Appendix A – Survey Guidelines

The State of Israel
Ministry of Environmental Protection
Policy and Planning Cluster
Planning Department

המשרד להגנת הסביבה
وزارة حماية البيئة
Ministry of Environmental Protection
שלום עם הסביבה

August 2, 2012

Mr. Amram Kalaji
Chair, National Planning and Building Board
Director-General, Ministry of the Interior
Jerusalem

Re: Environmental Impact Survey Guidelines, Chapters C-E
NOP 37/H –Treatment Facilities for Natural Gas from Offshore Discoveries

Dear Mr. Kalaji,

Attached is a draft of the guidelines for conducting an environmental impact survey for NOP 37/H – Treatment Facilities for Natural Gas from Offshore Discoveries This draft of the guidelines is designed for discussion and approval by the National Planning and Building Board at its meeting to be held on August 7, 2012.

These guidelines are for preparing Chapters C-E of the Survey and related to all of the system's components from the marine pipeline to offshore facilities for pressure reduction and treatment, the onshore valve, onshore pipelines, onshore treatment facility, INGL and any other infrastructures associated with these facilities.

The purpose of these guidelines is to reduce to a minimum the possible environmental risks and environmental effects resulting from implementing the plan in the locations to be selected by the National Planning and Building Board, and based on the EIS submitted regarding the alternatives (Chapters A-B).

It should be noted that this project is unique in that is a detailed NOP on the basis of which building permits can be issued, but without any specific developer behind it. Therefore the Survey was written in broad terms and is aimed at defining an "environmental performance framework" that will help advance the move the permits forward with the certainty that no damage will be caused to the public or to the environment. Nonetheless, there will be areas that will have to be sent to the building permit stage, and it will also be necessary to define a mechanism to reduce that "performance framework" in order to reduce the limitations that may be placed on the environments of various parts of the project following approval of the Plan.

Sincerely,

Shachar Solar

Head of Environmental Planning and Green Building Division cc.:

Adv. Alona Sheffer Karo – Director-General, Ministry of Environmental Protection
Mr. Shaul Tzemach – Director-General, Ministry of National Infrastructures, Energy and Water Resources
Ms. Galit Cohen –Deputy Director-General for Sustainable Planning and Development, Environmental Protection Ministry
Ms. Binat Schwartz – Director, Planning Administration, Ministry of the Interior
Ms. Ronit Mazar – Director, Division of Theme Planning, Planning Administration, Ministry of the Interior
Ms. Dorit Hochner – Ministry of National Infrastructures, Energy and Water Resources
Shlomo Katz, Gideon Mazor, Nurit Shtork, Vered Edri, Romi Even Denan, Rani Amir, Gidi Bressler, Tzur Galin – Internal
Dr. Ruti Yahel – Nature and Parks Authority
Ms. Zina Parfaltzin – Planning Administration, Ministry of the Interior
Architect Gidi Lerman– head of the planning team

Table of Contents

General

A. The guidelines in this document were prepared for a discussion by the National Planning and Building Board at a meeting to be held on August 7, 2012.

B. The plan developer will be responsible for preparing the survey.

C. The survey will include the name of the party responsible for conducting it as well as the names of the professional service providers who took part in its preparation and in assessing the various environmental impacts.

D. The survey author and his professional advisors will complete and sign the appropriate declarations (Forms 1, 2) in accordance with Regulation 14 (C) of the Planning and Building Regulations (Environmental Impact Surveys), 5763-2003.

E. The survey will open with a summary that presents the major findings.

F. The survey will be submitted in digital format, in PDF and as a Word file. Document scenarios will be submitted as a DWG file (in the vector mapping that recognizes AutoCAD format).

G. The survey will relate to all plan components at the detailed planning level. To the extent that a detailed response cannot be given the reasons for this must be detailed while providing a mechanism for implementation during the building permit phase.

H. The survey should fully address each item of the guidelines, in the order of the guidelines. <u>Incomplete surveys will be returned unread</u>. Surveys for offshore sites and onshore sites can be submitted separately.

I. Should a specific item be submitted in a way that deviates from the requirements, the deviation must be explained and justified.

J. The proposed plan must be attached to the EIS being submitted (guidelines + diagram).

K. The guidelines will be part of the survey and appear as an appendix.

L. The document should include the bibliography and list of data sources that were used by the survey preparation team.

M. The survey should be submitted in 5 copies (digital and hard copy) to the Ministry of Environmental Protection – Planning Division. In accordance with Section 9 (A) of the regulations, the survey should also be submitted to the planning institution and to the local planning and building committee.

N. These guidelines are valid for three years from the date on which they are approved by the National Planning and Building Board.

O. The survey will include the following chapters as set forth below:

Chapter 3: Description of the actions resulting from implementation of the proposed plan

3.0 General

This chapter will detail the proposed site plan including the various areas and facilities, their physical properties and the activities to be performed therein. The plans and descriptions will refer to all of the works to be performed in order to build all the various parts of the project **including related infrastructures**, and its operation.

Please present and highlight the way in which the facilities (offshore and onshore) will be integrated into the relevant spaces while emphasizing how they will fit in with present land usage, planned land zoning, offshore and coastal activity, and so on.

Concomitantly please identify and specify the pipeline corridors including the different areas and facilities along their alignment, including valve stations and the like. For each of the pipelines passing through the corridors you must specify physical attributes, type of fluid and capacity, impact on the offshore and onshore environment in the event of a leak). The plans and description shall relate to all of the works that will be performed in order to build and operate the project while referring to each of the pipeline segments and their different character in the water, on the coast and on land.

It should be noted that given the fact that at this stage the developer and/or operator has not been selected to run the facilities there is no information as to the type of gas and details of the facilities; therefore the survey guidelines refer to a representative type of facility based on information that presently exists and derived from basic assessments. As such, in addition to a survey that will be prepared according to these guidelines, when submitting an application for a building permit the plan developer will be required to submit, among other things, a detailed Environmental Management and Monitoring Plan (EMMP).

3.1 Structures and facilities at the site

* In this section please refer to all components of the various systems and facilities in the water, on the coast and on land.

3.1.1 On a 1:2,500 map of the interior compounds and a 1:2,500 general map you must specify the type and location of the facilities and structures, including the area they cover, elevation above ground level / sea level (as relevant), fencing, lighting and so on. Additionally several cross-sections should be included at appropriate scales from all directions.

3.1.2 Specify and describe the required construction works: Preparing offshore and onshore areas, earthworks, access roads, contractor's staging area, infrastructures for drainage, sealing, wastewater treatment, etc.

3.1.3 Use maps to indicate clearly, based on Section 3.1.1 above, the changes proposed in relation to the present situation. Changes must also be described in writing, using cross-sections, diagrams, simulations, tables, etc.

3.1.4 Present complete characterization of the facilities and the means to be used to protect against hazmat incidents, means for protecting the marine and coastal environment, means to prevent air pollution, pollution of soil and groundwater, noise and so on.,

3.1.5 Characterize the various products resulting from the gas treatment process for each alternative (type of substance, composition, quantities, concentrations) and the methods for storage and removal until the end solution.

3.16 Give details of the fuels for each alternative: Types of fuels and quantities that will be produced, intermediate storage volume, system for removal from the receiving station to the connection with the national pipeline, or other solution.

3.2 Structures and facilities in the pipeline corridor and related infrastructures

3.2.1 Mapping the offshore pipeline will be presented on background maps according to Chapter A of the Survey (no need to submit additional maps). Include cross-sections of the pipeline corridor for each typical segment. Indicate on the map the location of the attached cross-sections.

3.2.2 Describe the required work strip, staging areas and organizing port (location and size), access roads and the strip of land necessary for landscape rehabilitation.

3.3 Operating regime

3.3.1 Describe the facility's operating principles for the following components: Offshore facilities and platforms, offshore pipelines, onshore valves, onshore pipelines, receiving and treatment facility.

3.3.2 Describe the operating regime planned for each part of the facility specified in the previous paragraph, and include: How it operates, control method, safety restrictions, emergency procedures, etc. Describe the planned operating regime and hours of operation according to the various project stages for all parts of the project.

3.3.3 Describe the means to be used for monitoring and preventing malfunctions at sea, along the coastal environment and on land.

3.3.4 Address the situation of a malfunction in the pipeline and the facilities and describe the steps to be taken and the means to be used in order to protect the onshore, coastal and offshore environment.

3.4 Infrastructures

3.4.1 Specify the project's related infrastructures (supply lines to the project and lines for removing products from the project), including power lines, fuel lines, gas, system water, sewage, produced water, roadways and so on. Relate to <u>all parts of the project</u> and all of the related infrastructures.

3.4.2 If relevant, present the quantities and types of wastewater expected to be generated at each part of the project (platform, onshore facility and so on), how it will be pre-treated, how by-products from the gas treatment system will be handled and how the facility is to be connected to an approved end solution.

3.4.3 Produced water

Specify the drying process while emphasizing the question of produced water and how this will be treated in each part of the system (platform, onshore facility, etc.). Among other things detail the following:

- Quantities – Maximum hourly, maximum daily, maximum monthly and yearly.
- Composition of the produced water – Concentrations and annual loads, among others, for the following parameters (where relevant): Biological

oxygen demand (BOD),total organic carbon (TOC), suspended solids, turbidity, nutrients (nitrogen and phosphorous components), metals, reaction, total dissolved solids (TDS), chlorides, and so on, depending on processes and additives.

- Additives – Specify the use of additives to the process and produced water, including: List of additives, how they are used, concentration in produced water, annual quantities. Include material data safety sheets (MSDS) with an emphasis on information regarding ecological impact in the marine environment.
- Treatment – specify the method used to treat produced water including treatment alternatives. Detail treatment methods used in other parts of the world and compare them to the proposed treatment method, including advantages and disadvantages.

Detail the structure of the facilities required, including:

- Proposed location in the water (coordinates or exploration area / sea floor depth and distance)
- Flow method – gravitation / propulsion
- Location of pumps for propulsion relative to the coastline
- Structure of the removal pipeline: pipe diameter, ancillary facilities, diffuser heads
- Refer to the list of already existing exits or those in approved plans. In the event of a new egress, give explicit reasons why the water will not flow to an existing egress.

3.4.4 Present the means that will be used to prevent penetration of surface runoff from the surrounding area into the facility premises, including during unusual rain. Relate to the way in which the proposed facility will be integrated into the existing drainage system.

3.4.5 Describe the means being planned to prevent damage to the facility and surrounding area from flooding.

3.4.6 Present the projected monitoring systems that will be installed to monitor hazardous materials, leaks, air quality, marine environment and so on.

3.4.7 Present as specifically as possible the systems for emissions or gas burning (flare) during routine operations and emergencies, referring to the different alternatives including the proposed technology, height of the facilities, etc. This presentation shall refer to all parts of the system, including the platform, onshore facilities and the like.

3.4.8 Give details with regarding to fences, signage and so on.

3.4.9 Present the means required to protect the groundwater from pollution from the surface in accordance with the relevant water regulations, to maintain protected areas for drinking water drills in accordance with the Public Health Regulations, and to prevent damaging existing drilling infrastructures.

3.5 Hazardous materials

Storage and use of hazardous materials – present a table with the names and quantities of hazardous materials that will be stored and used in the project.

3.6 Energy

3.6.1 Specify all the types of energy facilities in all parts of the project, and their capacity. Describe the work regime of these facilities (continuous, intermittent and emergency).

3.6.2 Details the types of fuels and their quantities that will be used for various processes within the facility.

Chapter 4: Details and Assessment of Environmental Impacts

4.0 General

For this chapter present in written and graphic form the various issues that are expected to have an environmental impact within the plan area as well as the immediate and more distant surrounding area. The description of the environmental impacts and their sources shall be both qualitative and quantitative.

For each issue explain whether there is a need to prevent or reduce the negative environmental impacts and what measures will be taken to prevent or reduce them. Refer to all stages of the project:

A. During planning and construction;

B. During operations;

C. The matter of imposing prohibitions and restrictions on land usage, maritime activity, coastal activity and the like, in all parts of the project;

D. At the end of the project's life and its dismantling.

With regard to all project components for which a significant environmental impact is expected, describe the existing Best Available Technology (BAT) and indicate whether these methods will be used.

It should be noted that the following list of impacts does not necessarily include all possible impacts; impacts that are not mentioned should also be presented. If the impacts will not actually exist this should be noted and explained.

4.1 Air quality

- It should be noted that during the building permit stage an emissions permit will apparently be required. At this stage the following issues should be examined:

4.1.1 Specify all emissions into the air, points and non-points, that can be expected from operating the offshore and onshore gas treatment facilities. Present emission rates of the contaminants sulfur dioxide, nitrogen oxides and benzene, as well as other pollutants that are expected to be released during the continuous operation of the facility and during non-routine operations.

4.1.2 Assess the impact of emissions on air quality around all the plan alternatives, onshore and offshore, by running a dispersion model.

4.1.3 Specify the means planned to reduce emissions from all emission sources presented and what is the Best Available Technology (BAT) to reduce emissions from the processes used at facilities of this type so as to comply with international requirements.

4.1.4 Emission dispersion calculations from the different sources involved in the plan should be performed using the AERMOD modeling system, at a range of 10 km around each alternative, or using the CALPUFF model on a larger range. The survey author will obtain authorization from the Ministry of Environmental Protection for model chosen before it is run. Include significant emissions sources in the area. The model shall be run on the basis of 5 years of meteorological data from a representative weather station.

4.1.5 Results of running the models shall be examined in relation to target and environmental values (Air Quality Values Regulations, 2011), and shall include a graphic description using isopleths.

4.1.6 Investigate cases where a malfunction or failure in the emission gas treatment systems causes or is liable to cause increased emissions of air pollutants. Describe the situations that might cause failure or malfunction as described, while addressing ways to prepare the facility to prevent such occurrences in advance.

4.1.7 In order to describe air quality status during a malfunction scenario, use the CALPUFF model approved by the EPA for severe meteorological situations.

4.1.8 Describe in detail the means to prevent leaks and a control system for this eventuality. Refer to means for complying with international requirements in this regard, if any.

4.1.9 If a gas burning system (flare) is planned, describe in detail the gas burning systems in all parts of the project, the technology proposed, its appearance and environmental restrictions resulting from its operation.

4.1.10 Attach to the survey digital media that includes input data from the calculations, calculation results, and meteorological data files.

4.2 Zoning, uses and activities

4.2.1 Refer to the activities, zoning, and land uses (existing and planned) that are liable to be harmed as a result of building the various parts of the facility (pipelines, treatment platforms, valve station, onshore treatment facility, INGL facility and so on).

4.2.2 Refer to changes in zoning, land uses or defining restrictions on activities that may be required as a result of hazards in the wake of building the various parts of the facility.

4.2.3 Mark on a 1:25,000 map building or activity restrictions that could be created on relevant uses or zoning as a result of operation of various parts of the facility.

4.3 Appearance

- Remember – refer to all components of the system.

4.3.1 On the basis of the data presented in Chapter A, Section 1.3, a visual and landscape analysis of the planned sites should be presented against the background of its environment using visual means. Additionally you must present visibility cross sections that include all parts of the facilities, including related infrastructures (paths, structures, chimneys, antennae, etc.). The visual analysis will be prepared from prominent points in the area and from settlement points, paths and roads, hiking trails, parking areas and observation points, from nature, landscape and heritage sites, and from the coastline to the offshore facilities as they are specified in Chapter A.

4.3.2 Analyze and describe the findings verbally as well, and present a visibility map of the project and its various parts.

4.3.3 Describe the size of the area from which the project and its various parts are visible, from which distances, the degree to which it integrates with the horizon and the extent of its prominence and presence in the surrounding area.

4.3.4 If necessary, present the possible means for reducing the visual impact that would be produced by all of the project components.

4.3.5 Present possible means that can be used to reduce environmental / landscape damage by the engineering facilities, such as underground electrical feeds, alternative communications means, hiding engineering facilities and structures by completely or partially burying them, choosing dedicated technology, planting flora, concealing engineering facilities in areas of low ground, architectural design that integrates into the landscape, painting, and so on.

4.4 Antiquities and heritage sites

4.4.1 Refer to antiquities and heritage values on land and in the sea that are likely to be influenced from implementing the plan.

4.4.2 Present the means to reduce the impact from carrying out the plan on antiquities and heritage sites.

4.5 Seismology

4.5.1 Regarding the issue of seismology as presented in the previous part of the survey and in Section 1.6, present the expected implications due to seismic events from the perspectives of an incident involving materials that are hazardous and would pollute water, soil, groundwater, air and the like.

4.5.2 Describe the means to prevent and treat pollution in the event of seismic events, while relating to each of the possible risk factors (for example, soil liquefaction, tsunami, etc.).

4.6 Noise

* In this paragraph refer to both the construction phase, including building platform systems (including introduction of scaffolds, excavations etc.), and to the operations phase.

<u>Offshore area</u>:

4.6.1 Describe the noise level expected from operations and from the pipelines (gas, glycol, produced water and so on) at increasing distances one meter apart, until the point is reached where the noise level is less than 10 dB.

4.6.2 Noise levels should be defined according to their expected influence on animals in the marine environment (review the scientific literature in this field, particularly as it relates to marine mammals), and on human activity (with an emphasis on acoustic means for navigation and mapping, and on military activity).

4.6.3 Indicate the types of acoustic protection that will be used if necessary, their technical characteristics and their effectiveness in reducing the anticipated noise.

Onshore area:

4.6.4 On a map similar to the one described in Section 3 above, indicate clearly all of the sources of noise planned in the various structures and facilities and give details, including their height above the land surface.

4.6.5 Indicate the strength of the existing / expected noise near each noise source according to manufacturer's data, or alternatively, based on measurements taken near the noise source itself or an identical noise source that already exists. In this case the measurements will be made regarding the maximum strength of the noise at various distances from the source in order to determine the farthest distance at which the noise remains at maximum strength.

4.6.6 Specify on a land zoning map (including plans that were submitted) the location of the sensitive noise receptors in the plan environment (residential areas, public institutions and parks) for a distance of 1 km from the plan boundaries.

4.6.7 Prepare a forecast of the expected noise levels at the plan boundaries and for potential receptors up to a distance of 1 km from the plan boundaries. The results of the projection will be presenting using equivalent lines at a range of 5 dB (A). The projection will relate to extreme weather conditions in the area during various seasons of the year, and the matter of noise dispersion (for example, due to wind). Noise levels should be defined in accordance with the regulations in units of Leq; also take into account, among other things, the phenomenon of a prominent tone. The projection should be prepared for a situation in which all of the existing and potential noise sources are operating simultaneously and at maximum volume.

4.6.8 Propose physical solutions to adjust expected noise levels from the plan area to the maximum noise levels permitted in the Regulations for Preventing Unreasonable Noise 5757-1990, including during nighttime hours. Generally speaking operating solutions should also be presented.

4.7 Pollution of the offshore or onshore environment due to leaks

4.7.1 Describe the conditions that are liable to cause a leak of natural gas, produced water, fuels, glycol and any other liquid from all of the system's components on land or at sea.

4.7.2 Indicate the means and procedures that will be used in order to detect and monitor leaks from all of the system's components.

4.7.3 Indicate the means and procedures that will be used to prevent pollution of the onshore and offshore environment in the event of a leak.

4.7.4 Indicate the operating plans and means that will be used in the event of a leak, including procedures and timetables for the steps to be taken.

4.8 Treating produced water and condensate

4.8.1 You must be prepared with regard to the expected influences of produced water with the onshore treatment alternative.

4.8.2 Regarding the offshore alternative, perform a dispersion model of produced water at sea in accordance with the guidelines of the Ministry of Environmental Protection.

4.8.3 Assess the impact of produced water on the offshore environment, among other things, based on the results of the dispersion model.

4.8.4 Removal via existing means – distinguish between an egress that actually exists (receiving station or pipeline, etc.) and an existing egress that exists only as coordinates on a map. Present the data regarding the existing egress as it actually is and the change in the quantity and composition of the brine as a result of the addition. (In the event that removal by means of an existing egress significantly changes the values that were the basis for approving the egress, it must be treated as a new egress; if there is doubt as to whether the change is significant or not, consult with the Marine and Coastal Division.)

4.8.5 Removal via a new egress – will require performing a pollutant dispersion model, bathymetric mapping, background monitoring of the marine environment – all this subject to receiving guidelines and approval in advance of choosing the model and model scenarios by the Ministry of Environmental Protection – Marine and Coastal Division. If necessary, and in coordination with the Environmental Protection Division, specific topics in this paragraph may be moved to the building permits stage as part of the environmental monitoring and management document.

4.8.6 Reference to a malfunction incident in the storage of condensate at sea. Detail the conditions that will require running a dispersion model according to the composition and nature of the condensate to be found, and as required perform dispersion model according to the instructions of the Ministry of Environmental Protection.

4.9 Impact on habitats and natural treasures

4.9.1 Onshore environment

A. Describe the expected impact on the natural environment as a result of implementing the plan, including reference to natural treasures, contiguous open spaces and habitats. Relate specifically to foraging and migrating activities among waterfowl as well as the influence of all the installations, especially the treatment platform.

B. Describe the possible and planned means to reduce the negative impacts noted in the previous paragraph, including reduction of injury to waterfowl.

4.9.2 Offshore environment

A. Describe the foundation underlying the habitats along the infrastructure corridor including the nature of the foundation – is it hard or soft, its mobility, type of rock formation or sediment, distribution of grain sizes, concentration of organic material, etc. Describe the relief of the surface to a level of detail that will allow you to distinguish between one habitat and another all along the corridor alignment.

