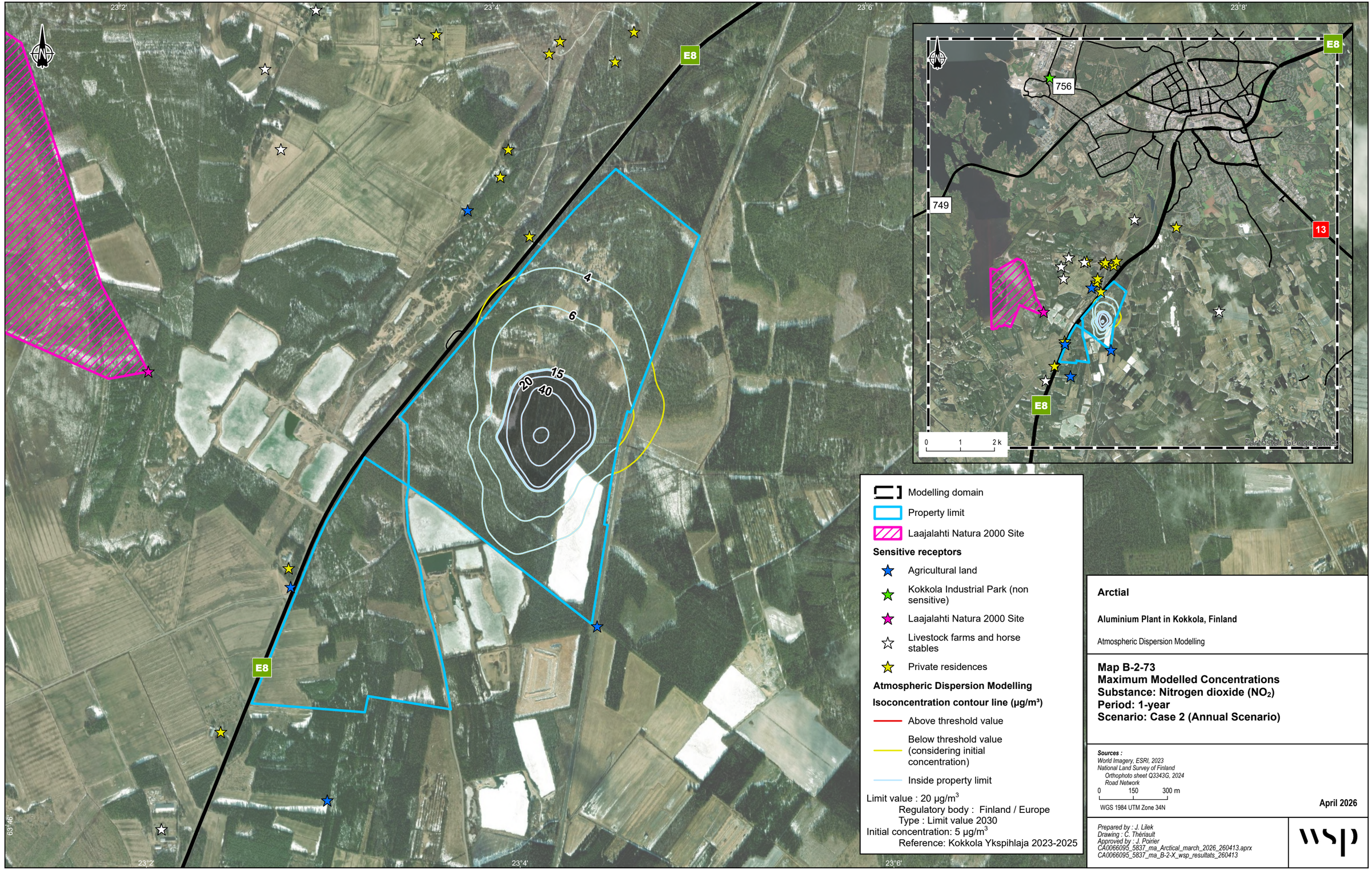

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-73
Maximum Modelled Concentrations
Substance: Nitrogen dioxide (NO_2)