B. Describe (quantitatively) the organisms living within the upper 10 cm of the seabed at representative depth points in the platform compound (where the isobaths represent intervals of 10 meters, for example, 60 m, 70 m, 80 m, etc.) At each sampling point sampling should be repeated three times (triplicate). Along the pipeline alignment sample at least three spots (three triplicates) from each habitat defined in Section A, in accordance with bathymetric mapping and the preliminary survey, and in coordination with the Nature and Parks Authority.

C. Describe (quantitatively) the flora on the land within the platform compound using a dredge along specific lines on the seabed at two representative points of the area designated for building the platform. Every line dredged will cover a distance of at least 500 meters.

D. Describe the unique values of the habitat and their degree of rarity in the marine environment. Note phenomena that are unique to the area, such as its richness in rare species, breeding or nesting grounds if observed, richness of species, coverage of the area and any other aspect that describes the habitat. Refer to the connection between the habitat floor (benthic zone) and the water column (pelagic zone) and indicate the phenomena that allow for the interconnection of various habitats.

E. Provide information about fish populations in the platform area to the extent these are known from the professional literature and other publications, and using photographic data or details from habitat samplings.

F. Describe interferences to the habitat that already exist (egresses, damage to habitat foundations, fishing activity, infrastructures.

G. To the extent that the alignment crosses existing infrastructure lines, include an assessment regarding the extent of the change these infrastructure lines have made to their environment and the means for and extent of environment rehabilitation throughout the period in which they have been located in the water.

H. Describe the significance of placing the pipeline on the habitat alignment during the construction and the operations phase.

I. Include updated photographs from the habitat foundation including the seabed, flora and fauna, interferences with the habitat, particularly if the habitat is located on exposed rock.

4.10 Drainage and hydrogeology

4.10.1 Describe the impact of activities involved in building and operating the facility and the pipeline on groundwater quality.

4.10.2 Describe the impact of leaks from the system's various components on groundwater quality.

4.10.3 Describe the impact that activities stemming from building the facility will have on the drainage system and runoff.

4.11 Hazardous materials

4.11.1 Indicate and specify possible means to minimize risk in and around the facilities.

4.11.2 Prepare a hazardous materials separation distance report.

Chapter 5: Proposal for the plan guidelines

5.0 General

This chapter summarizes all of the proposals for defining the plan instructions, as required by the details of possible impacts set forth in Chapter D, and the means that must be taken in order to prevent or mitigate them. The instructions will refer to actions that must be performed or not performed during construction of the facility, and regulating activities for using the adjacent land, including stipulations and restrictions on planning and building. The instructions must also relate to operating conditions and procedures for handling malfunction, including the installation and operation of control and monitoring systems regarding those phenomena that require this. Instructions will refer to all system components.

5.1 The plan instructions shall relate to the following issues:

1. Project implementation stages;
2. Handling hazardous materials;
3. Preventing marine pollution and handling pollution incidents;
4. Preventing air pollution;
5. Preventing soil, runoff and groundwater pollution;
6. Preventing damage to natural and landscape treasures and contiguous open spaces;
7. Control and treatment of leaks;
8. Visual treatment for all parts of the site;
9. Instructions for collecting, treating and removing wastewater, brine and produced water;
10. Performing earthworks and drainage systems in the facilities and along the pipeline alignment;
11. Safety of structures and facilities from seismic events, relating to each of the possible damage factors;
12. Instruction for noise reduction during construction and during ongoing operations;

13. Rehabilitating the sea floor environment;
14. Rehabilitating the pipeline onshore alignment.
15. Sealing and monitoring leaks from the pipeline (gas and fuel);
16. Handling related infrastructures;
17. Dismantling the infrastructures and restoring the area to its previous condition at the end of the project.

5.2 Provisions and instructions for issuing building permits

Although the plan is a detailed plan, there may still be some issues that remain unresolved and these should be examined as the planning progresses, if they need to be re-examined during the building permit phase; among these topics the following should also be addressed:

5.2.1 Defining guidelines to reduce the area occupied by all parts of the project by the developers, in order to allow for the best usage of the soil resources by developers that will be joining the project in later stages, with regard to the areas authorized as part of the project.

5.2.2 Preparing a hazardous materials separation distance report and updating the restrictions imposed as part of this plan.

5.2.3 Preparing an emissions permit as a condition for receiving a building permit (contingent upon further examination).

5.2.4 Preparing an Environmental Management and Monitoring Plan (EMMP) that includes, among other things, operational plans to prevent and treat leaks (with an emphasis on cooperation between various organizations, including civilian and military entities) and guidelines for the various monitoring systems (air, hazmat, sea water, etc.) that must be built and operated, including details of emergency procedures in the event of a fire, spill or leak of pollutants into the environment. The monitoring plan must include routine control procedures for facilities at sea, on the coast and on land, including defining responsibility for implementing controls and timeframes for repairing malfunctions, should these be discovered.

5.2.5 The permit must include solutions to reduce fuel storage.

5.2.6 Detail any additional supplements required for the building permit stage, if any, that could not be addressed during the statutory plan stage, including guidelines for preparing the EMMP, provisions for the facility dismantling stage and land rehabilitation, mechanism for creating a link between project operators and residents of the adjacent locations, and a mechanism for reporting complaints, environmental hazards and their treatment, means for minimizing sources of ignition, and so on.

5.3 Restrictions and guidelines in connection with land zoning, uses and activities

Establish in the plan documents the restrictions and guidelines with regard to land usage, land zoning or activities adjacent to the plan area, and in the plan itself.

Appendix B – PDI Engineering Document

[ORIGINAL TEXT IS IN ENGLISH – SEE PDF FILE תמא_37-ח_תסקיר_השפעה_על_הסביבה-_חגית-פרקים_ג-ה_+_נספחים_איכות_פחותה_6.2013]

Appendix C – Engineering and Operational Aspects
[ORIGINAL TEXT IS IN ENGLISH – SEE PDF FILE תמא_37-ח_תסקיר_השפעה_על_הסביבה-_חגית-פרקים_ג-ה_+_נספחים_איכות_פחותה_6.2013]

Appendix D – Ornithological Assessment of the Hagit Site

0900401

Re: Ornithological Assessment of the Hagit Facility Alternative in the Framework of NOP 37/H

Assaf Meroz

1. Bird migration in the plan area

1.A. Introduction

Israel is an intercontinental junction and bottleneck of global importance for bird migration. A huge population of birds that nest in Eastern Europe and Western Asia migrate in the fall to Africa, spend the winter there, and return to their nesting places in the spring. A large proportion of these birds avoid crossing large bodies of water, such as the Mediterranean Sea and the Red Sea, preferring to bypass them. Consequently, millions of migrating birds pour into Israel, which serves as a narrow land bridge between the three continents. Based on study that employed radar tracking, it is estimated that at least a million birds pass over Israel per season – fall and spring (Bruderer et al. 1994), representing some 38,000 species (Shirihai 1996).

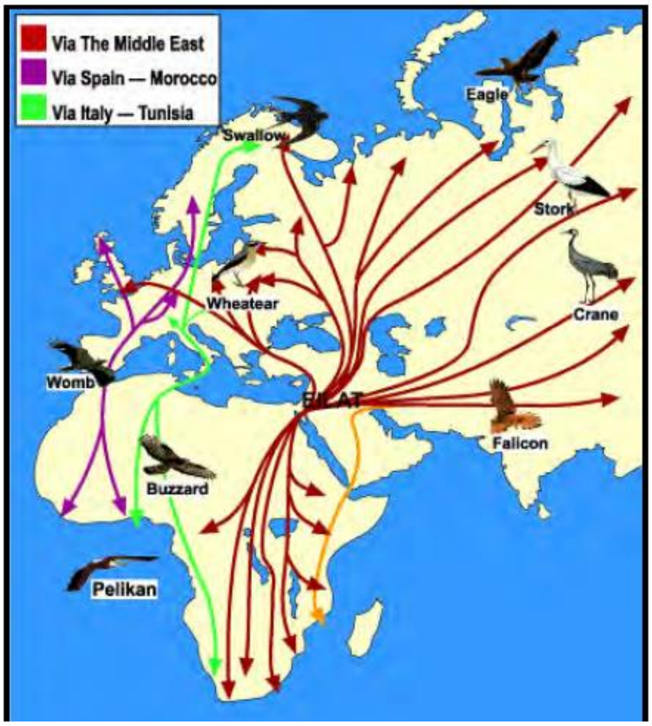


Figure 1: Schematic map of bird migratory routes around the Mediterranean basin

The migratory birds can be divided roughly into two groups – passive migrators (or "day migrators"), and active migrators ("night migrators). These groups differ from each other in their migratory technique and timing:

- **Passive migrators**: These are gliding birds, usually large, with high wing load, that use warm wind currents (thermals) to gain height while soaring and that traverse long distances by gliding, almost without moving their wings. Thermals are generated through the heating of the earth by solar radiation, during daytime hours and only over land; passive migrators thus fly solely during the day and generally refrain from crossing large bodies of water. This group includes most raptors (birds of prey), pelicans and storks.

- **Active migrators**: Small and medium-sized birds characterized by low wing load that are suited to extended flapping flight. This group includes birds that migrate primarily at night and are also able to cross large bodies of water. Most songbirds, Charadriiformes, ducks and the like are active migrators.

1.B. Migration of gliding birds (passive migrators)

The differences between the two groups in the migration method also lead to different selections of migratory routes and axes – most passive migrators refrain from crossing large bodies of water, and therefore Israel constitutes for the populations of Eastern Europe and Western Asia the almost sole axis of transportation on their way to Africa. Moreover, because the distribution areas of a number of gliding fowl are limited to said areas, **Israel and the eastern Mediterranean constitute the sole axis of movement for their global populations.** To illustrate, the entire world population of Aquila pomarina (a large raptor that nests in the forests of eastern Europe), numbering a hundred thousand birds, passes through Israel twice a year.

Additional examples of large populations that pass through Israel are: the European white pelican population (000 birds), the eastern white stork population (000 birds), the East European *Pernis apivorus* population (a million birds), the entire global *Levant sparrowhawk population* (a hundred thousand birds), and more (Shirihai 1996).

What this means is that Israel is important in terms of safeguarding entire migratory species populations, and bears responsibility for the state of the natural systems in broad expanses of Eastern Europe and Western Asia. If a hazard of some kind were to close Israel's skies to the passage of migratory birds, that would necessarily translate into ecological and economic disaster: hundreds of thousands of raptors would be unable to return in the spring to their nesting areas, and consequently would not regulate the rodent population, which cause great damage to agricultural crops there.

In northern Israel, the gliding birds' main migratory route in the fall starts ten kilometers east of the coastline, peaking along the western edge of the mountain ridge – in the Galilee, Samaria and Judea. Another main route passes along the Jordan Valley to the northern Dead Sea, and from southwest to the northern Sinai (Figure 3). In the area that lies between 0-10 km from the coastline, [00] thousand birds of prey may pass through each season (Meroz and Eyal 1981).

Figure 2: Main migratory flyways of gliding birds (passive migrators) in our area (Leshem and Bahad 1991).

1.C. Night migrators (active migrators)

For active migrators, which numerically constitute the absolute majority of migrators, the situation is less clear-cut for a number of reasons. The first is that they pass over Israel in a wide angle. They do not avoid crossing bodies of water, so a smaller segment of their populations circumvents the Mediterranean Sea and the Red Sea and passes over Israel. Another reason is related to our ability to collect quality information regarding their migration. While the passive migrators are large birds that fly by day and can therefore be identified and observed visually, most active migrators are small birds that travel by night, meaning that direct observation methods are ineffective with them. A variety of observation means are used with these birds, including listening to their cries, analyzing radar images to identify flocks, using individual marking of birds in radio transmissions, and more.

An overview of the data gathered by these means indicates that the migration path through Israel is one of the most important in the world, perhaps the most important in the Old World, and is comparable in its intensity to the Trans-American migration path between North and South American, whose density peaks at the Panama-Costa Rica bottleneck (Leshem & Yom-Tov 1998).

Of the estimated [000] million birds that pass over our region, a few million (3 million at most) are raptors, storks, cranes and pelicans which engage in passive migration along routes that are more or less defined and known, while all the rest are songbirds and the like, Charadriiformes, water birds and seabirds, which fly over Israel in a broad-front migration pattern, mainly at night, and whose paths are not well-mapped. 00% of all migratory birds pass over Israel at night, most of them songbirds. Migration over western Israel is more substantial during the fall, while in the spring most migrators take an eastern route, over the eastern Negev and the Arava, the Jordan Valley and the eastern slopes of the mountain ridge (Bruderer 1994).

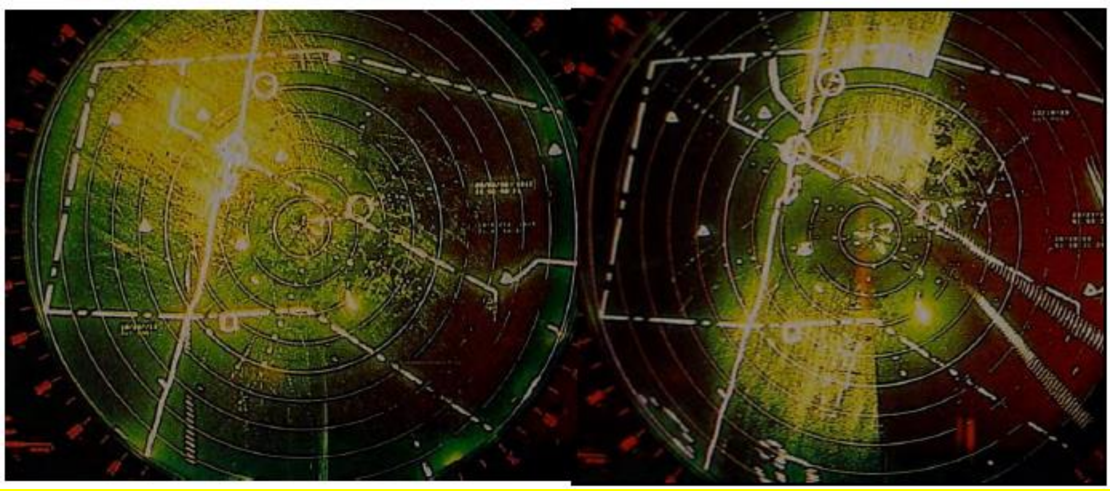


Figure 7: Two radar images, Ben-Gurion International Airport control, showing the nighttime skies of Gush Dan in October – during fall migration (the Israeli coastline is the pale line that crosses the image from top to bottom). The "shiny blocs" are migratory bird flocks. In the image on the right bird migration is taking place parallel to the coast from north to south – these are birds who started their night migration in the Galilee, Lebanon or western Syria. In the image on the left, bird flocks are arriving after midnight from the northwest, having crossed the sea from Cyprus or western Turkey (Leshem and Bahat 1991).

As noted above, large numbers of songbirds and similar birds pass over western Israel during the autumn months (peaking between September and December). This migration is characterized as follows:

- Most migration takes place at night. It peaks an hour after sunset, and winds down gradually during the second half of the night, with some activity continuing into the morning, up to around 10:00 a.m. (Sobel 1980, Bruderer 1994).
- Songbirds, and night migrators in general, usually fly alone, with a few meters or more between birds.
- Migration takes place in a broad-front pattern, generally across the entire area of Israel, but with concentrations along certain routes that vary according to season and weather. The number of birds traversing Israel's skies over a 1 sq. k. wide cross-section is on the order 4,000 to [0,000] birds per hour, i.e., 40,000 birds per night (Bruderer 1994).
- Spring migration over western Israel is sparser. Bird density in this area during the spring migration is 40% that of the fall migration.
- Migratory altitude: The altitude at which birds migrate is obviously affected by wind direction, temperature and relative humidity. The hypothesis is that active migrators

migrate at night because continuous flight causes warming of the flight muscles and fluid loss, meaning that the birds have to fly during the cooler and more humid hours, and at heights where the temperature is lower and the oxygen concentration facilitates strenuous breathing. In northeast Africa and in our area, trade winds generally blow north-south to an elevation of 1,000 meters above sea level, and in the opposite direction (anti-trade winds) above this elevation. That is to say, in the fall, when the birds are migrating from north to south, they are better off flying below the aforementioned elevation and benefiting from tail winds. And indeed it has been found that [00]% of the birds fly during the fall at elevations lower than 900 meters. By contrast, in the spring the birds are better off flying at elevations of over 1,000 meters and benefiting from south-north tailwinds – and it has in fact been found that most birds fly higher: per measurements, [00] of birds fly at an altitude of 1,800 meters (Bruderer 1994). While studies using radar indicate that most migration takes place at elevations of 3,000 – [000] meters above sea level, direct observations point to a substantial amount of migration occurring at low altitudes of 100 meters and less. A songbird migration survey that was conducted at Tel Baruch beach revealed migration on the order of 100 thousand birds per season at heights lower than 0-00 meters (Sobel 1980). These numbers may constitute only a small portion of the birds that pass at low elevations, as counting takes place during daylight hours only, though radar studies indicate that birds lower their flight altitudes in the morning, prior to landing.

1.D. Interim stops during migration

Many of the birds that pass over our region do make interim rest stops during migration. The gliding birds, i.e., the birds of prey, pelicans and storks, travel distances as great as 300 to [000] km per day; most of them are forced to land each evening because the thermals crucial to their migration are not produced at night (Leshem & Yom-Tov 1998). That is, these birds generally land for a single night on Israeli territory; when morning comes they continue on their way without delay. There are, however, exceptional cases where weather conditions force the birds to stop for several days. Certain species, such as cranes and bee-eaters, which combine passive and active migration, are not obliged to stop for rest on a daily basis; they travel with the aid of thermals by day, and continue at night via active flight.

Another part of the migratory birds stop in Israel for longer periods in order to rest, feed and accumulate fat, which becomes the "fuel" that allows them to continue their journey. This group comprises isolated individuals or parts of the migrating flocks of most of the species that pass through Israel, although there are species for which stopping in Israel on the way is more important. One example is that of the white pelican, which mainly winters in South Sudan. In the onshore segment between Israel and South Sudan, there are almost no appropriate food sources for it. Therefore, Israel constitutes its last fueling station before a journey of 2,000 to 3,000 km over the deserts of Sinai and the Sahara. Most of the pelicans that pass through Israel in autumn (about 40,000 individuals), also pass through the coastal plain and Emek Hefer. Some of them only land for one night without feeding, while others remain for a period of a number of days to a number of weeks and feed off the water reservoirs and the fish pools in the valley. In the autumn of 2012, for example, 40,000 pelicans landed in the valley for a stop of one night to three weeks (Assaf Kaplan, Agricultural Damages Supervisor and the Nature and Parks Authority, personal communication).

Figure 1: Two species that make interim rest stops in the region in large numbers. Right: *Motacilla flava*. Left: *Emberiza hortulana* (photographed in the plan area in Spring 2117, Assaf Meroz).

2. Birds that stay extended periods in Ramot Menashe (stable/wintering/summering)

2.A. General

Of the 040 species that have been observed to date in Israel, 300 also nest here (100 are regular nesters, while the rest are random nesters). Of the regular nesters, 00 species are stable (spend the entire year in Israel), 44 summer in Israel (come in the spring and leave in the fall), and 044 species are "complex summerers, i.e., part of their population summers in Israel and part is stable. Additionally, 311 species of birds are considered to be "winterers" (some also pass through Israel, while some only spend the winter). The number of birds that stay in Israel during the winter or rest here while migrating is immeasurably larger than the number of stable birds and nesters.

2.B. Bird habitats near the Hagit facility

The Hagit treatment facility is located within a natural area of herbaceous dwarf shrubbery along the south and east slopes of the Carmel range – on the Ramot Menashe boundary, in proximity to the Hagit power station. Within the plan area and in its vicinity, we can find fowl habitats that serve the birds throughout all seasons (for a list of representative species, see the appendix). A precise definition of the species of these fowl and their numbers requires long-range monitoring, for these data change all the time (in contrast to other vertebrate classes, such as reptiles, mammals and amphibians, which occupy their living spaces all year long). Birds, because of their great mobility and the fact that they can cover large distances quickly, change their distribution in space according to food and water availability, weather conditions and other factors such as the presence of habitats for reproduction and rest.

<u>The plan area and its environs contain a mosaic of important bird habitats</u>:

- **Shrub-steppe**: Most of the plan area is characterized by a shrub-steppe land cover (some of it open cattle pasture), which is used for nesting by scrubland birds such as *Cisticola juncidis* and *Emberiza calandra*, and for foraging by birds of prey such as *Falco tinnunculus, Falco naumanni, Circus cyaneus*, and *Circus macrourus*.
- **Reed beds [marsh, river thicket] and wet meadow**: South of the plan area lies wet meadow around the lower basin of Tut River and the tributaries that flow into it (part of it is included in the Nahal Tut nature reserve). It serves as nesting ground for reed birds such as *Acrocephalus scirpaceus*, *Iduna pallida, Sylvia melanocephala*, *Cisticola juncidis* and *Cettia cetti*. In winter and spring the wet meadow area expands and shallow seasonal pools are created; water bird species can then be observed, such as *Anas platyrhynchos*, *Anas crecca*, *Alcedo atthis*, a variety of waders, and *Gallinula chloropus.*
- **Groves, planted forests and natural woodlands**: The plan area borders farmland to the south and east (dryland farming, olive groves and deciduous orchards). To the northeast of the plan are Mount Tabor's oaks (north of Ein Yoach), while to the northwest a variety of trees have been planted. Farther afield, 3 km north and south of the facility, lie natural and planted Mediterranean woodlands (part of the Carmel forest park, Mount Carmel National Park and Nature Reserve, and Horshan Mountain Reserve). All of these areas are populated by woodland birds such as *Turdus merula*, *Parus major*, and jays, and by synanthropes such as *Streptopelia senegalensis*, *Pycnonotus*, *Passer domesticus* and *Corvus cornix*.

Figure 5: Representative area habitats: upper right – wet meadow; upper left – horses in open pasture; lower right – scrubland; lower left – planted woodland (photograph: Assaf Meroz).

2.C. Scrubland birds as a unique group

Most of the area proposed for the facility is characterized by low, leafy scrubland. In general, insufficient attention has been devoted in Israel to scrubland preservation, for a number of reasons: scrubland areas have no trees, they are not usually places where people can move easily on foot, their value as pasturage is limited while the cost of cultivating scrubland for development is relatively low. In Israeli tradition damage to trees is looked upon more harshly than damage to bushes. For these reasons, the planning institutions and development entities permit damage to scrubland with relative ease.

The orientation of development toward scrubland and the consequent transformation of large expanses of scrubland into planted woodland have caused this important landscape typology to become rare in the Israeli biosphere, and to be inadequately represented in the country's nature reserves and other protected areas. At the same time, scrubland-habitat animals have become rare (Shkedi and Agrest 2011, Rothschild 2012).

Scrubland is home to "scrub specialists" that are suited to nesting and seeking food in semi-dry areas characterized by low vegetation. These animals include:

- Ground nesting birds such as *Galerida cristata*, *Oenanthe hispanica and Anthus similis*
- Thicket nesting birds such as *Prinia gracilis*, *Cisticola juncidis* and *Sylvia conspicillata*
- Shrub nesting birds such as *Lanius senator*, *Cercotrichas galactotes* and *Hippolais languid*
- Hole nesters such as *Coraciidae* and *Merops apiaster*
- Cliff, stone wall and ruin nesters such as *Falco naumanni*, *Athene noctua* and *Bubo bubo.*

Today, due to reduced scrubland area, the populations of these species are declining and some, such as *Sylvia conspicillata, Hippolais languid, Anthus similis* (an endemic species whose distribution is confined to Israel, Lebanon, Syria and Jordan), *Cercotrichas podobe, Oenanthe hispanica, Emberiza melanocephala* and *Emberiza caesia*, are in danger of extinction.

Scrublands are crucial foraging areas for many birds of prey such as *Falco naumanni*, *Circus macrourus***,** *Aquila heliacal* (all three in danger of extinction globally), *Spizaetus ornatus*, *Buteo rufinus*, and *Circaetus*, whom the open, tree-less scrublands enable to identify prey (rodents and reptiles), and to lunge on them from high altitudes. These birds of prey have trouble hunting in forests and woodlands, and are therefore dependent on scrublands and grasslands for nourishment.

Of the bird species that nest in Israel, /9 are considered to be "scrubland species," of which 9 are in danger of extinction in Israel (Meroz and Alon 2001, Perlman and Alon 2008).

Scrubland species are specialist species that are highly sensitive to changes in their habitat and that also respond to changes that take place far from their nesting grounds. In the northern Negev, for example, it was found that the presence of scrubland species increases significantly in scrubland patches larger than 000 dunams. It was also found that the presence of large scrubland patches increases the biodiversity of the area as a whole, in contrast to increases in woodland area which do not enhance biodiversity (Shochat et al. 2001).

All of the aforementioned factors (which indicate that the scrubland bird community includes species that are relatively rare and change-sensitive) make scrubland particularly valuable in terms of safeguarding bird species diversity in Israel.

2.D. Birds observed in the plan area

A list of 1/0 bird species that were observed in areas near the plan is provided in the Appendix, and includes observations from the Israel Nature and Parks Authority database (Sever 2001) as well as personal observations conducted by Assaf Meroz and other ornithologists over the years. This list is certainly not exhaustive, but it does include the majority of the area's representative bird species.

Of the birds observed, two species groups deserve special attention:

Scrubland birds:

This group includes specialist and sensitive species whose entire local populations would be negatively affected by the facility, far beyond its physical boundaries. For example: *Alectoris chukar*, *Coturnix coturnix*, *Falco naumanni*, *Falco naumanni*, *Circus macrourus, Buteo rufinus*, *Cisticola juncidis*, *Sylvia communis*, and *Emberiza calandra*.

Birds of prey:

In the open spaces of the plan area myriad raptor species have been observed, including several that are in danger of extinction, globally or regionally:

- *Aquila heliacal* – classified as "vulnerable" (VU – Level Three threat of extinction) (*Birdlife International* 2013). The species winters in the region (especially young birds).
- *Circus macrourus* – a species whose global population is small and which is classified at a low level of global danger of extinction – NT (Birdlife International 2013).
- *Falco naumanni* – A species whose global population is small. It is a colony summerer and nester in the area's localities (including Elkayam and Bat Shlomo). The Ramot Menashe nesting colony is Israel's largest and numbers 300 pairs (Gal and Meroz 2004).
- Many other raptors seek prey in this area, including *Circaetus gallicus*, *Buteo rufinus* and *Accipiter nisus* which nest in the area, as well as *Circus aeruginosus, Circus cyaneus, Buteo buteo and Falco columbarius* which winter there.

***Figure 6: Nesting species in the plan area. Upper right – Sylvia communis*; upper left – *Burhinus oedicnemus*; lower right – *Emberiza calandra*; lower left – *Carduelis carduelis* (photographed in the plan area in Spring, 2015, Assaf Meroz).**

7. Potential facility impacts on birds

7.A. Impacts on migratory birds

As noted, migratory birds are divided into two groups distinguished by their migratory strategies and flight methods. For **passive migrators – gliding birds**, i.e. raptors, storks, pelicans and the like, the situation is relatively straightforward. Although huge populations of gliding birds fly over Ramot Menashe, the probability that these birds will collide with the facility is low, mainly because they travel during daytime hours, when their excellent vision enables them to discern and bypass geographic obstacles. Most of these birds in any case fly at altitudes where the facilities would not pose a problem (/00 and above).

For **night migrators – active migrators**, i.e. songbirds, *Charadriiformes* and water birds, the situation is more complex. We do not actually know how many birds fly over the area and at what heights. These birds migrate over Israel in a broad front pattern and at varying altitudes. They fly at night and are thus impossible to observe directly. In order to obtain more reliable data about the quantity of these migrators in a given area, a survey has to be conducted using radar, which is capable of determining the volume of night migration and breaking it down by altitudes. For facilities whose impact on bird migration could potentially be dramatic, such as wind turbines, the Israel Nature and Parks Authority requires that preliminary radar surveys be carried out (Ohed HaTzofe and Dan Alon, personal communication). Internationally it is, in fact, accepted practice to use bird radar to warn of coming bird migration waves, so that wind turbines can cease their activity when the waves arrive.

Some idea of the volume of low-altitude migration can be obtained from Sobel's study (1980), which indicates that 100 thousand birds pass each fall at low altitudes (0-00 meters) over a 1-kilometer cross section.

In any case, the facility's prominent location in Ramat Menashe, at the center of Israel's western migration route is such that one may assume it to be an area where the volume of night migration is large.

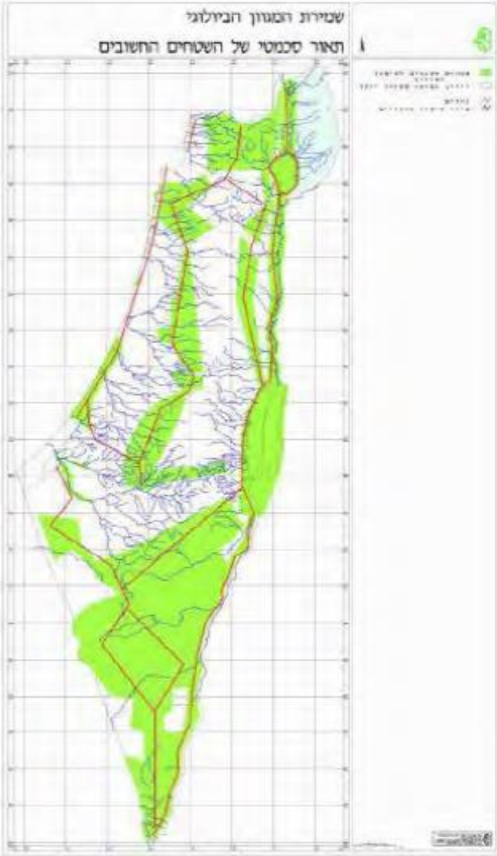
There have been many documented instances, both internationally and in Israel, of migrating birds being **injured by colliding with buildings and power lines**. In October 2001 tens of dead birds (mainly *Phylloscopus trochilus*) that had collided with Ramat Gan high-rises while migrating were collected (Dan Alon, personal communication). In North America, where this phenomenon has been well documented, the number of recorded bird collisions is estimated to be at least five million per year (Erickson et al. 2005). Collisions can be divided into three main types:

- Collisions with structures and facilities of various kinds due to improper lighting that creates glare, diverts birds from their migration paths or attracts them to the other side of the obstacle
- Collisions with structures whose walls and windows are made of glass, which deceives the birds by reflecting the sky.
- Collisions with communication structures and high voltage power lines that are not illuminated, making it hard for the birds to see them.

After reviewing the facility plan it appears that the main danger to migratory birds would likely be that of collision with the building's stack (even if it is relatively low, 0-30 meters – the height at which a substantial amount of night migration takes place). Another potential danger could arise from the installation of overhead power lines to the facility or in its environs, should such lines be planned.

7.B. Impact on birds staying in Ramot Menashe for extended periods (stable, wintering and the like)

As noted, the Hagit alternative involves the construction of an industrial facility in the heart of an open natural area that serves both migratory bird populations and populations of birds that stay in the area year round (stable) or during the winter (wintering), or that make interim stops in the area in the course of migration.



[map] – **Preserving biodiversity Schematic description of the major areas**

Figure 3: Map of Israel's ecological corridors (Shkedi and Sadot 2011). Ramot Menashe is part of the western corridor used for movement along a north-south axis.

The potential impacts on these birds can be divided into several types:

- **Habitat loss**: The facility will cover an area of 1/0 dunams, and will come at the expense of quality space for songbird nesting and raptor foraging. One must take into account an impact radius of /00 meters from the building line (Assaf Meroz, personal observations).

- **Impact on local and spatial movement**: The envisioned facility area is located at the heart of Israel's western ecological corridor (Shkedi and Sadot 2000); it serves animals moving on both north-south and east-west axes within a space that connects Ramot Menashe to the southern Carmel. Although this facility would not be the first artificial infrastructure in the area, it would nevertheless constitute yet another segment of the barrier that is forming between Ramot Menashe and Mount Carmel.

- **Impact of planted trees on scrubland birds**

Plans call for the facility to be built in an area that is mainly shrub-steppe. This habitat is home to species that have evolved to live in an open habitat with low ground cover. Planting trees in this area would foster increased penetration of species that use such trees for nesting or observation, such as *Corvus cornix, Garrulus, Buteo buteo, Accipiter nisus* and various *Lanius* species. These species intensify predatory pressure on ground and shrub nesters and cause them to disappear.

- **Impact of lighting on local birds**: Artificial lighting has been found to affect birds in many ways. Among other things it confuses their circadian rhythm, causing them, for example, to emit in mating vocalizations at night, which entails unnecessary energy expenditure and thus affects the birds' reproductive fitness. In certain cases light pollution has caused birds to nest in the fall rather than the spring (Lieder 2008, Derickson 1988).

  It should be noted that light pollution can also negatively affect the stability of entire food chains, by harming key food chain species and causing imbalance to the entire natural system (Longcore and Rich 2004).

1. Recommendations for minimizing damage

1.A. Lighting and light pollution

- In general, the impact of artificial lighting on birds is negative and it is advisable that that impact be minimized insofar as possible. In the case of perimeter fence lighting, it is recommended that motion detectors be used so that lighting can be activated only when people are approaching the facility.
- When the above recommendation cannot be implemented, i.e., when permanent, outward-facing perimeter lighting is necessary, the following guidelines should be followed (Noam Lieder, Science Division, Israel Nature and Parks Authority, personal communication):
  A. Verify that the lighting does not cause glare by using full cutoff luminaires.
  B. The lighting wavelength should be larger than 000 nanometers (without a blue element), to ensure relatively small impact on circadian rhythms.
  C. The lighting plan should be backed up by photometric mapping that presents the dispersion of light around the facility and verifies that there is no lighting beyond the necessary area (the photometric mapping should be sent to the planning authorities in the Nature and Parks Authority and the Ministry of Environmental Protection).
- Special attention should be given to the lighting of tall structures such as chimneys and antennas. These structures are usually illuminated with continuous red light, to mark them for aircraft. Such lighting has been found to be dangerous for migratory birds; it causes them to deviate from their migration paths and results in numerous collisions. It is advisable to use non-continuous, non-red lighting (Ohad HaTzofe, personal communication). In the US it was proven that use of flashing LED lights at a frequency of up to ??? flashes per minute is most effective in preventing bird collisions (Patterson 2013).

1.B. Preventing collisions

- **Collisions with buildings**: The use of glass in exterior building walls increases the rate of bird-building collisions. It is recommended that the use of glass in the building envelope be reduced; if glass must be used, it should be screened from the outside by anything that will prevent reflection, i.e. exterior curtains or screens, painting the windows or covering them densely with adhesives.
- **Collisions with power lines**: Birds that fly by night collide with power lines. It is advisable to avoid installing overhead high-voltage lines; they should be installed underground via suitable means (recommendations for methods that have already been tried can be obtained from the INPA planning entities).

1.C. Non-planting of trees

As noted in 7B, planting trees in shrub-steppe negatively affects shrub-steppe specialist species. For this reason it is recommended that trees not be planted in the plan area (other reasons, including scenic considerations, may nevertheless result in a recommendation to plant trees). It is especially advisable to refrain from planting non-native or invasive species such as *Pinus halepensis* or other pines, *Acacia saligna*, *Schinus terebinthifolius*, *Ailanthus altissima*, and the like (a full list can be found in Dufour-Dror 2010).

1.D. Preventing domestic cat penetration

Domestic cats are known throughout the world as a major factor in the loss of biodiversity, and their negative impact on birds and other small vertebrate species is especially notable (Birkner-Baron 2010). The impact of cats on other animals in a low ground coverage area would likely be most severe. **For this reason it is unequivocally recommended that domestic cats not be brought into the facility**.

References

מקורות:

אלון, ד. ופרלמן, י., 3008. ציפורים בישראל בסכנת הכחדה, תמונת מצב. פרסומי החברה להגנת הטבע.

בירקנר בראון, ע., 3010. השפעת חתולי–בית על חיות–בר ועל שמירת טבע. אקולוגיה וסביבה 3, 14-00.

גל, א. ומירוז, א.)עורכים(, 3004. הבז האדום בעדשת הטלסקופ – לקט מחקרים. העזניה מספר 3/, הוצאת טבע הדברים והחברה להגנת הטבע.

ז'אן-מארק ד., 3010. הצמחים הפולשים בישראל. הוצאת אחווה, ירושלים.

לידר, נ., 3008. השלכות אקולוגיות של תאורת כבישים בישראל. פרסומי חטיבת מדע, רשות הטבע והגנים.

מירוז, א. ואייל ע. 1981. סיכום סקר נדידת דורסים ברמת השרון, סתיו 1980. העזניה 13: 89-90, הוצאת החברה להגנת הטבע.

מירוז, א. ואלון, ד. 3001. פרק העופות בספר האדום של החולייתנים בישראל, הוצאת רשות הטבע והגנים והחברה להגנת הטבע.

סבר, נ., 3001. נחל תות – תוכנית ממשק לשמורה. הוגש לרט"ג.

סובל, א. 1980. נדידת ציפורי שיר בחוף תל אביב, 198/ - 1984. עלון צופית מס' /: 11-09.

רוטשילד, א. 3013. נוף פתוח הולך ונעלם - המגוון הביולוגי של הבתה והשטחים העשבוניים, חוברת מידע והמלצות לקובעי מדיניות, מתכננים, מנהלי שטח ואנשי חינוך. פרסומי החברה להגנת הטבע.

שקדי, י., אגרט, נ.)3004(. בתות בסובב הים-תיכוני. פרסומי חטיבת מדע, רשות הטבע והגנים.

שקדי, י., שדות, א. (3000). מסדרונות אקולוגיים בשטחים פתוחים: כלי לשמירת טבע. פרסומי חטיבת המדע, רשות הטבע והגנים.

Bruderer, B. 1994. Nocturnal bird migration in the Negev (Israel): a tracking radar study. Ostrich 65: 204-212.

Bruderer, B., D. Peter, and T. Steuri. 1999. Behaviour of migrating birds exposed to X-band radar and a bright light beam. J. of Experimental Biology 202:1015-1022.

Derrickson KC. 1988. Variation in Repertoire presentation in Northern Mockingbirds. Condor 90: 592-606.

Erickson, W. P., Johnson, G. D., and Young D., P., 2005. A Summary and Comparison of Bird Mortality from Anthropogenic Causes with an Emphasis on Collisions. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191. 2005

Longcore, T. & Rich, C. 2004. Ecological Light Pollution. Front. Ecol. Environ. 2: 191-198.

Leshem, Y. & Yom-tov, Y.1998. Routes of migrating soaring birds
IBIS 140: 41-52

Paterson, J. W. 2012. Evaluation of New Obstruction Lighting Techniques to Reduce Avian Fatalities. U.S. Department of Transportation eport, Federal Aviation Administration.

Shamoun-Baranes, J., van Loon, E., Alon, D., Alpert, P., Yom-Tov, Y., Leshem, Y., 2006. Is there a connection between weather at departure sites, onset of migration and timing of soaring-bird autumn migration
in Israel? Global Ecology and Biogeography,

Shochat, E., Abramsky, Z., Pinshow, B., 2001. Breeding bird species diversity in the Negev: effects of scrub fragmentation by planted forests. Journal of Applied Ecology, vol 38, 1135–1147.

Appendix: Types of birds seen throughout the plan area (Sever 3001, personal observations by Assaf Miroz). Sensitive species whose populations in the area are liable to be hurt by the plan are marked in red

.No	Hebrew name	Latin name	Approximate status in the area
1	חוגלת סלעים	Alectoris chukar	Stable
3	שליו נודד	Coturnix coturnix	Migrant, possible nester
/	ברכיה	Anas platyrhynchos	Winterer
4	שרשיר מצוי	Anas crecca	Winterer
0	חסידה לבנה	Ciconia ciconia	Migrant
1	מגלן חום	Plegadis falcineilus	,Stablerandom visits in search of food
0	אנפ׳ת גמדית	Ixobrychus minutus	Migrant
8	אנפית סוף	Ardeola ralloides	Migrant
9	אנפית בקר	Bubulcus ibis	Stable
10	אנפה אפורה	Ardea cinerea	Winterer and migrant
11	לבנ׳ת קטנה	Egretta garzetta	Migrant and winterer
13	שקנאי מצוי	Pelecanus onocrotalus	Migrant
/1	בז אדום	Falco naumanni	Summerer, nester in adjacent localities
14	בז מצוי	Falco tinnunculus	Stable
10	בז ערב	Falco vespertinus	Migrant
11	בז גמדי	Falco columbarius	Winterer
10	בז עצים	Falco subbuteo	Summerer
18	איית צרעים	Pernis apivorus	Migrant
19	דיה שחורה	Milvus migrans	Winterer
30	נשר מקרא׳	Gyps fulvus	Migrant and stable, individuals arriving from the Carmel
31	חוויאי הנחשים	Circaetus gallicus	Summerer and migrant
33	זרון סוף	Circus aeruginosus	Winterer
/3	זרון תכול	Circus cyaneus	Winterer
34	זרון שדות	Circus macrourus	Migrant and winterer
30	זרון פס	Circus pygargus	Migrant
31	נץ מצוי	Accipiter nisus	Stable and winterer
30h	עקב	Buteo buteo	Winterer
38	עקב עיטי	Buteo rufinus	Winterer
39	עיט תורש	Aquila pomarina	Migrant
10	עיט צפרדעים	Aquila clanga	Winterer
1/	עיט שמש	Aquila heliaca	Winterer
3/	עיט גמדי	Hieraaetus pennatus	Migrant
//	רל׳ת המים	Rallus aquaticus	Winterer
14	מלכישל׳ו חלוד׳	Crex crex	Migrant
0/	ברוד׳ ת קטנה	Porzana parva	Migrant
ñ	סופית	Gallinula chloropus	Stable