Period: 1-year
Scenario: Case 2 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
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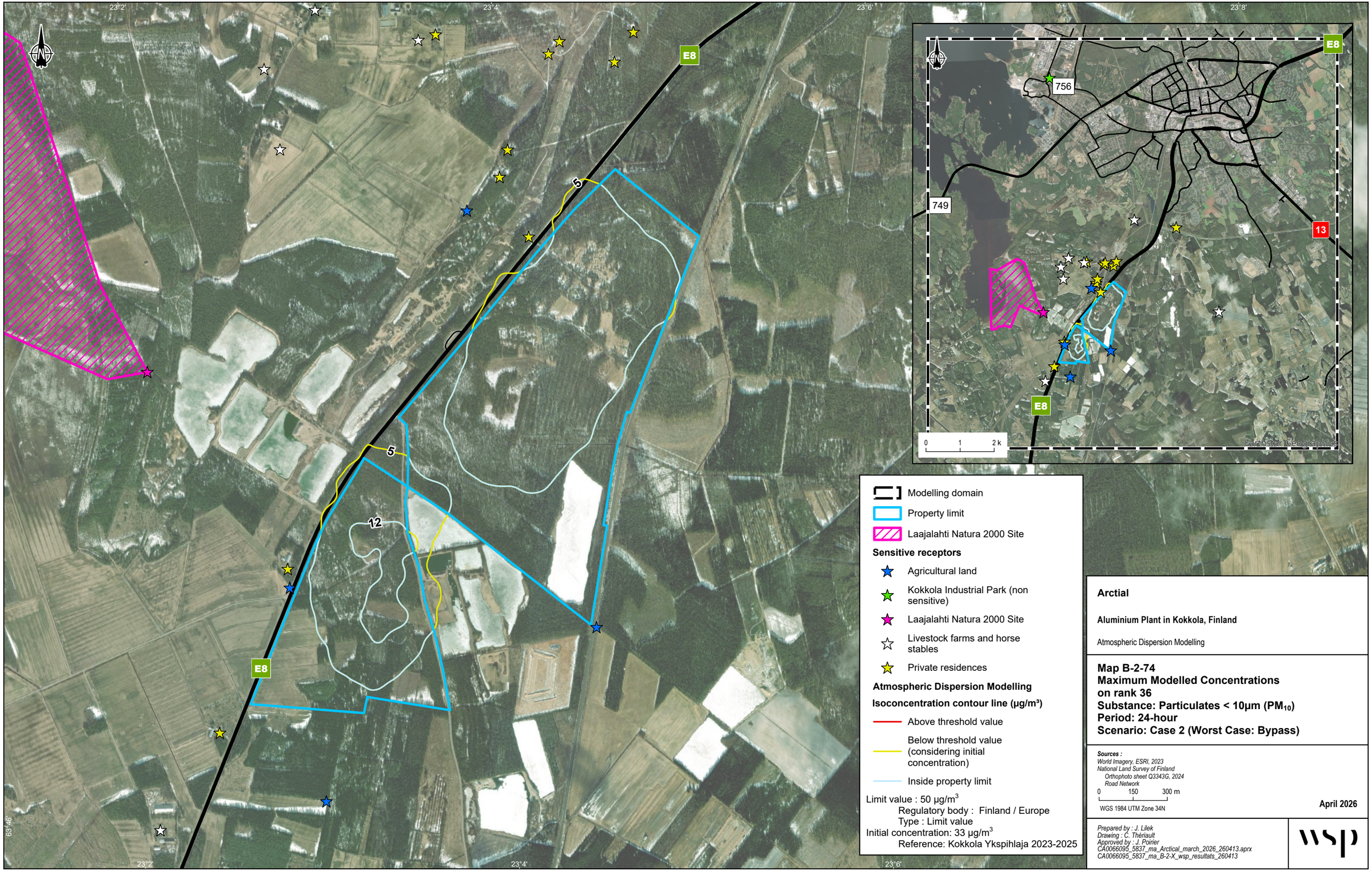