.No	Hebrew name	Latin name	Approximate status in the area
10	כחון מצוי	Burhinus oedicnemus	Stable
8/	קיווית מצויצת	Vanellus vanellus	Winterer
9/	סיקסק	Vanellus spinosus	Stable
40	חרטומן יערות	Scolopax rusticola	Winterer
41	תרטומית ביצות	Gallinago gallinago	Winterer
43	ביצנית שחורת-כנף	Tringa ochropus	Winterer
/4	שחף אגמים	Larus ridibundus	Winterer
- 44	יונת בית סלעים	Columba livia	Stable
40	יונת עצים	Columba oenas	Winterer
41	תור מצו׳	Streptopelia turtur	Summerer
40	תור צווארון	Streptopelia decaocto	Stable
48	צוצלת	Streptopelia senegalensis	Stable
49	דררה	Psittacula krameri	Stable, invader
00	קוקיה מצויצת	Clamator glandarius	Summerer
01	קוקיה אירופית	Cuculus canorus	Migrant
03	תנשמת לבנה	Tyto alba	Stable
/0	שעיר מצוי	Otus scops	Summerer
04	כוס החורבות	Athene noctua	Stable
00	סיס הרים	Tachymarptis melba	Migrant
01	סיס חומות	Apus apus	Migrant
00	כחל מצו׳	Coracias garrulus	Migrant
08	שלדג לבן חזה	Halcyon smyrnensis	Stable
09	שלדג גמדי	Alcedo atthis	Migrant
10	שרקרק מצוי	Merops apiaster	Migrant and summerer
11	דוכיפת	Upupa epops	Stable
13	סראש	Jynx torquilla	Migrant
/1	נקר סורי	Dendrocopos syriacus	Stable
14	חנקן אדום-גב	Lanius collurio	Migrant
10	חנקן שחור-מצח	Lanius minor	Migrant
11	חנקן אדום־ראש	Lanius senator	Migrant
10	חנקן נובי	Lanius nubicus	Migrant
18	זהבן מחלל	Oriolus oriolus	Migrant
19	עורבני שחור-כיפה	Garrulus glandarius	Stable
00	קאק	Corvus monedula	Stable
01	עורב מזרע	Corvus frugilegus	Winterer
03	עורב אפור	Corvus cornix	Stable
/0	ירגזי מצוי	Parus major	Stable
04	כוכית גדות	Riparia riparia	Migrant
00	סנונית רפתות	Hirundorustica	Stable and winterer
01	סנונית מערות	Hirundo daurica	Migrant and summerer
00	עפרונן קצ-אצבעות	Calandrella brachydactyla	Migrant
08	עפרוני מצויץ	Galerida cristata	Stable
09	זרעית השדה	Alauda arvensis	Winterer

.No	Hebrew name	Latin name	Approximate status in the area
80	תפר	Cisticola juncidis	Stable
81	פשוש	Prinia gracilis	Stable
83	בולבול ממושקף	Pycnonotus xanthopygos	Stable
/8	צטיה חלודית	Cettia cetti	Stable
84	קנית קטנה	Acrocephalus scirpaceus	Summerer
80	קנית אירופית	Acrocephalus arundinaceus	Migrant
81	שיחנית קטנה	Hippolais pallida	Summerer
80	עלווית אפורה	Phylloscopus trochilus	Migrant
88	עלווית חורף	Phylloscopus collybita	Winterer
8S	עלווית לבנת-בטן	Phylloscopus orientalis	Migrant
90	עלווית ירוקה	Phylloscopus sibilatrix	Migrant
91	סבכי שחור-כיפה	Sylvia atricapilla	Winterer and migrant
93	סבכי קוצים	Sylvia communis	Migrant and summerer
/9	סבכי טוחנים	Sylvia curruca	Migrant
94	סבכי חורש	Sylvia crassirostris	Migrant
90	סבכי שחור-גרון	Sylvia rueppelli	Migrant
91	בסכי שחור-ראש	Sylvia melanocephala	Stable
90	זרזיר מצוי	Sturnus vulgaris	Winterer
98	שחרור	Turdus merula	Stable
99	קיכלי רונן	Turdus philomelos	Migrant and winterer
100	אדום חזה	Erithacus rubecula	Winterer
101	זמיר הירדן	Luscinia megarhynchos	Migrant
103	כחול חזה	Luscinia svecica	Winterer and migrant
/10	חמריה חלודת-זנב	Cercotrichas galactotes	Migrant, possible summerer
104	חכלילית סלעים	Phoenicurus ochruros	Winterer
100	חכלילית עצים	Phoenicurus phoenicurus	Migrant
101	דוחל חום-גרון	Saxicola rubetra	Migrant
100	דוחל שחור-גרון	Saxicola torquatus	Winterer
108	סלעית אירופית	Oenanthe oenanthe	Migrant
109	סלעית קיץ	Oenanthe hispanica	Migrant
110	סלעית ערבות	Oenanthe isabellina	Migrant
111	חטפית אפורה	Muscicapa striata	Migrant
113	חטפית לבנת עורף	Ficedula albicollis	Migrant
/11	צופית בוהקת	Nectarinia osea	Stable
114	דרור הבית	Passer domesticus	Stable
110	דרור ספרדי	Passer hispaniolensis	Winterer
111	נחליאלי לבן	Motacilla alba	Winterer
110	נחליאלי צהוב	Motacilla flava	Migrant
118	נחליאלי זנבתן	Motacilla cinerea	Winterer
119	פפיון עצים	Anthus trivialis	Migrant
130	פפיון שחת	Anthus pratensis	Winterer
131	פפיון אדום-גרון	Anthus cervinus	Migrant
133	פרוש מצוי	Fringilla coelebs	Winterer

.No	Hebrew name	Latin name	Approximate status in the area
/13	בזבה אירופי	Serinus serinus	Winterer
134	ירקון	Carduelis chloris	Stable
130	חורפי	Carduelis spinus	Winterer
131	חוחית	Carduelis carduelis	Stable
130	תפוחית מצויה	Carduelis cannabina	Winterer
138	גיבתון עפרוני	Millaria calandra	Winterer, migrant, summerer
139	גיבתון גנים	Emberiza hortelana	Migrant
1/0	גיבתון אדום-מקור	Emberiza caesia	Migrant

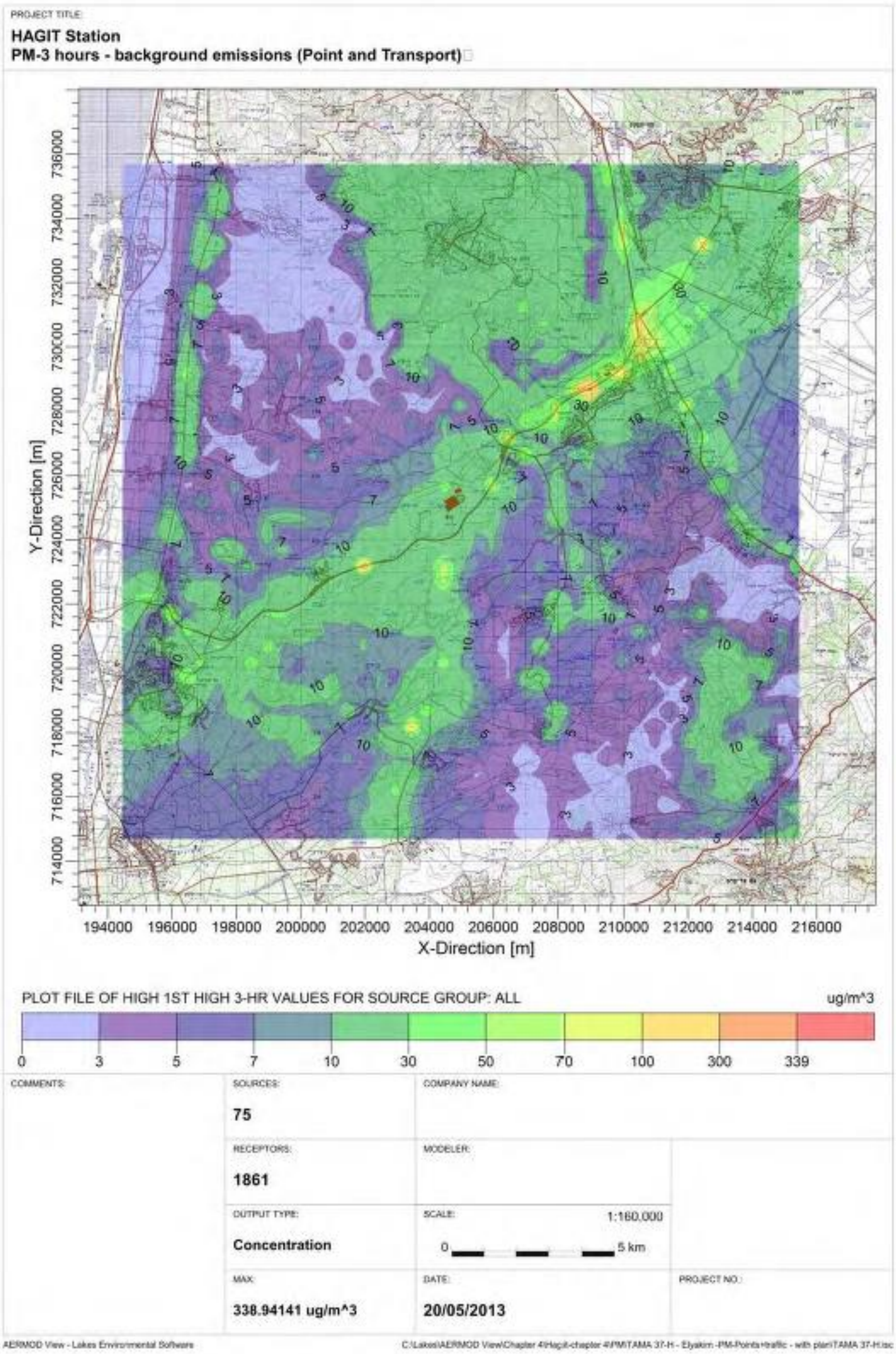
Appendix E – Air Quality – Model Run and Meteorological Data

Model run data, results and meteorological data documents are attached as a digital document

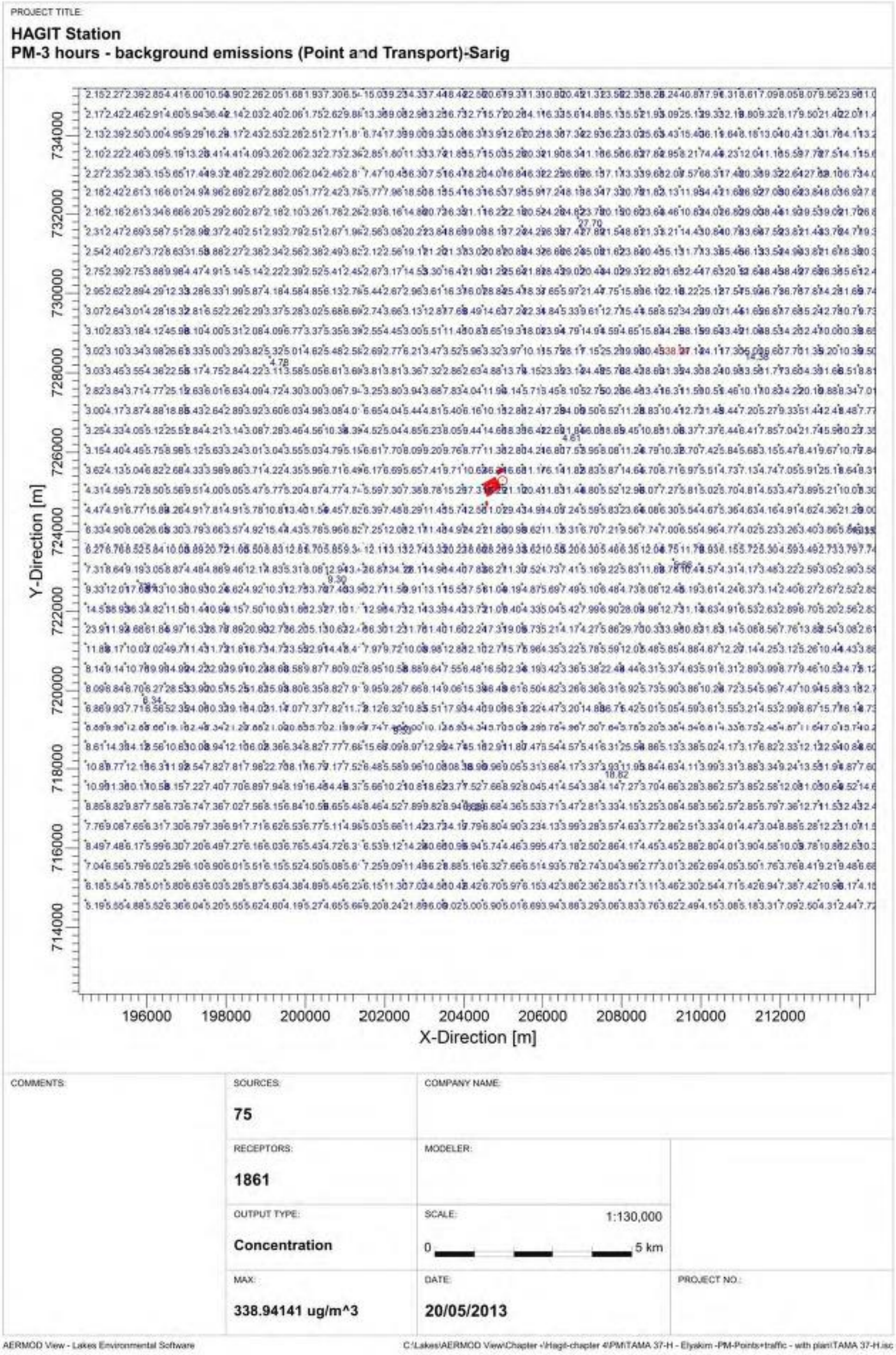
Appendix F – Results of Running Air Quality Models

Results for Background Emissions Model

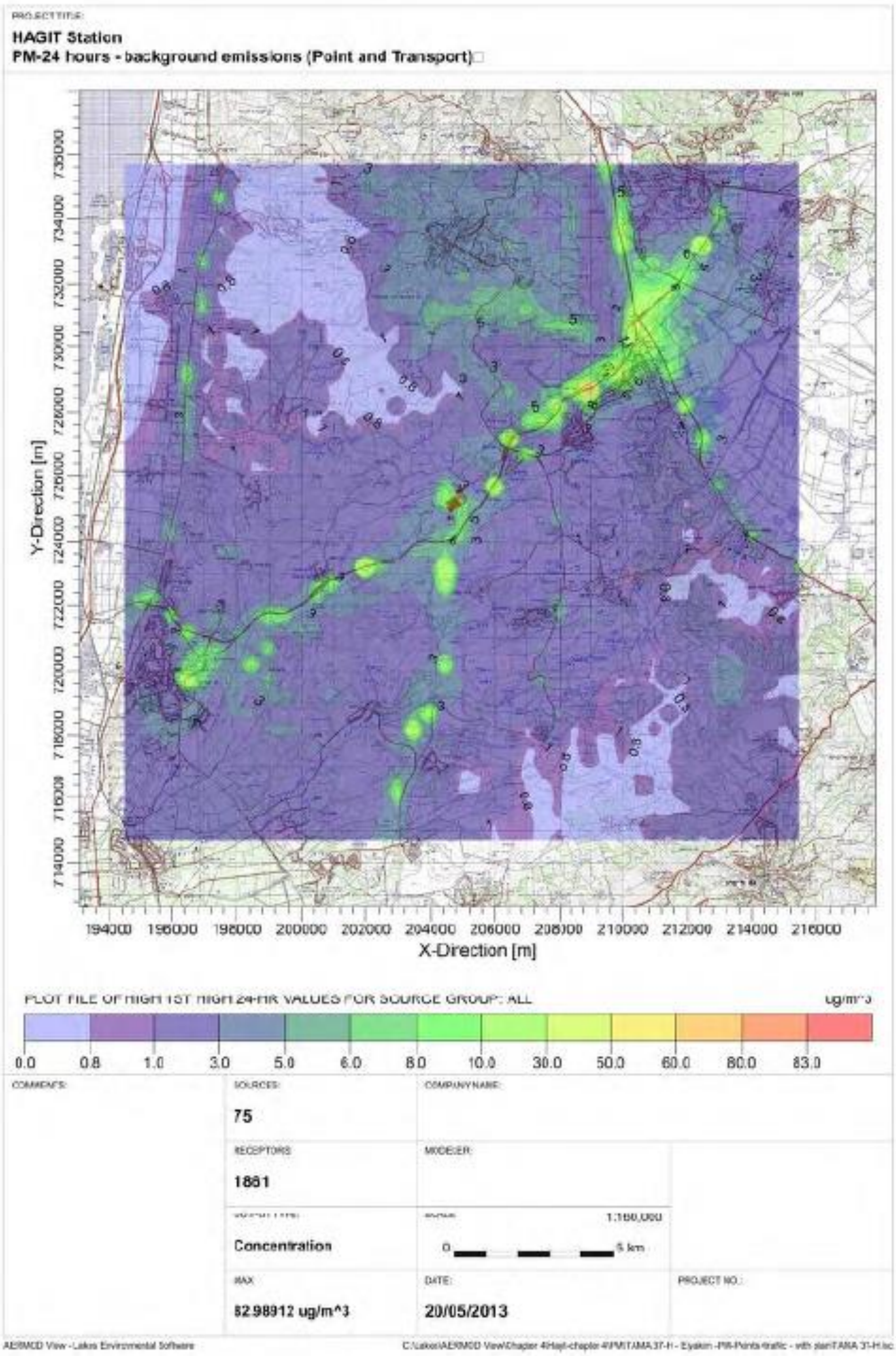
Isopleth map of particulate matter (PM) emissions, 3-hour average for present status, background emissions (point and transport)



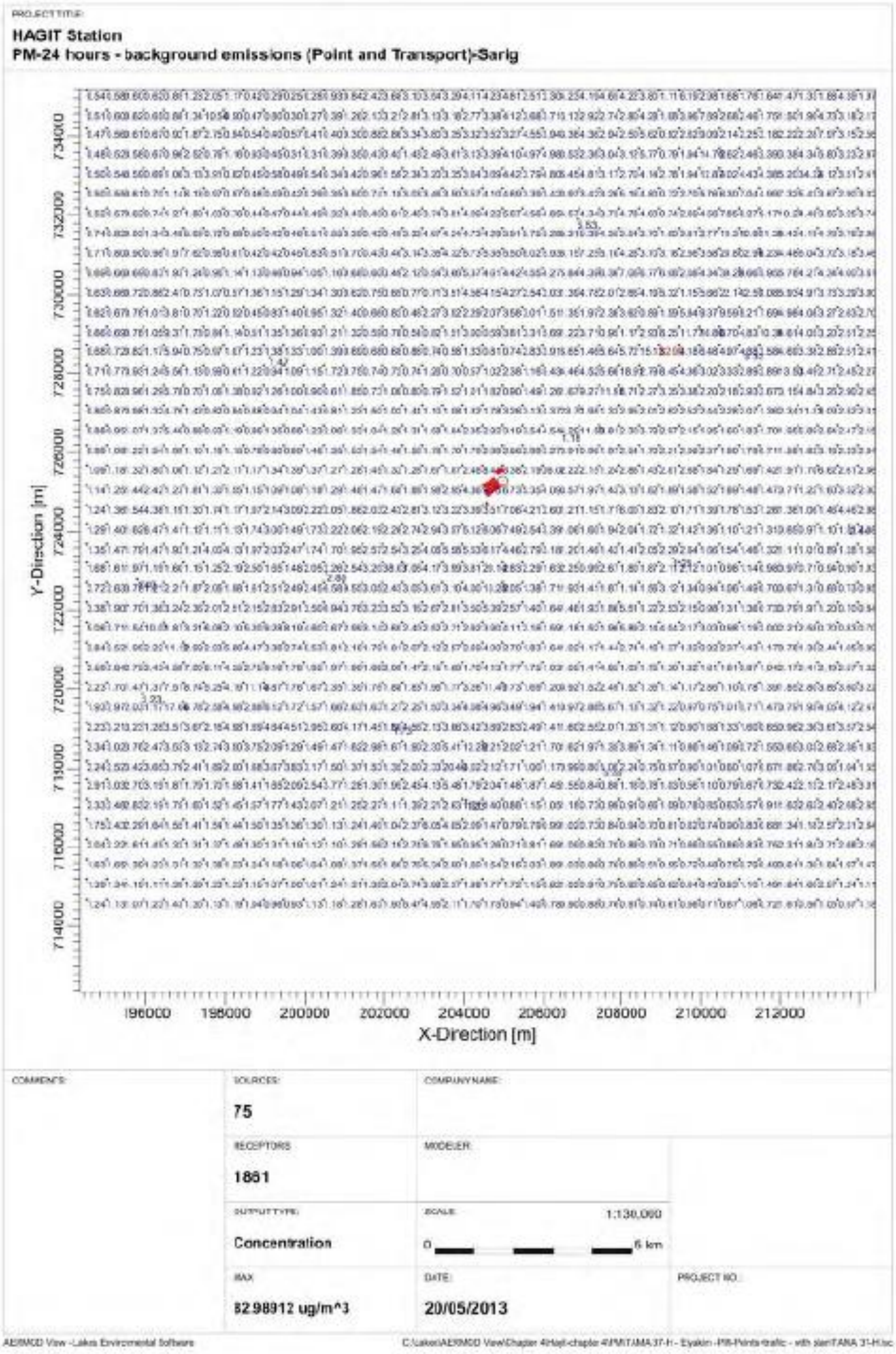
Lattice map of particulate matter (PM) emissions, 3 hour average for present status, background emissions (point and transport)



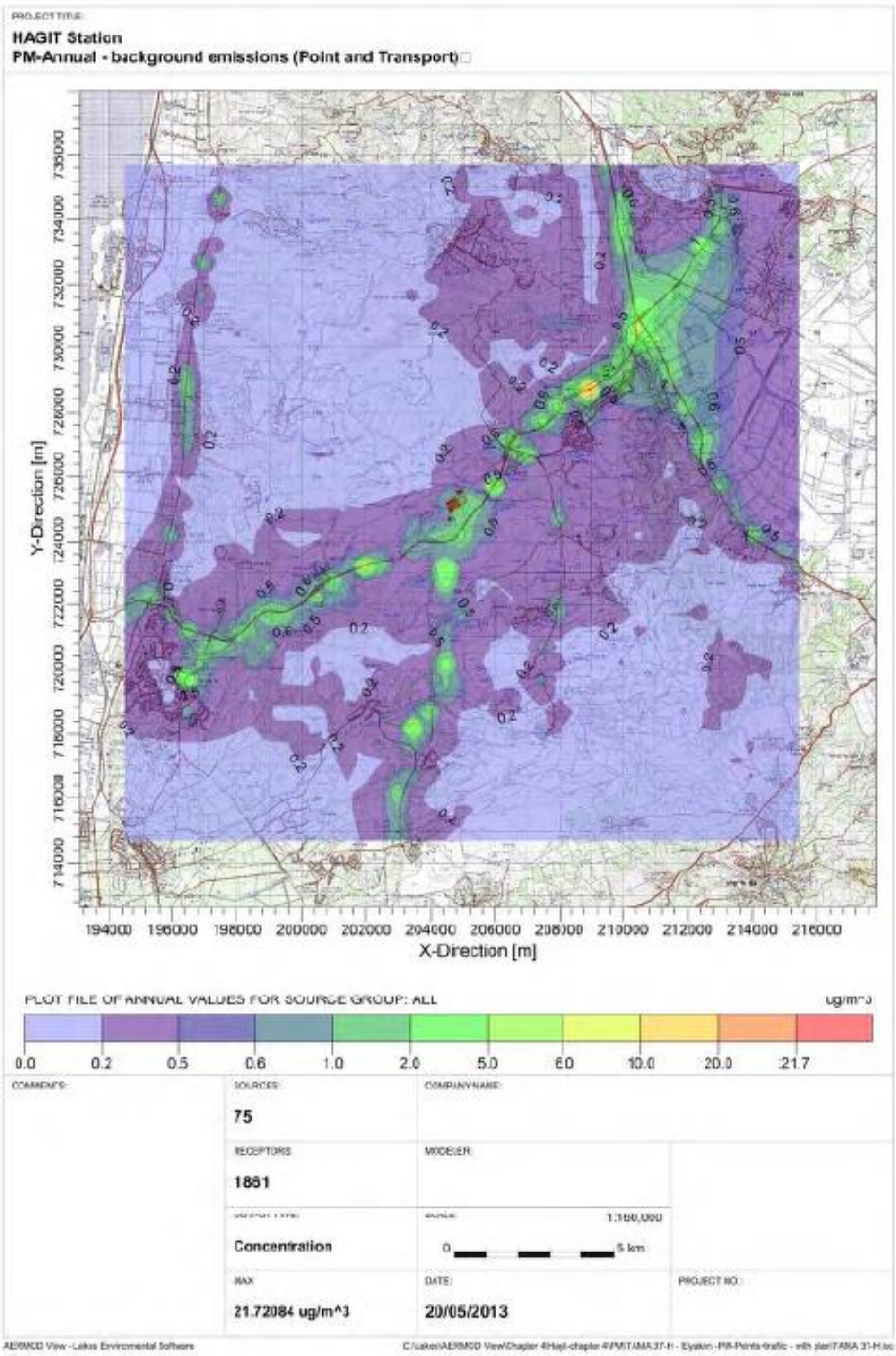
Isopleth map of particulate matter (PM) emissions, 24-hour average for present status, background emissions (point and transport)



Lattice map of particulate matter (PM) emissions, 24-hour average for present status, background missions (point and transport)



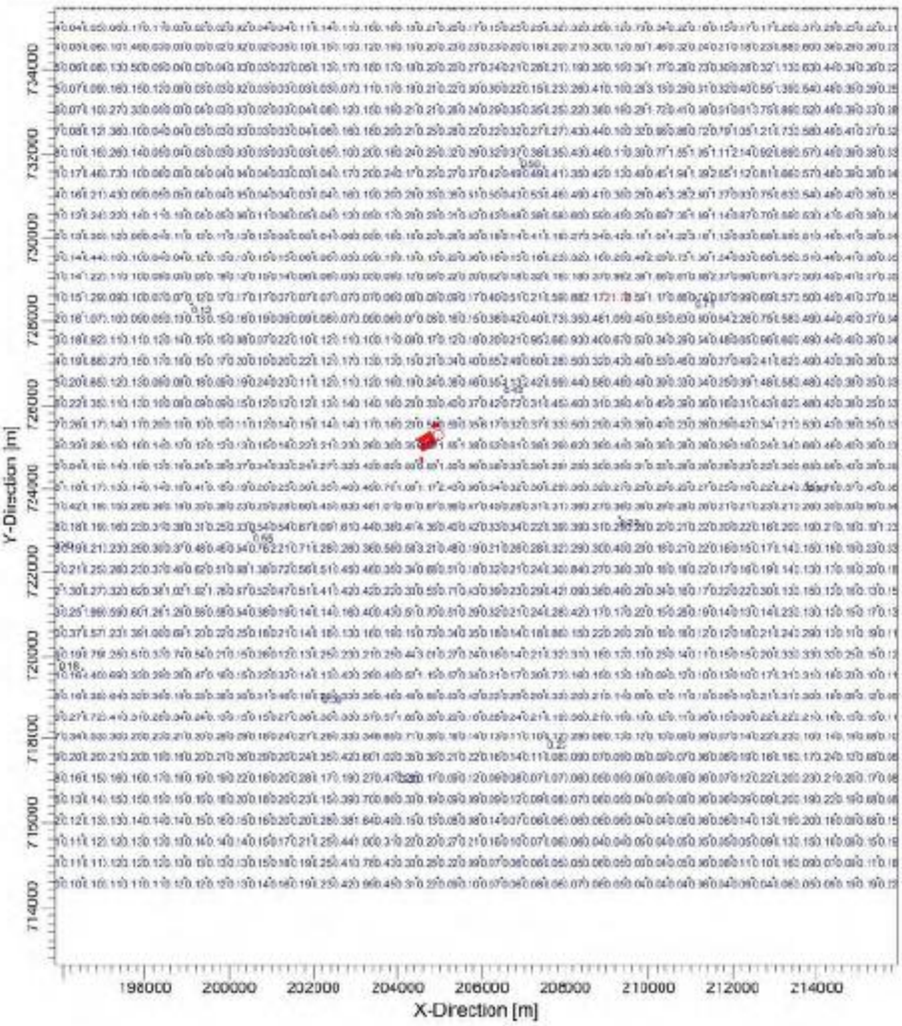
Isopleth map of particulate matter (PM) emissions, annual average for present status, background emissions (point and transport)



Lattice map of particulate matter (PM) emissions, annual average for present status, background emissions (point and transport)

PROJECT TITLE:

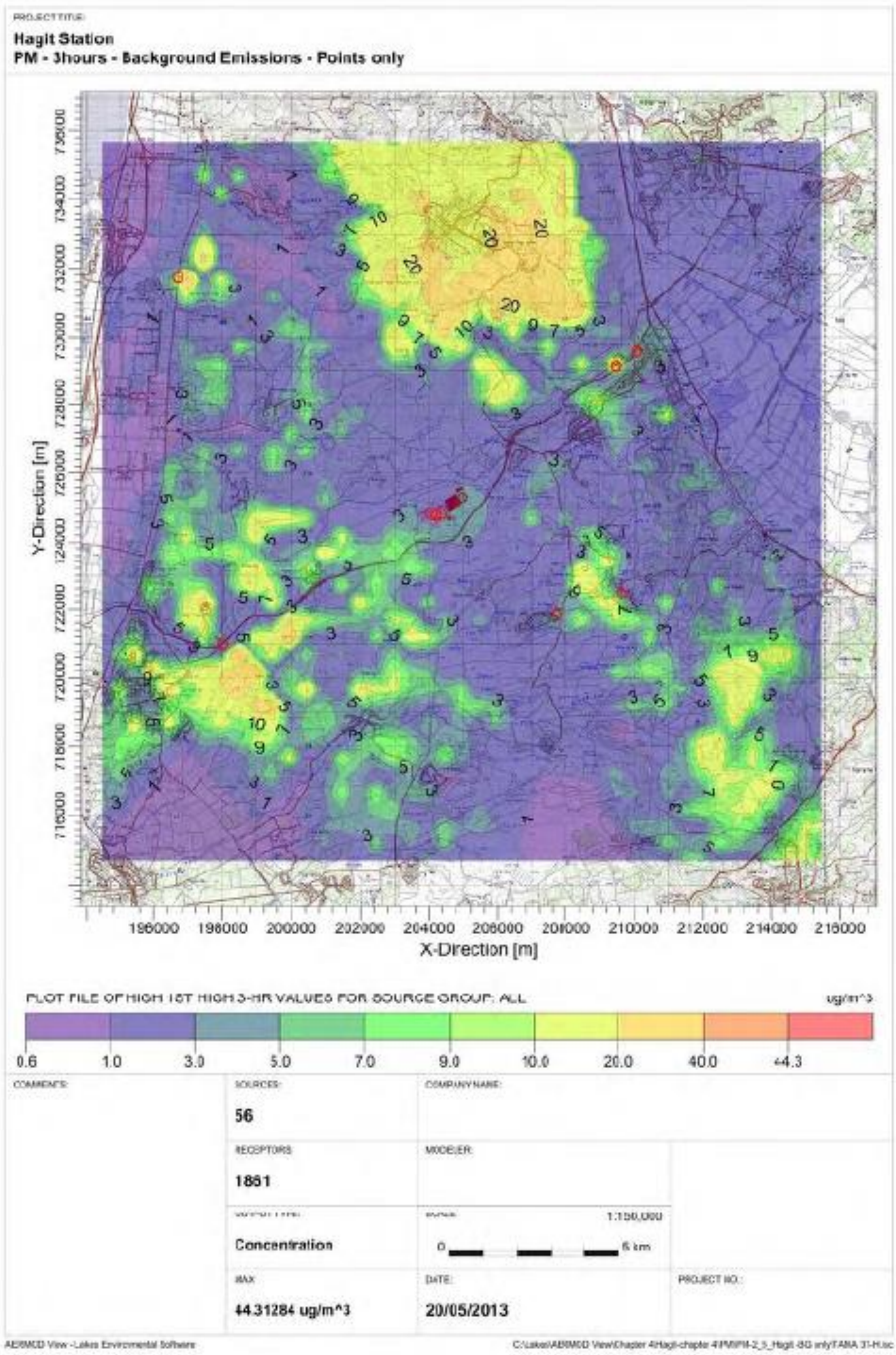
HAGIT Station
PM-Annual - background emissions (Point and Transport)-Sarig



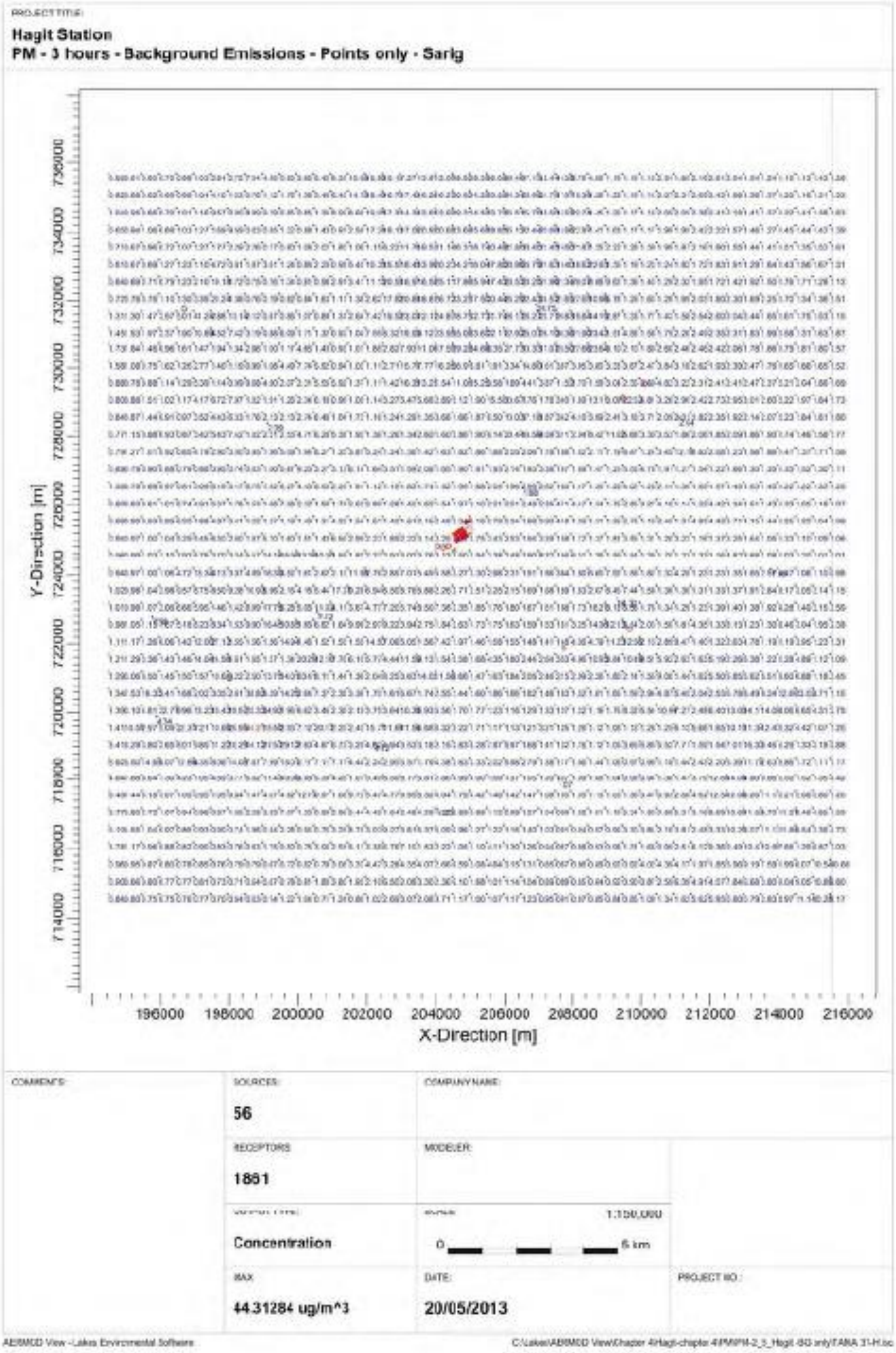
COMMENTS:	SOURCES:	COMPANY NAME:	
	75		
	RECEPTORS:	MODELER:	
	1861		
	OUTPUT TYPE:	SCALE: 1:130,000	
	Concentration	0 6 km	
	MAX:	DATE:	PROJECT NO.:
	21.72084 ug/m^3	20/05/2013	

Particulate Matter (PM) Model Results – Background emissions (points only)

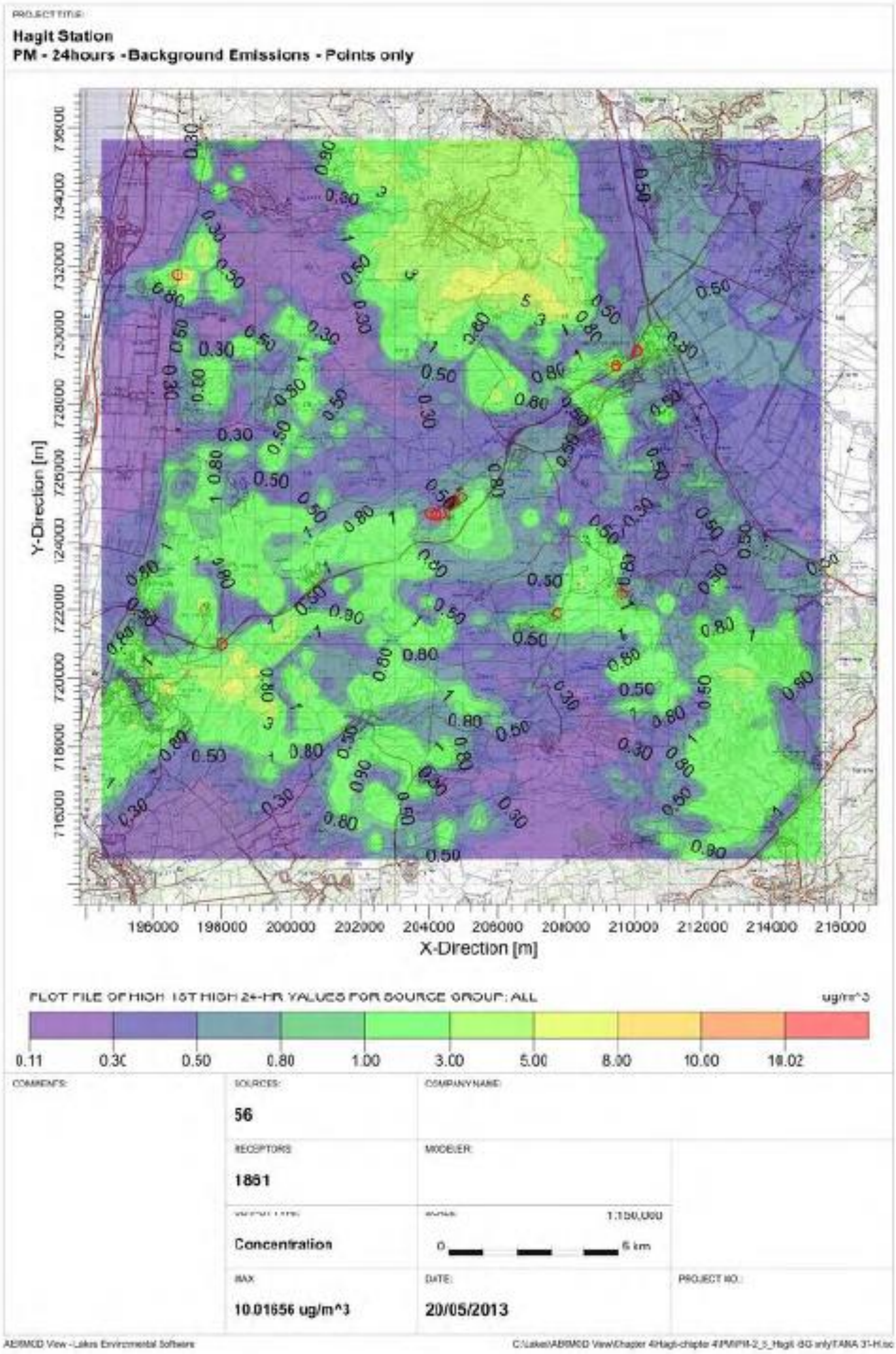
Isopleth map of particulate matter (PM) emissions, 3-hour average for present status, background emissions (points only, no transport emissions)



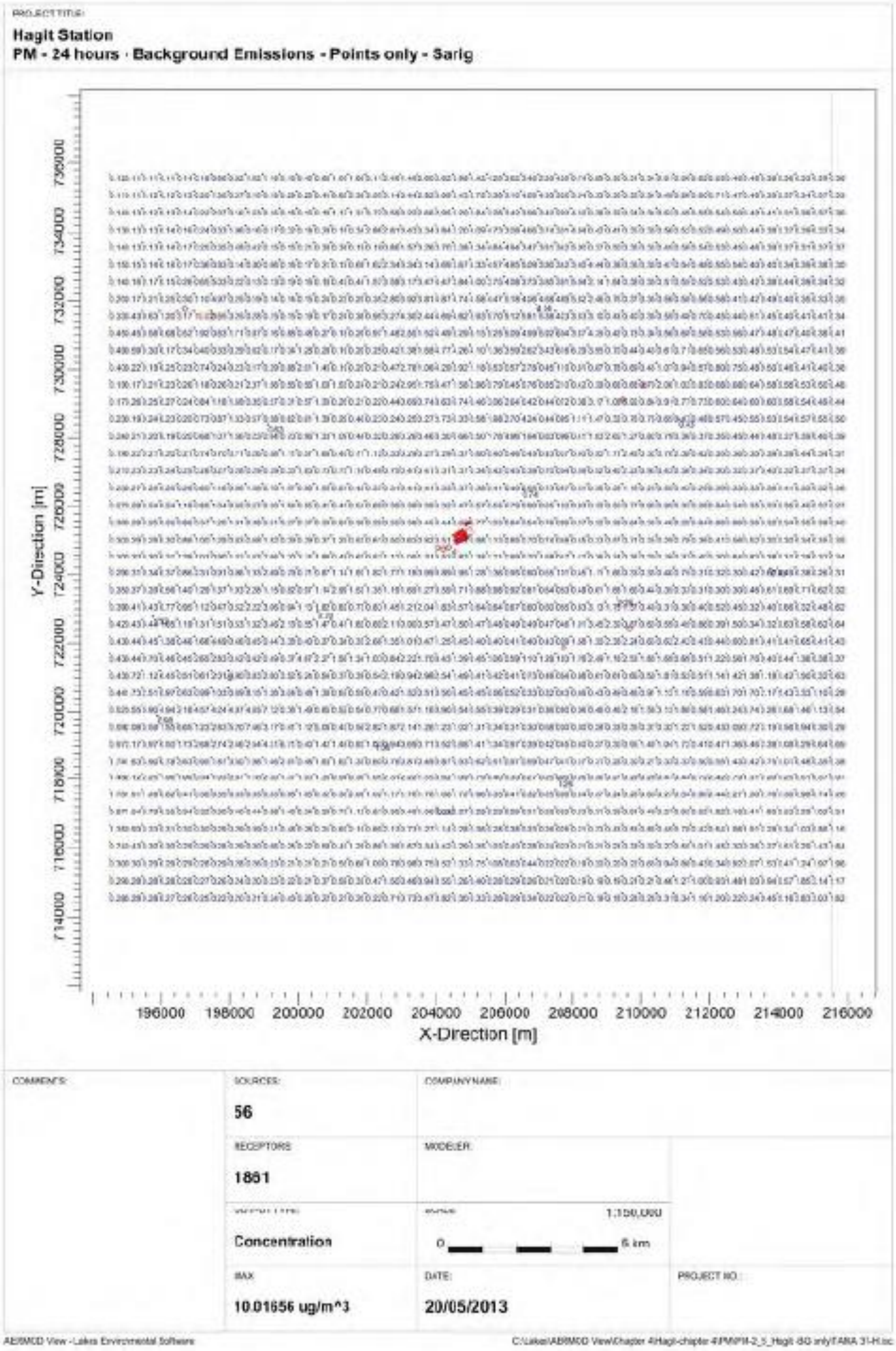
Lattice map of particulate matter (PM) emissions,3-hour average for present status, background emissions (points only, no transport emissions)