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-74
Maximum Modelled Concentrations on rank 36
Substance: Particulates < 10µm (PM_{10})
Period: 24-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
CA0066095_5837_ma_Arctical_march_2026_260413.aprx
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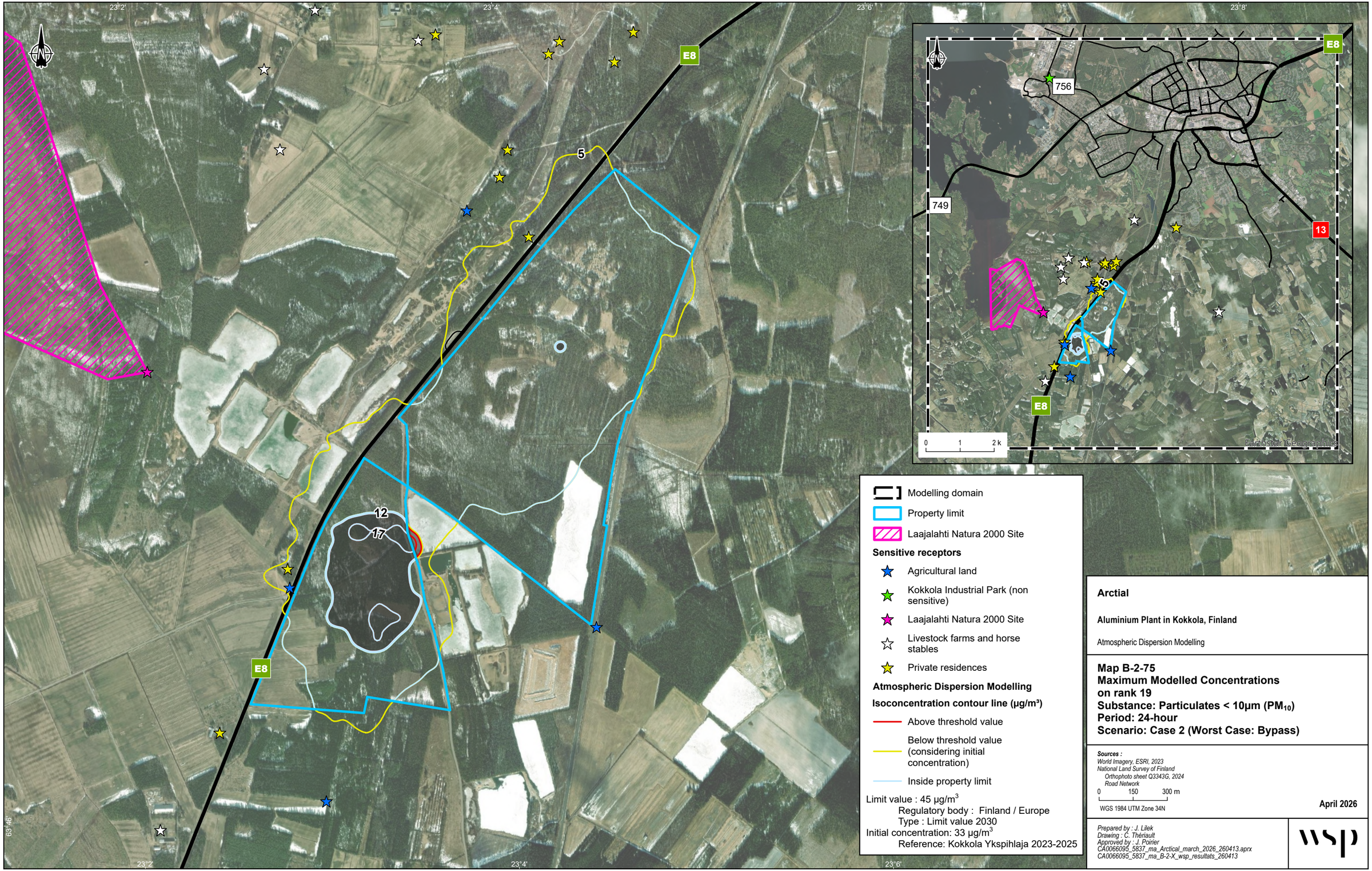

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-75
Maximum Modelled Concentrations on rank 19
Substance: Particulates < 10µm (PM_{10})
Period: 24-hour
Scenario: Case 2 (Worst Case: Bypass)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