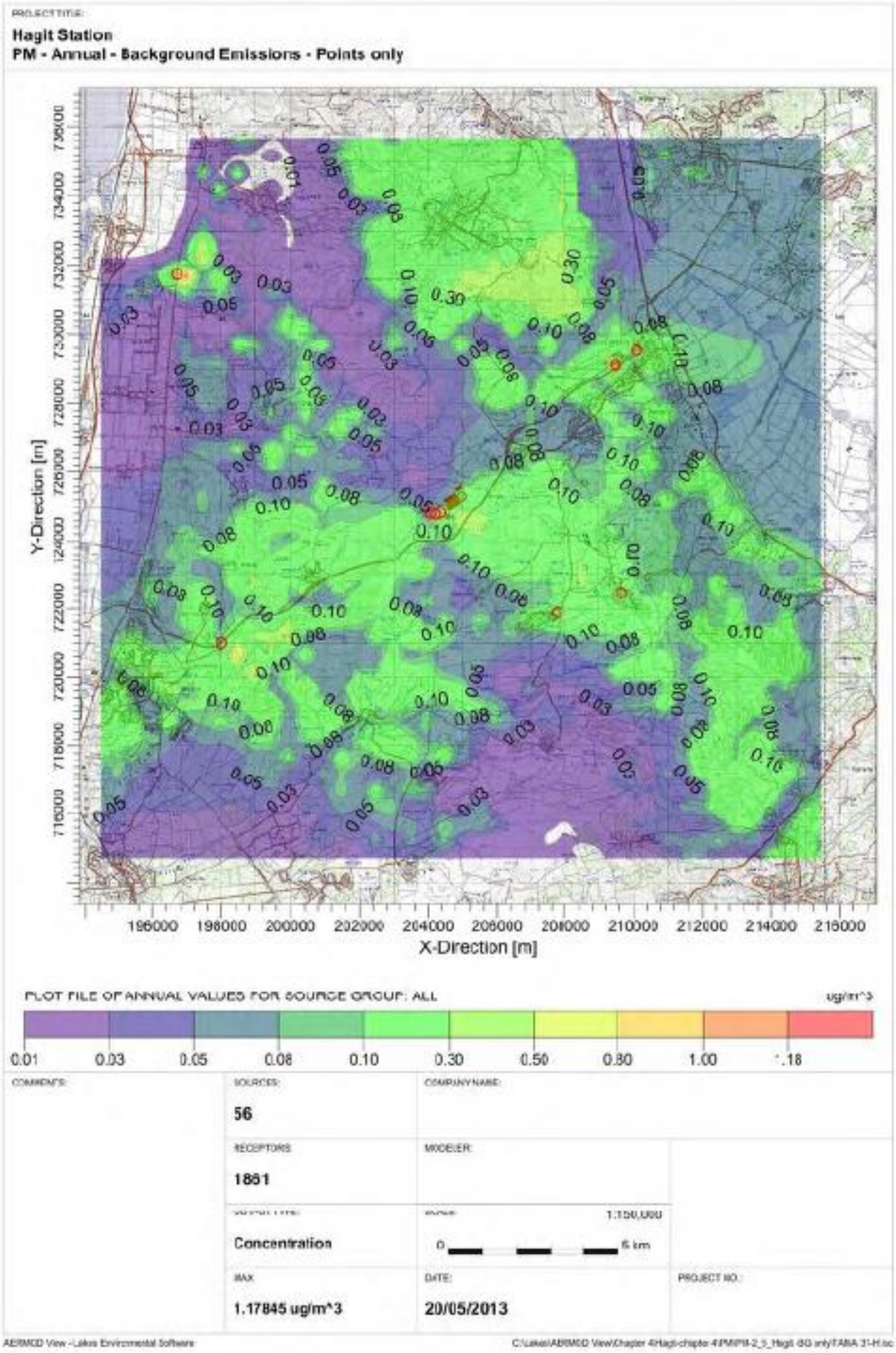
Isopleth map of particulate matter (PM) emissions, 24-hour average for present status, background emissions (points only, no transport emissions)



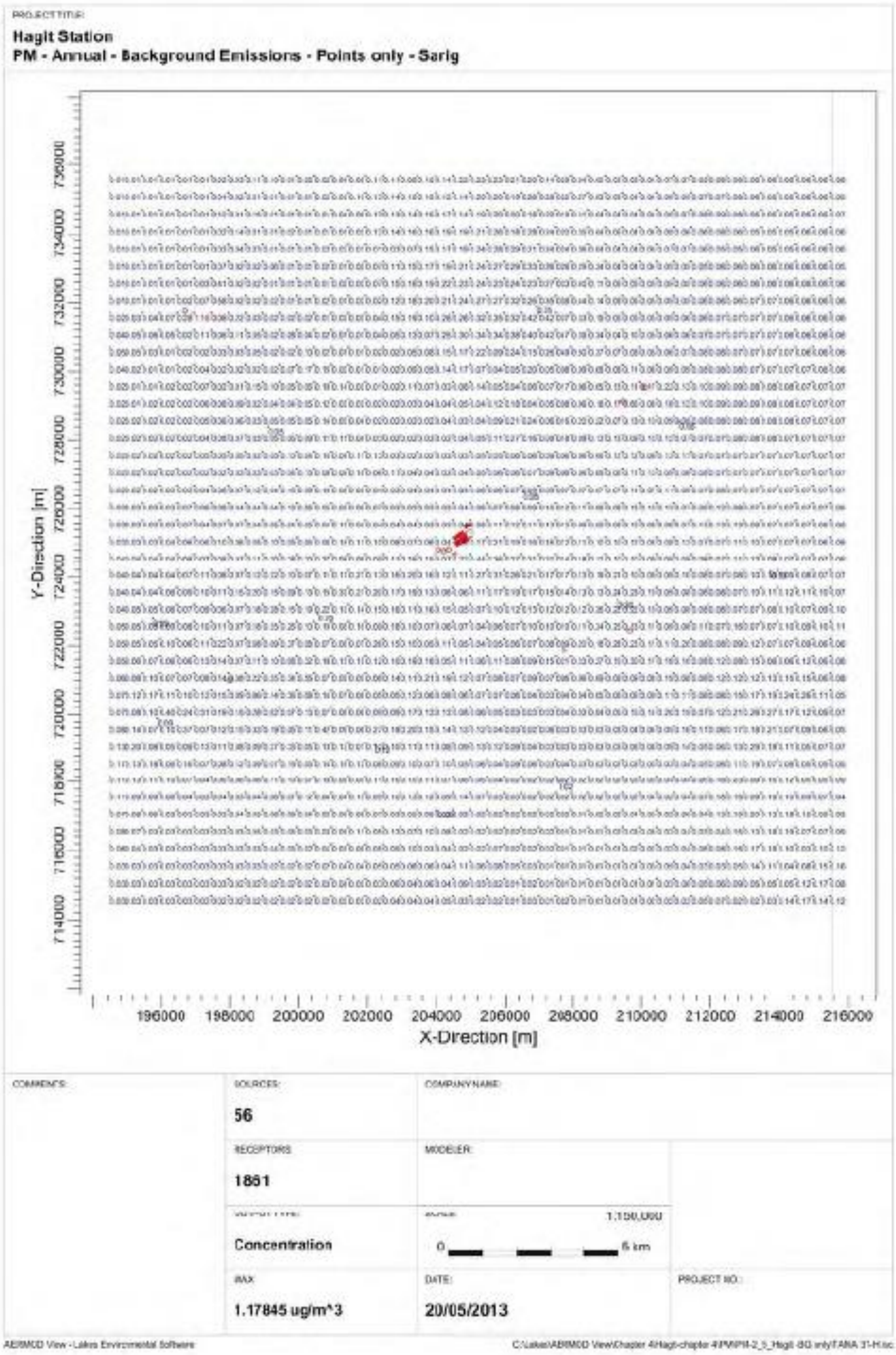
Lattice map of particulate matter (PM) emissions, 24-hour average for present status, background emissions (points only, no transport emissions)



Isopleth map of particulate matter (PM) emissions, annual average for present status, background emissions (points only, no transport emissions)



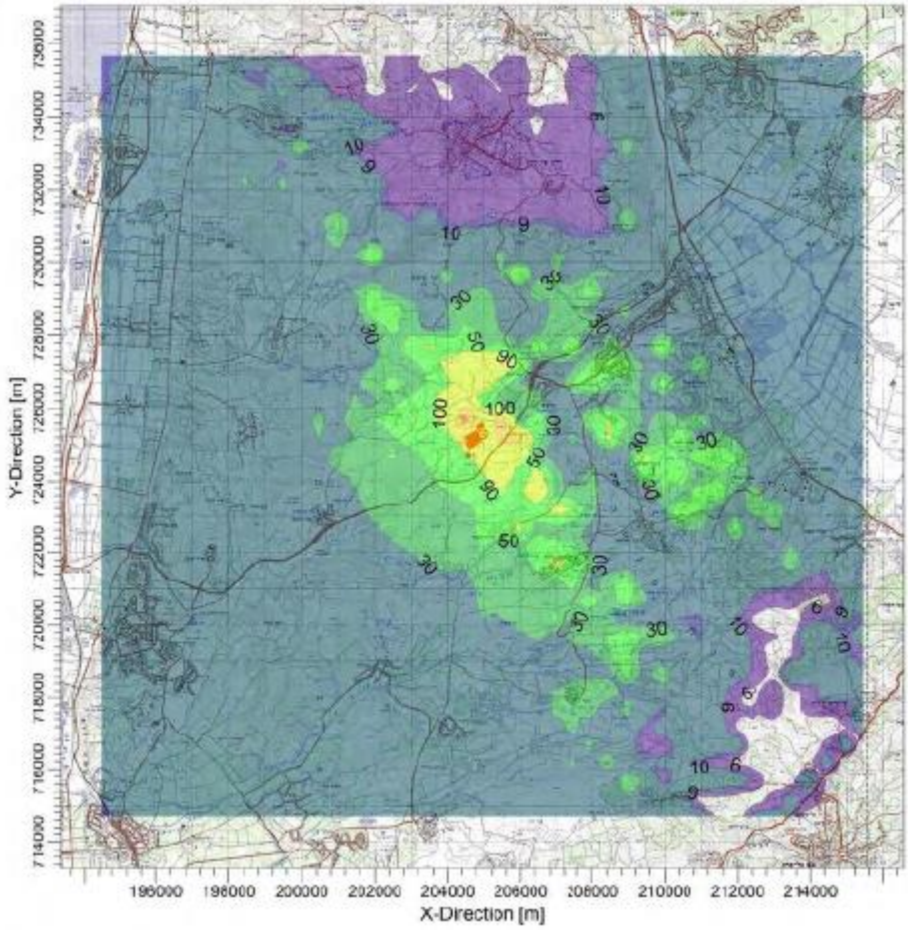
Lattice map of particulate matter (PM) emissions, annual average for present status, background emissions (points only, no transport emissions)



Isopleth map of nitrogen oxide (NOx) emissions, 1-hour average for 2016-2024 (emissions from natural gas treatment facilities and diesel engines)

PROJECT TITLE:

Hagit Station
NOX-1 hour - Flan only



PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL

ug/m^3

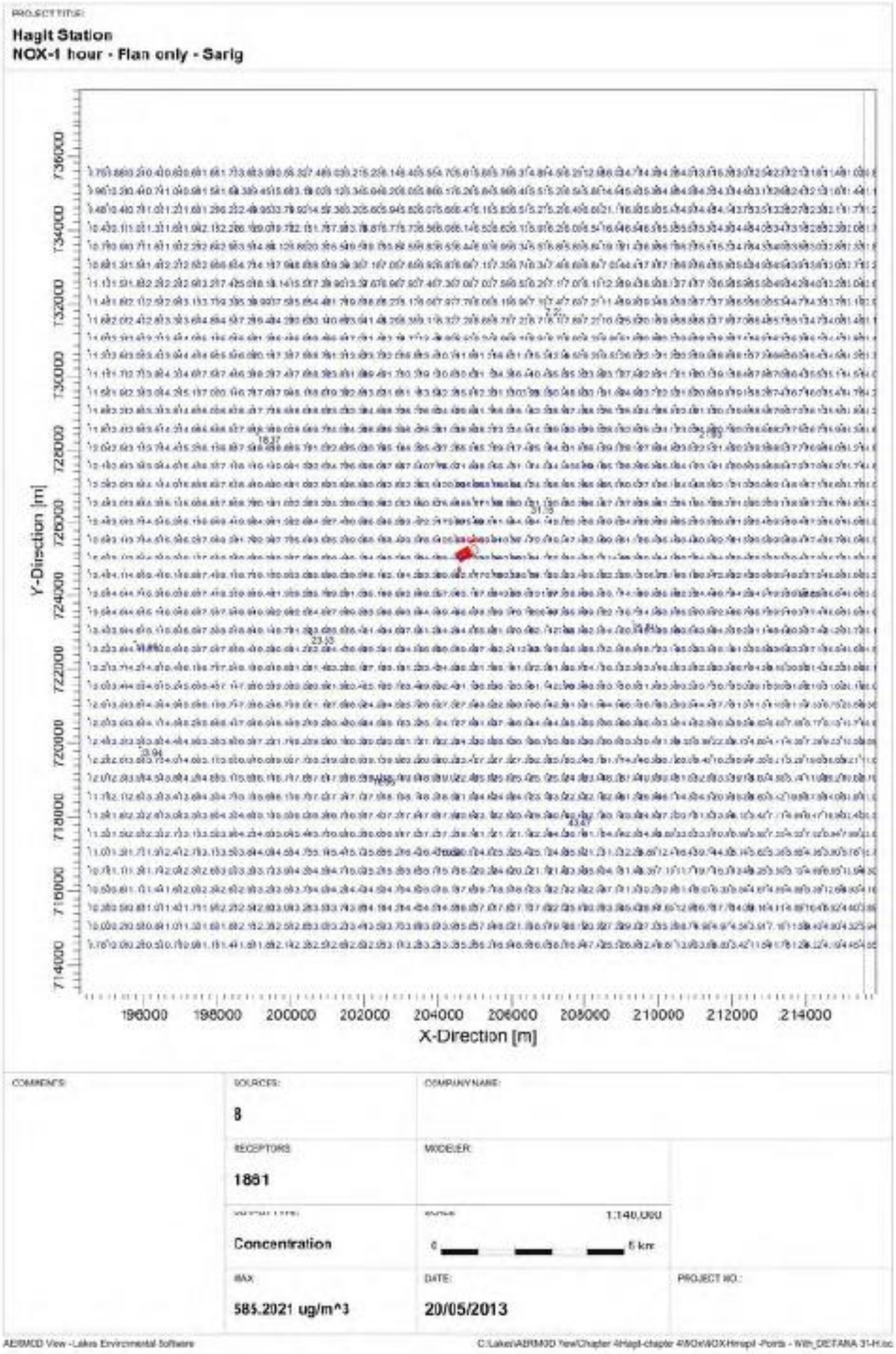
6 | 9 | 10 | 30 | 50 | 90 | 100 | 300 | 500 | 585

COMMENTS:	SOURCES: 8	COMPANY NAME:	
	RECEPTORS: 1861	MODELER:	
	OUTPUT TYPE: Concentration	SCALE: 1:150,000 0 — 5 km	
	MAX: 585.2021 ug/m^3	DATE: 20/05/2013	PROJECT NO.:

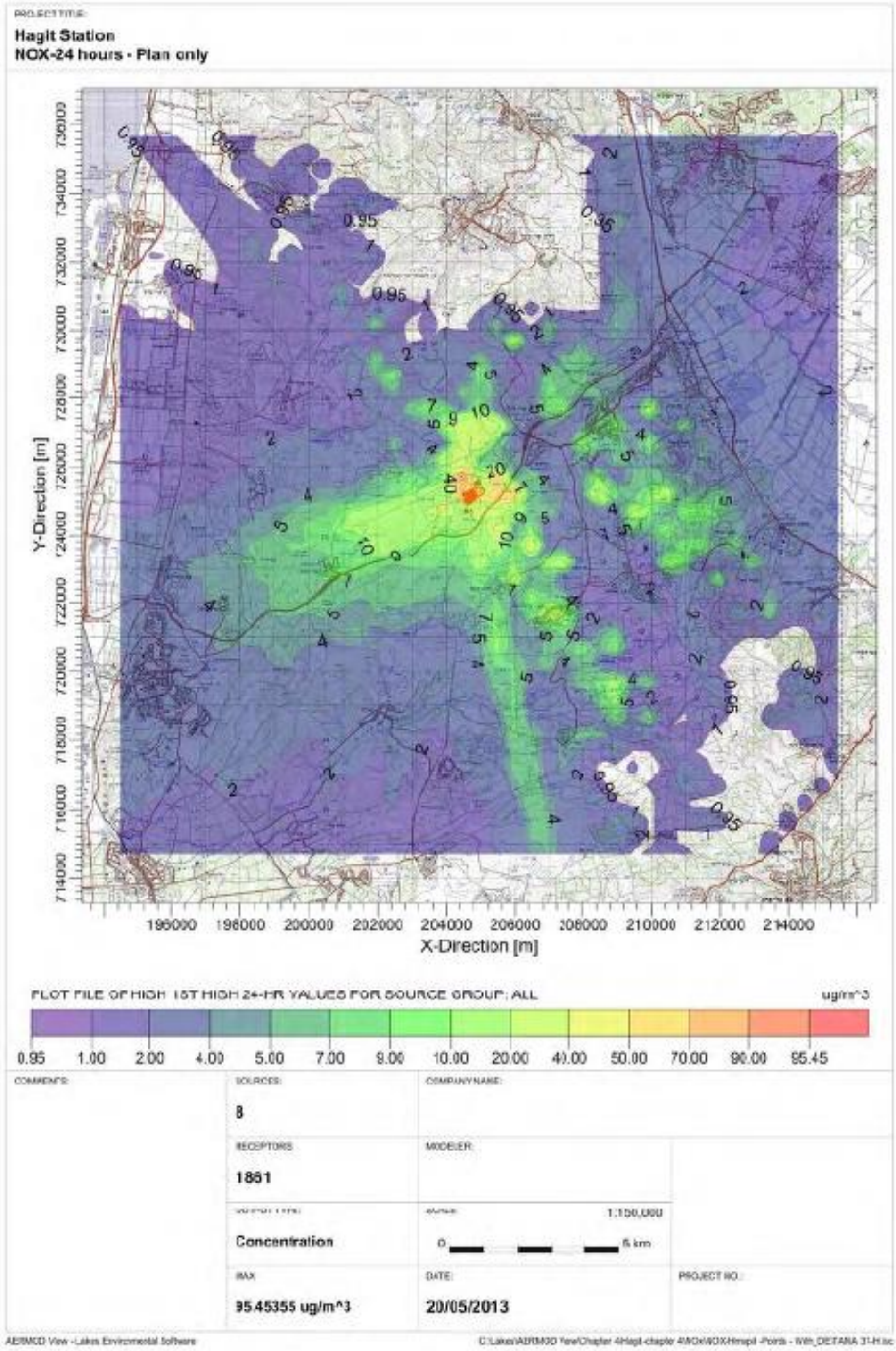
AERMOD View - Lakes Environmental Software

C:\Lakes\AERMOD View\Chapter 4\Hagit-chapter 4\NOx\NOX-Hmapil -Points - With_DETANA 31-H.isc

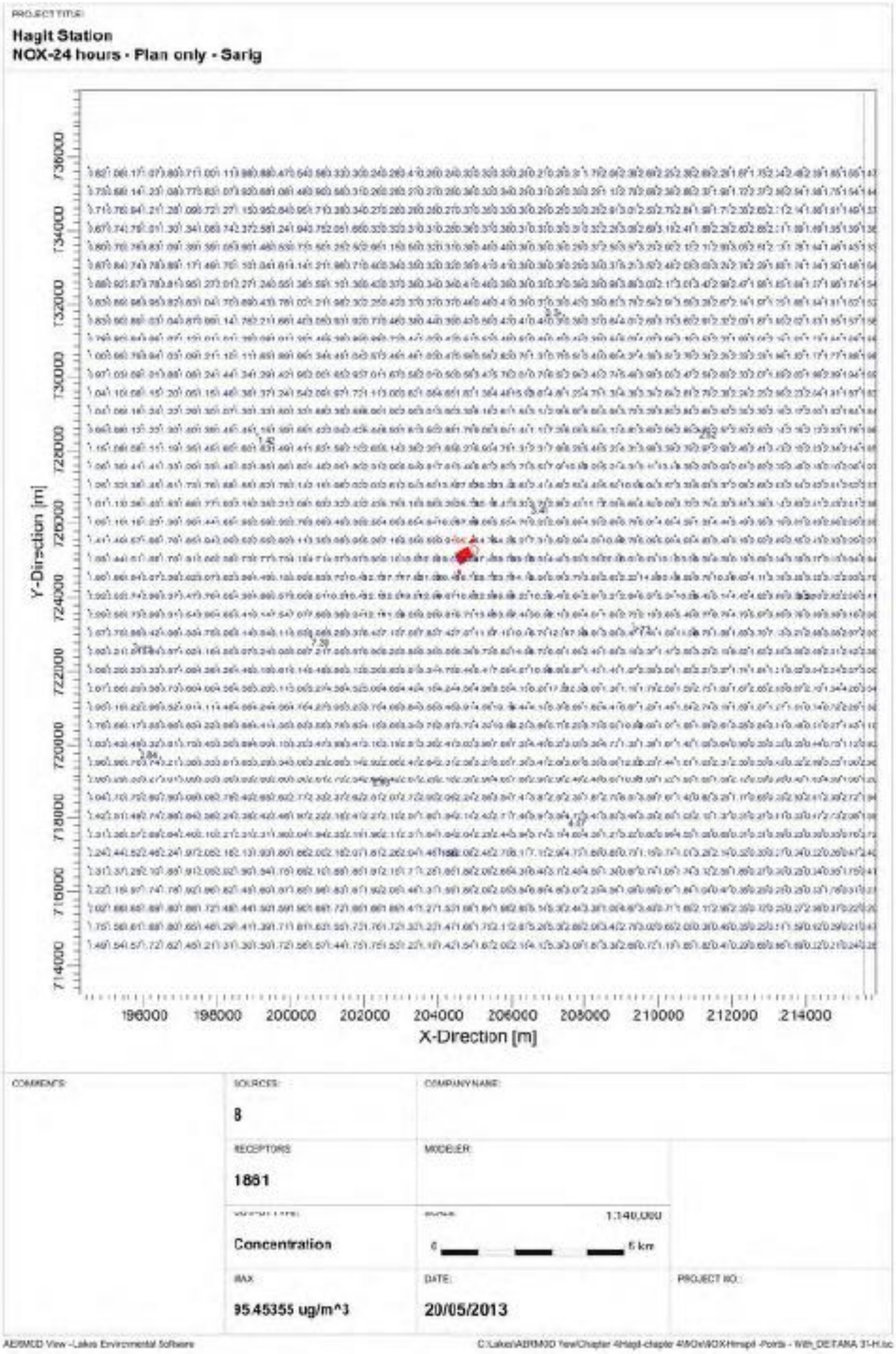
Lattice map of nitrogen oxide (NOx) emissions, 1-hour average for 2016-2024 (emissions from natural gas treatment facilities and diesel engines)



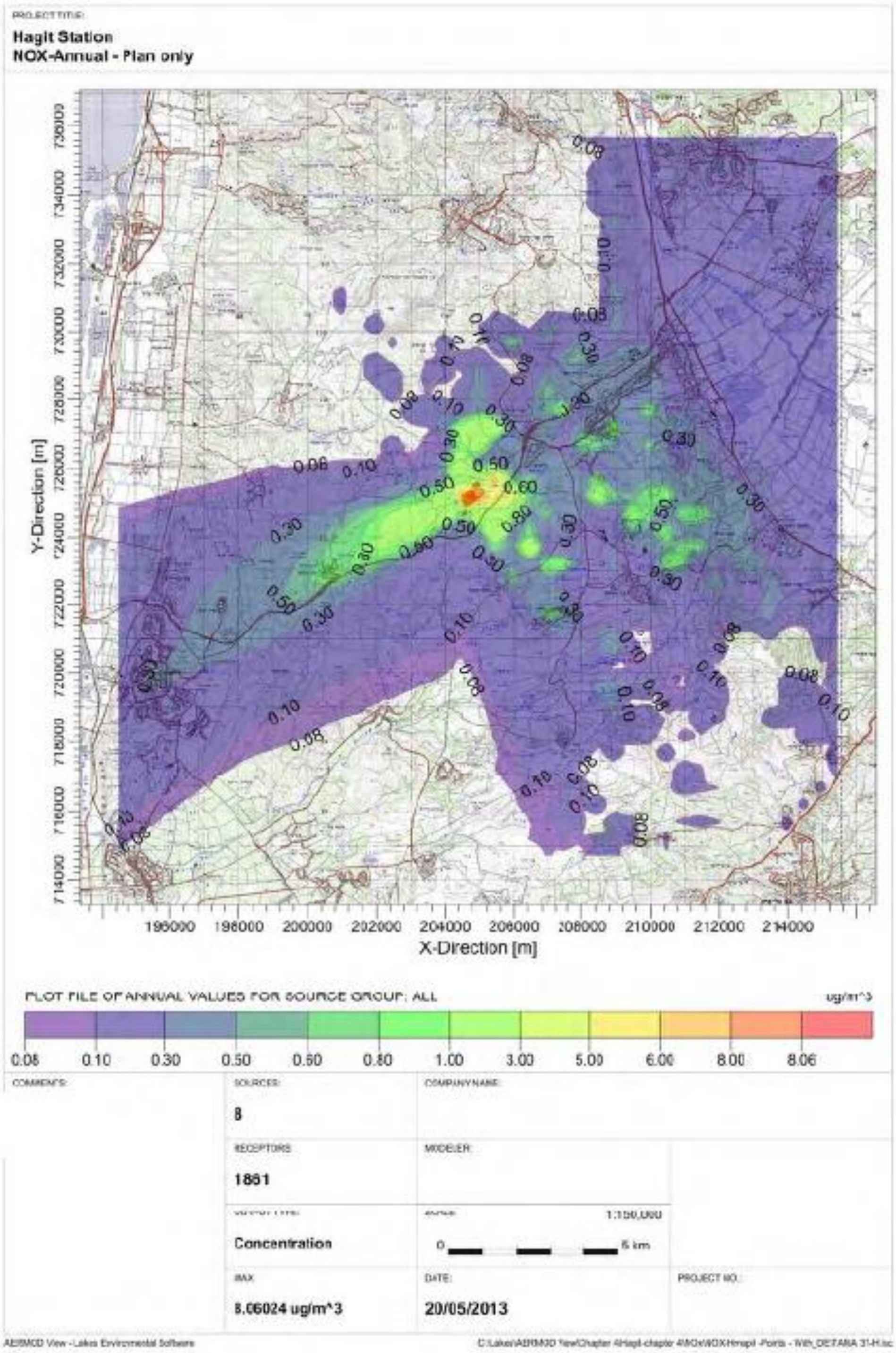
Isopleth map of nitrogen oxide (NOx) emissions, 24-hour average for 2016-2024 (emissions from natural gas treatment facilities and diesel engines)



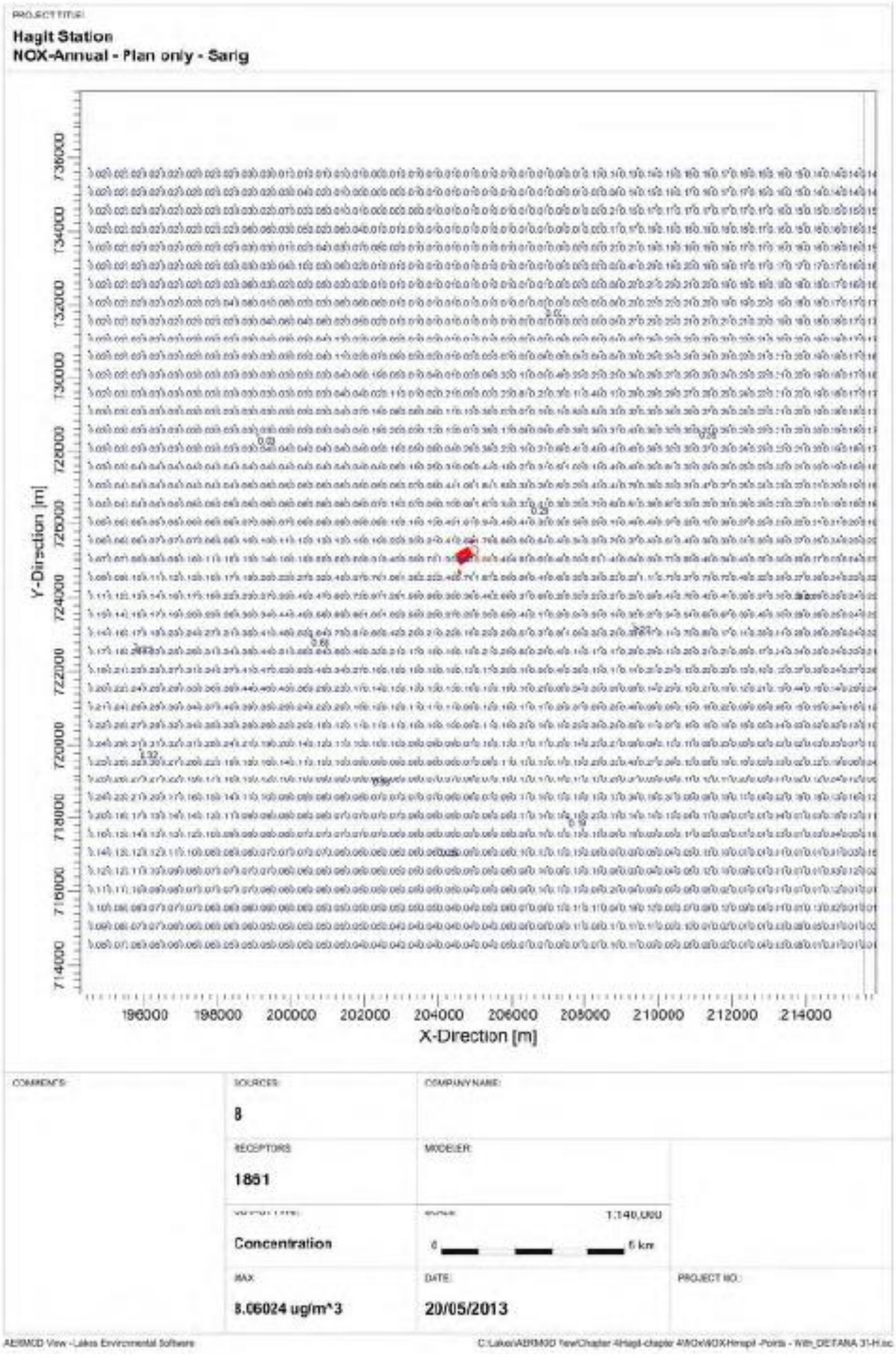
Lattice map of nitrogen oxide (NOx) emissions, 24-hour average for 2016-2024 (emissions from natural gas treatment facilities and diesel engines)



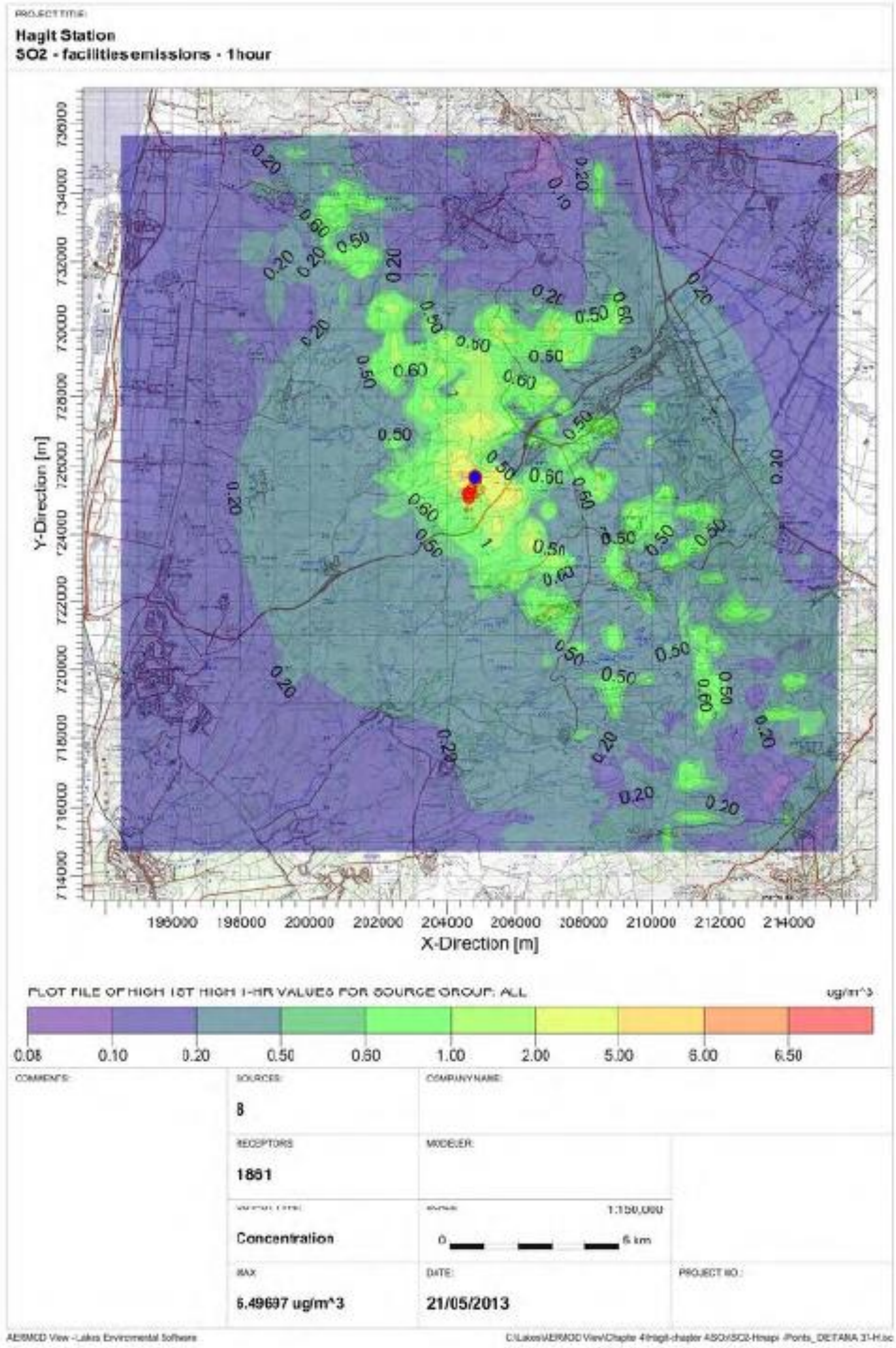
Isopleth map of nitrogen oxide (NOx) emissions, annual average for 2016-2024 (emissions from natural gas treatment facilities and diesel engines)



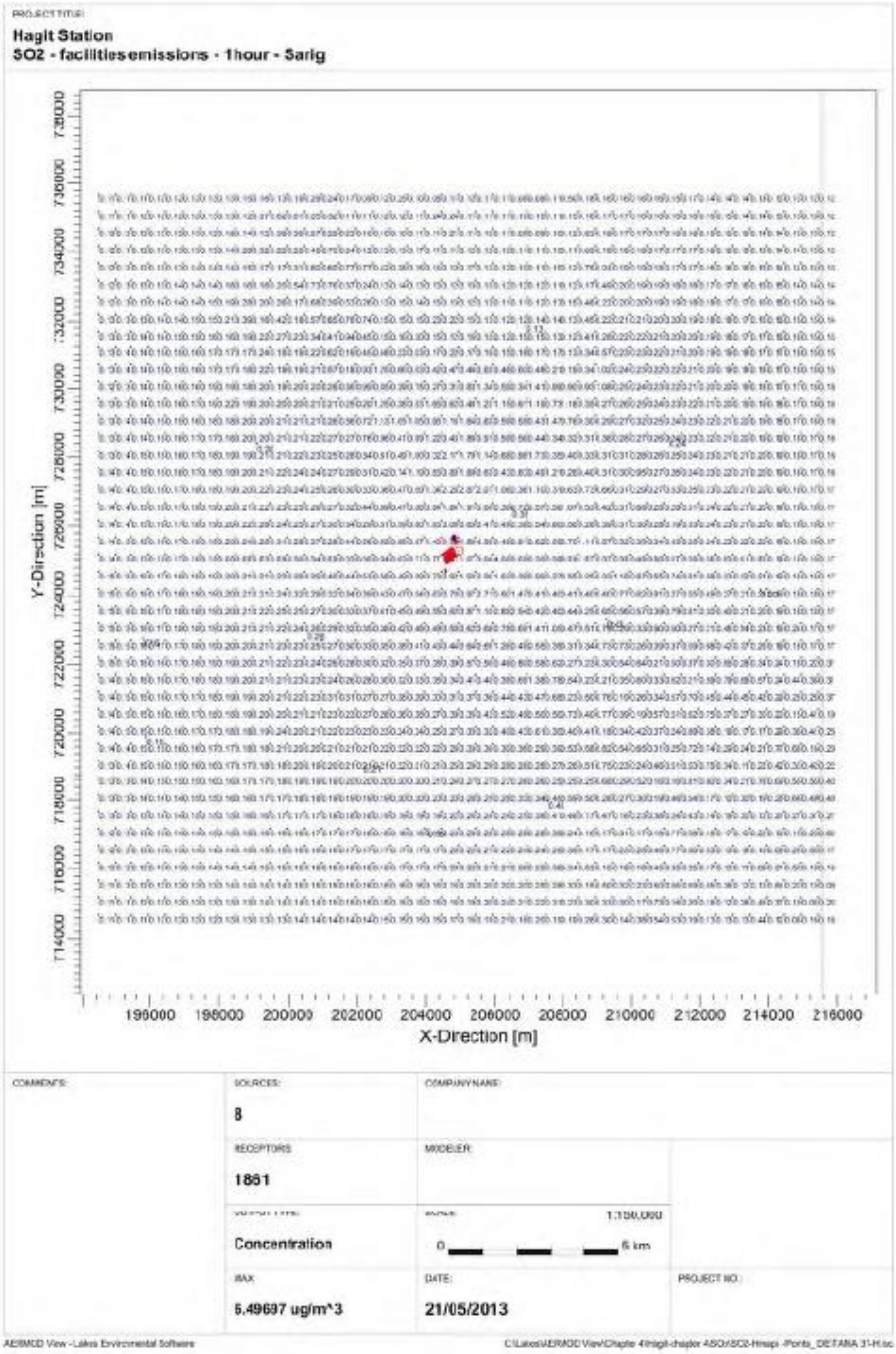
Lattice map of nitrogen oxide (NOx) emissions, annual average for 2016-2024 (emissions from natural gas treatment facilities and diesel engines)



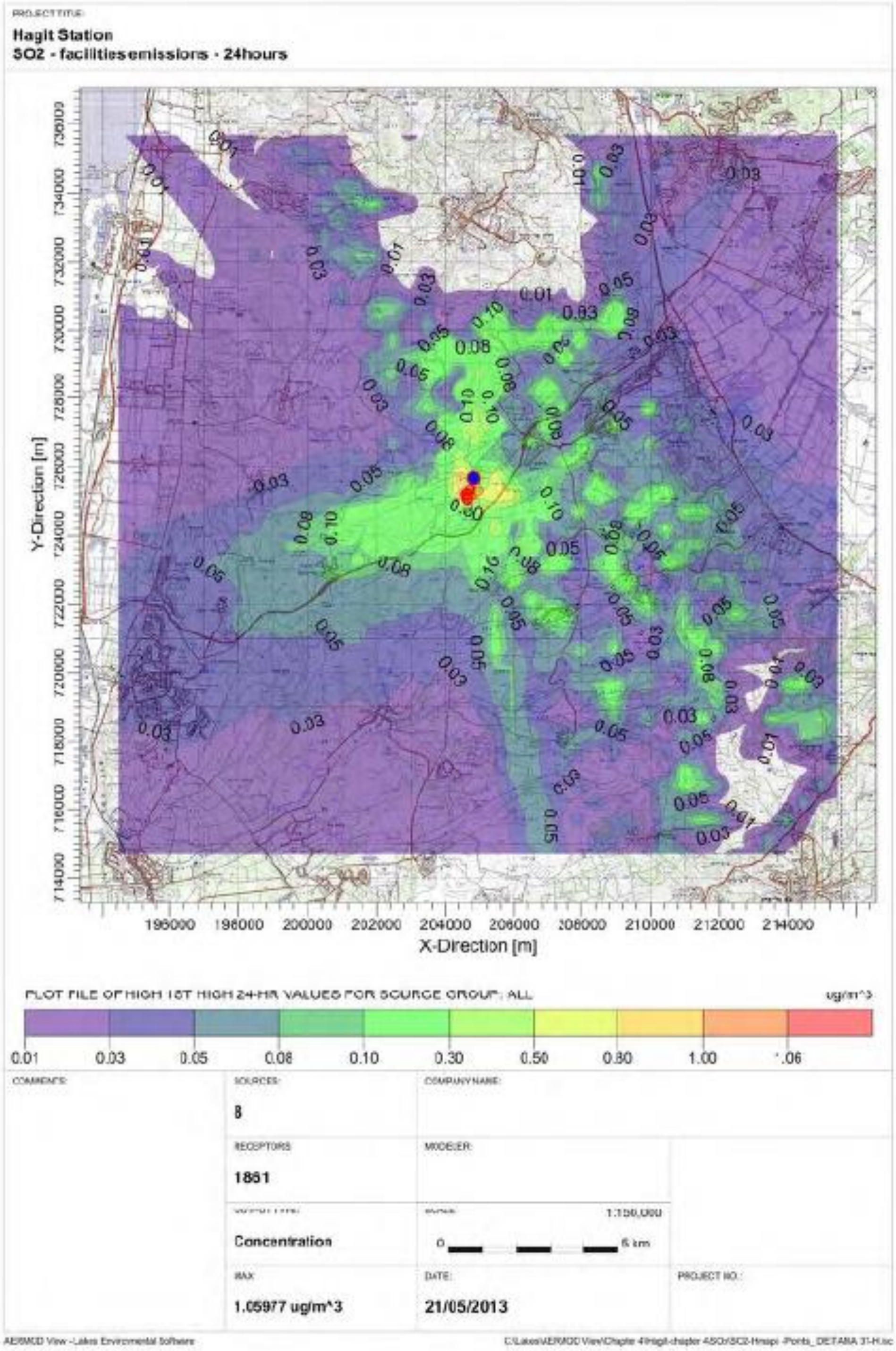
Isopleth map of sulfur dioxide (SO_2) emissions, 1-hour average for 2016-2024 (emissions from natural gas treatment facilities and diesel engines)