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Approved by : J. Poirier
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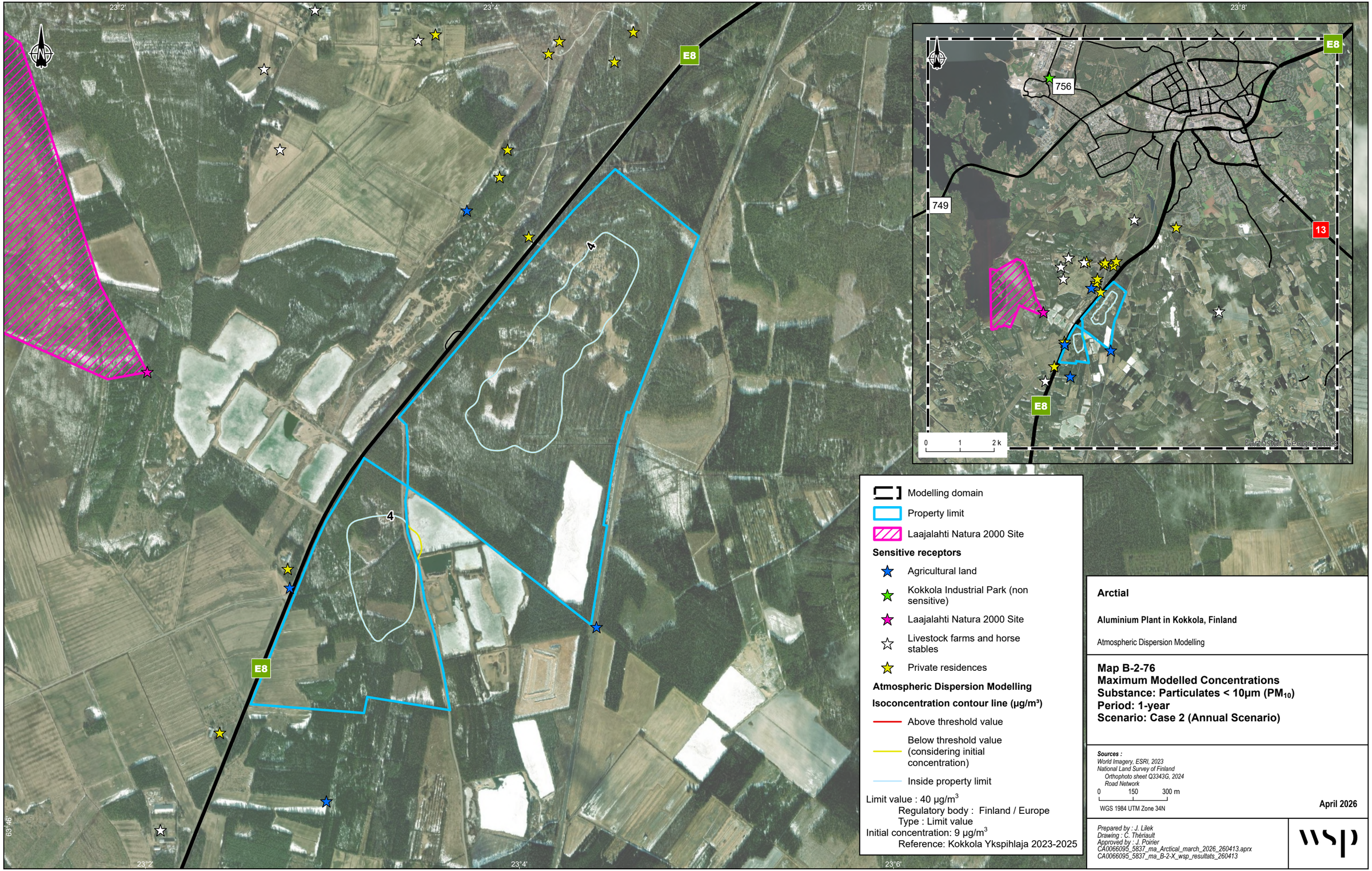

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-76
Maximum Modelled Concentrations
Substance: Particulates < 10µm (PM_{10})
Period: 1-year
Scenario: Case 2 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

WGS 1984 UTM Zone 34N

April 2026

Prepared by : J. Lilek
Drawing : C. Thériault
Approved by : J. Poirier
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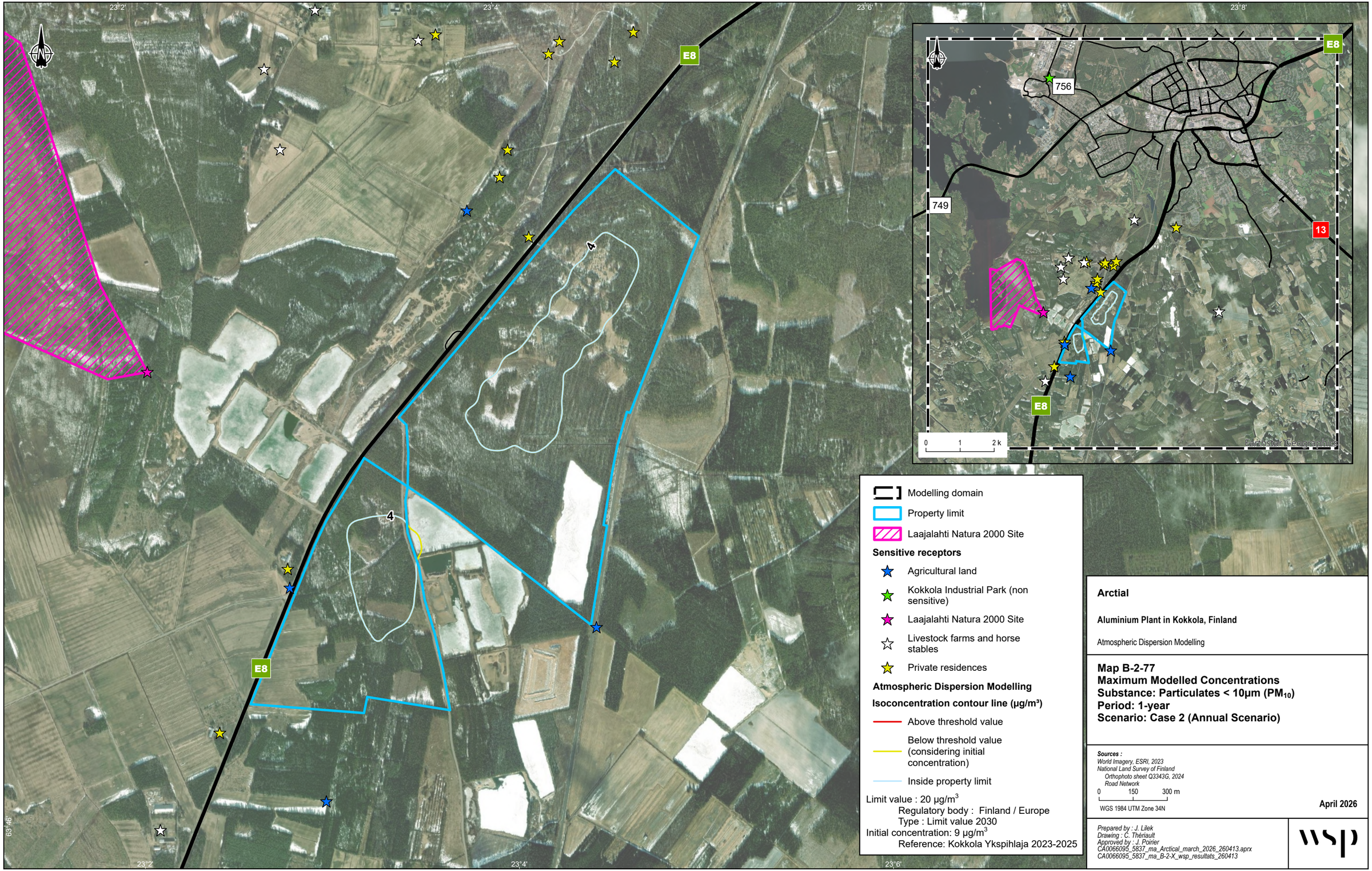

Arctial

Aluminium Plant in Kokkola, Finland

Atmospheric Dispersion Modelling

Map B-2-77
Maximum Modelled Concentrations
Substance: Particulates < 10µm (PM_{10})
Period: 1-year
Scenario: Case 2 (Annual Scenario)

Sources :
World Imagery, ESRI, 2023
National Land Survey of Finland
Orthophoto sheet Q3343G, 2024
Road Network

0 150 300 m

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