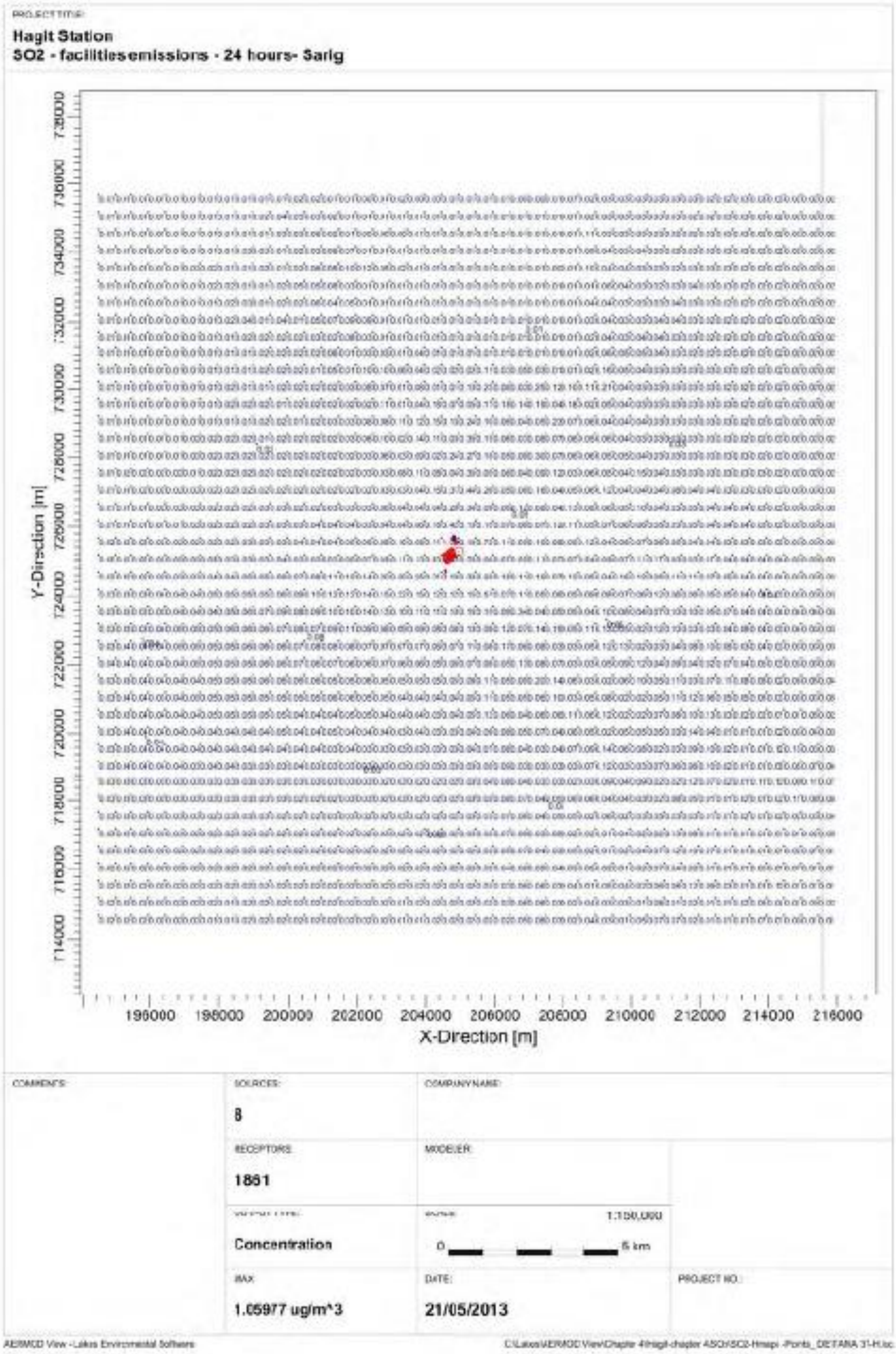
Lattice map of sulfur dioxide (SO_2) emissions, 1-hour average for 2016-2024 (emissions from natural gas treatment facilities and diesel engines)



Isopleth map of sulfur dioxide (SO_2) emissions, 24-hour average for 2016-2024 (emissions from natural gas treatment facilities and diesel engines)



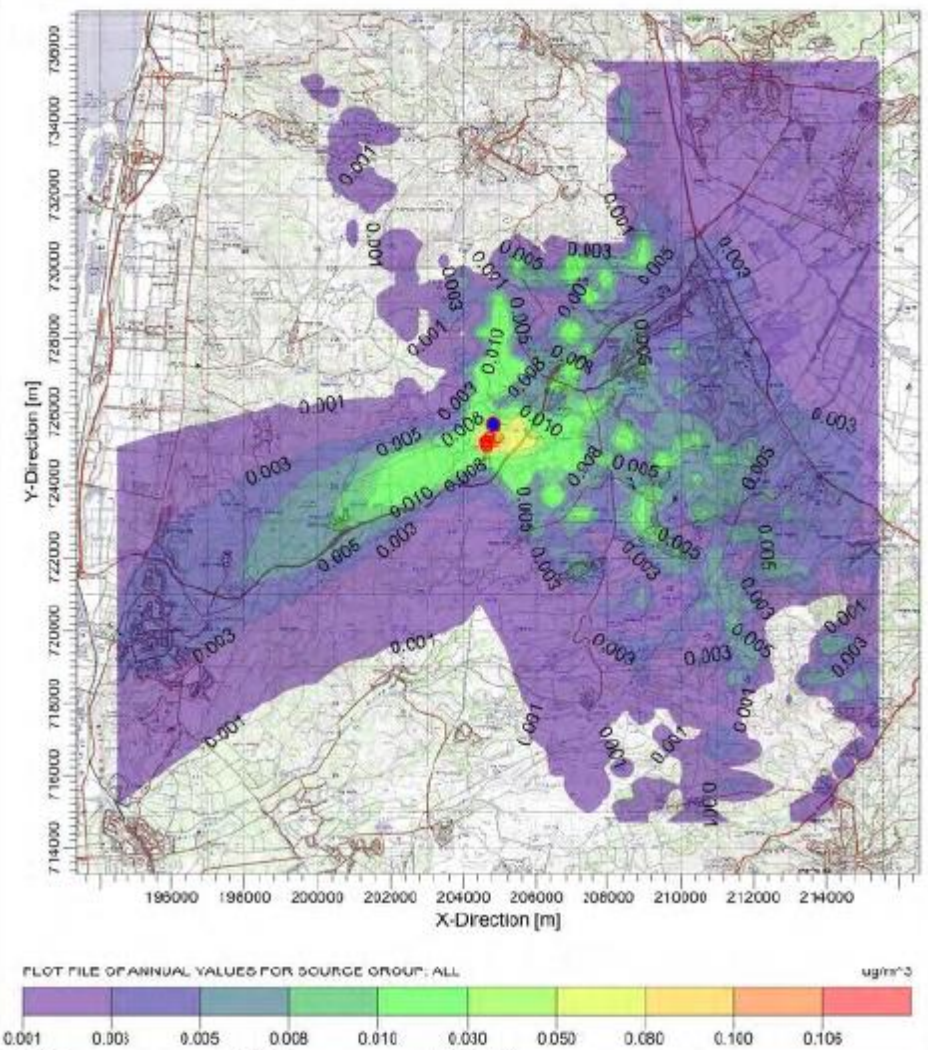
Lattice map of sulfur dioxide (SO_2) emissions, 24-hour average for 2016-2024 (emissions from natural gas treatment facilities and diesel engines)



Isopleth map of sulfur dioxide (SO_2) emissions, annual average for 2016-2024 (emissions from natural gas treatment facilities and diesel engines)

PROJECT TITLE:

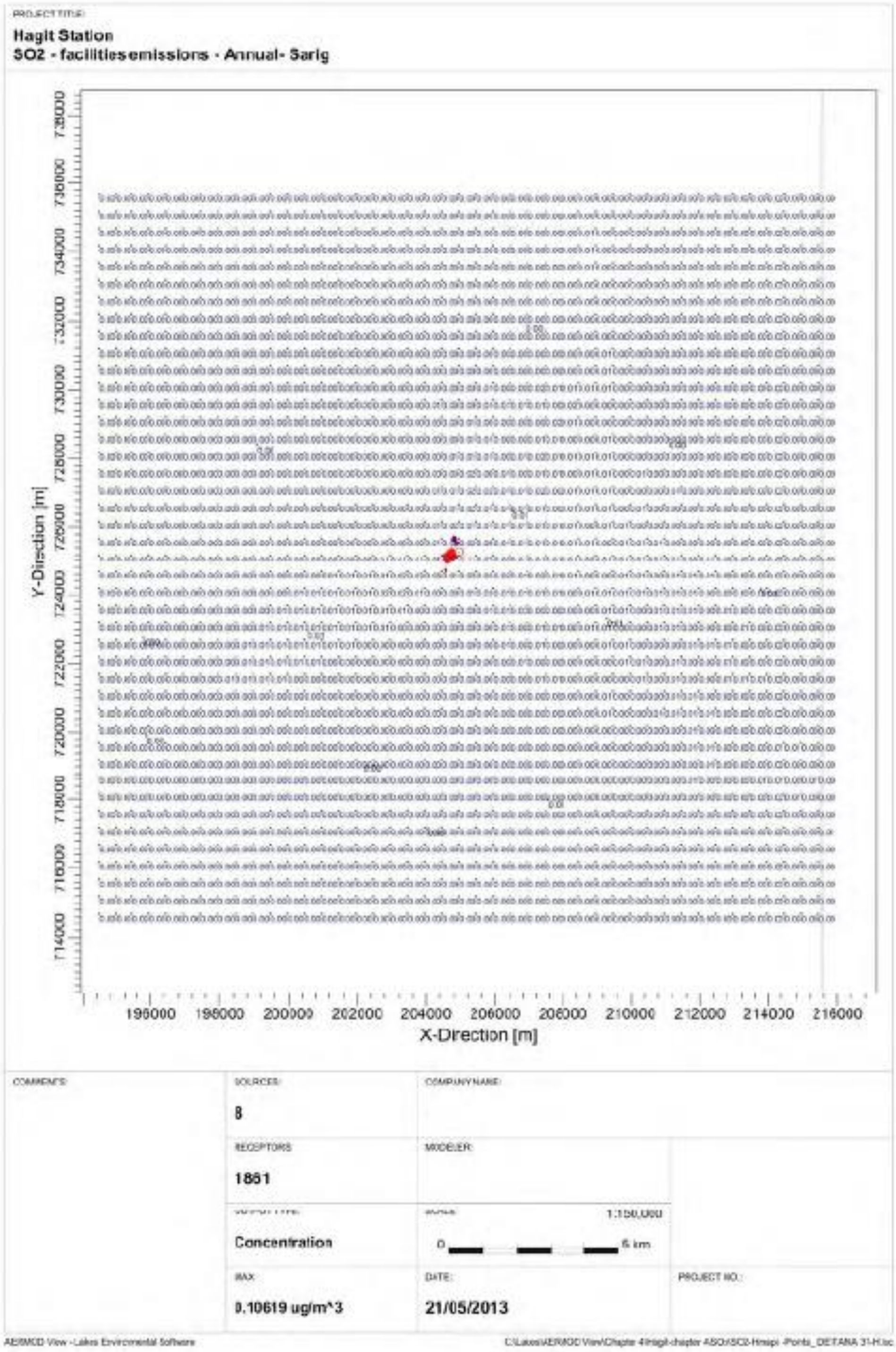
Hagit Station
SO2 - facilitiesemissions - Annual



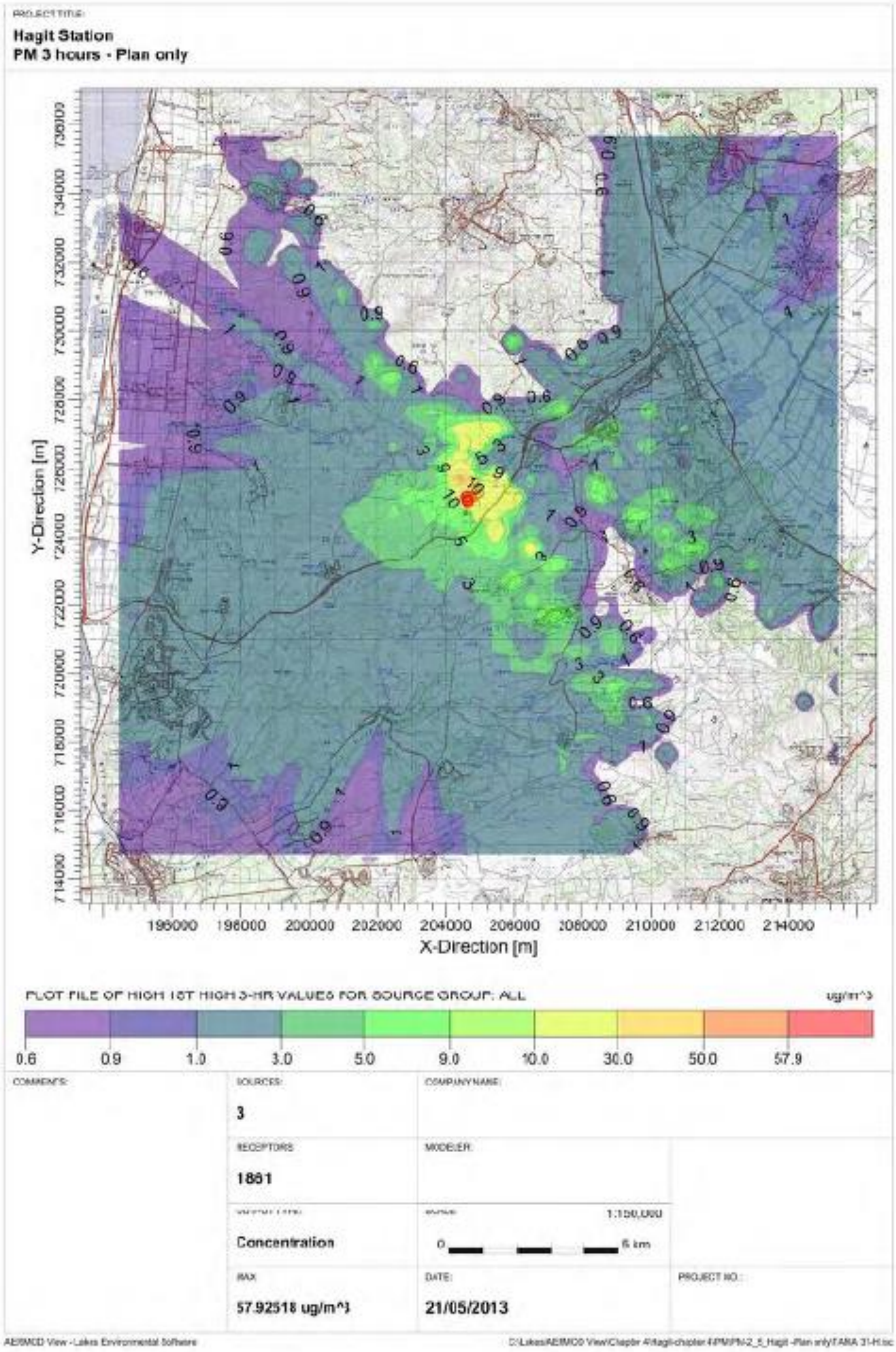
COMMENTS:	SOURCES: 8	COMPANY NAME:	
	RECEPTORS: 1861	MODELER:	
	OUTPUT TYPE: Concentration	SCALE: 1:150,000 0 — 5 km	
	MAX: 0.10619 ug/m^3	DATE: 21/05/2013	PROJECT NO.:

AERMOD View - Lakes Environmental Software   C:\Lakes\AERMOD View\Chapter 4\Hagit-chapter 4\SO2\SO2-Hmapi -Points_DETANA 31-H.isc

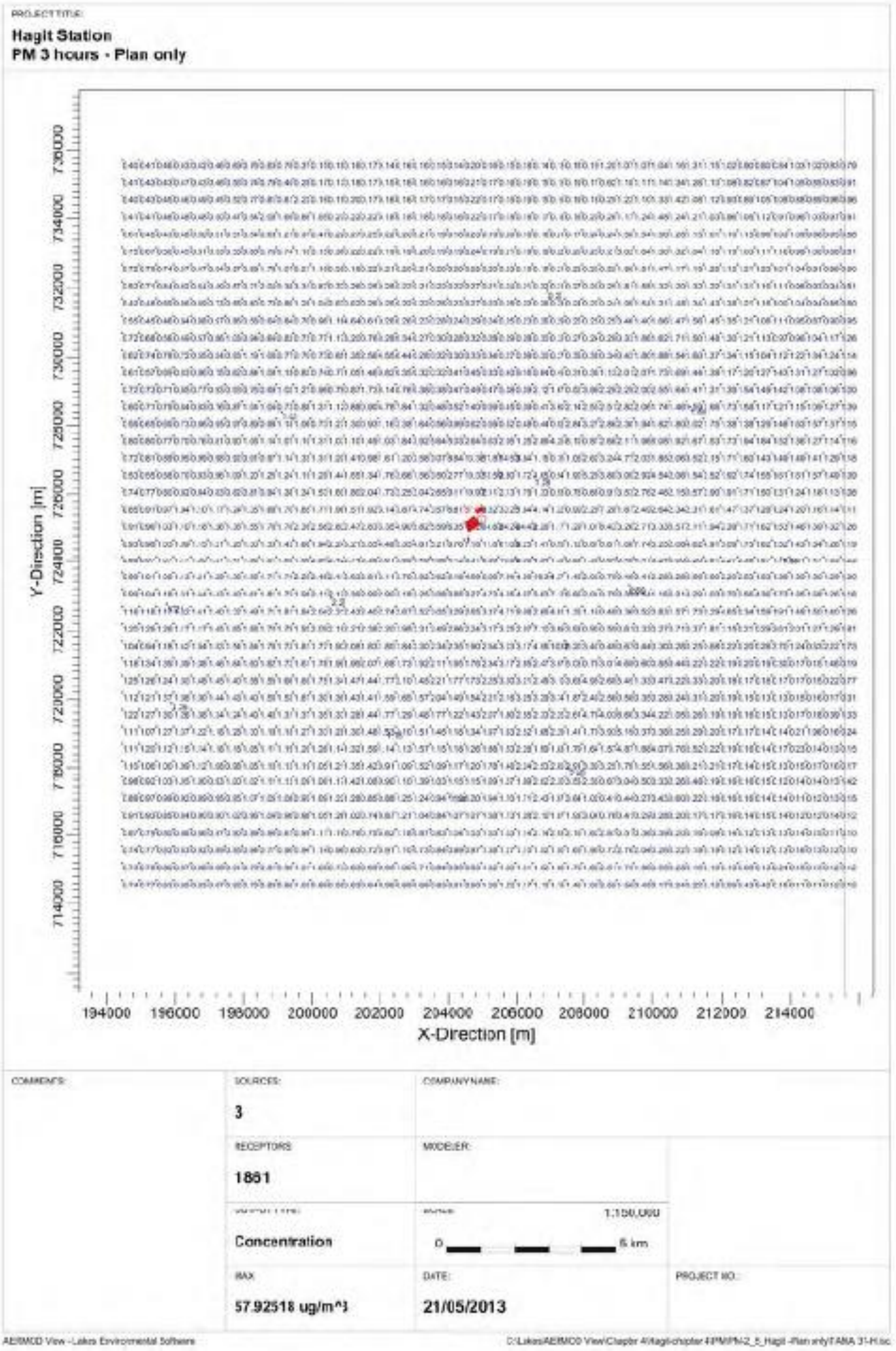
Lattice map of sulfur dioxide (SO_2) emissions, annual average for 2016-2024 (emissions from natural gas treatment facilities and diesel engines)



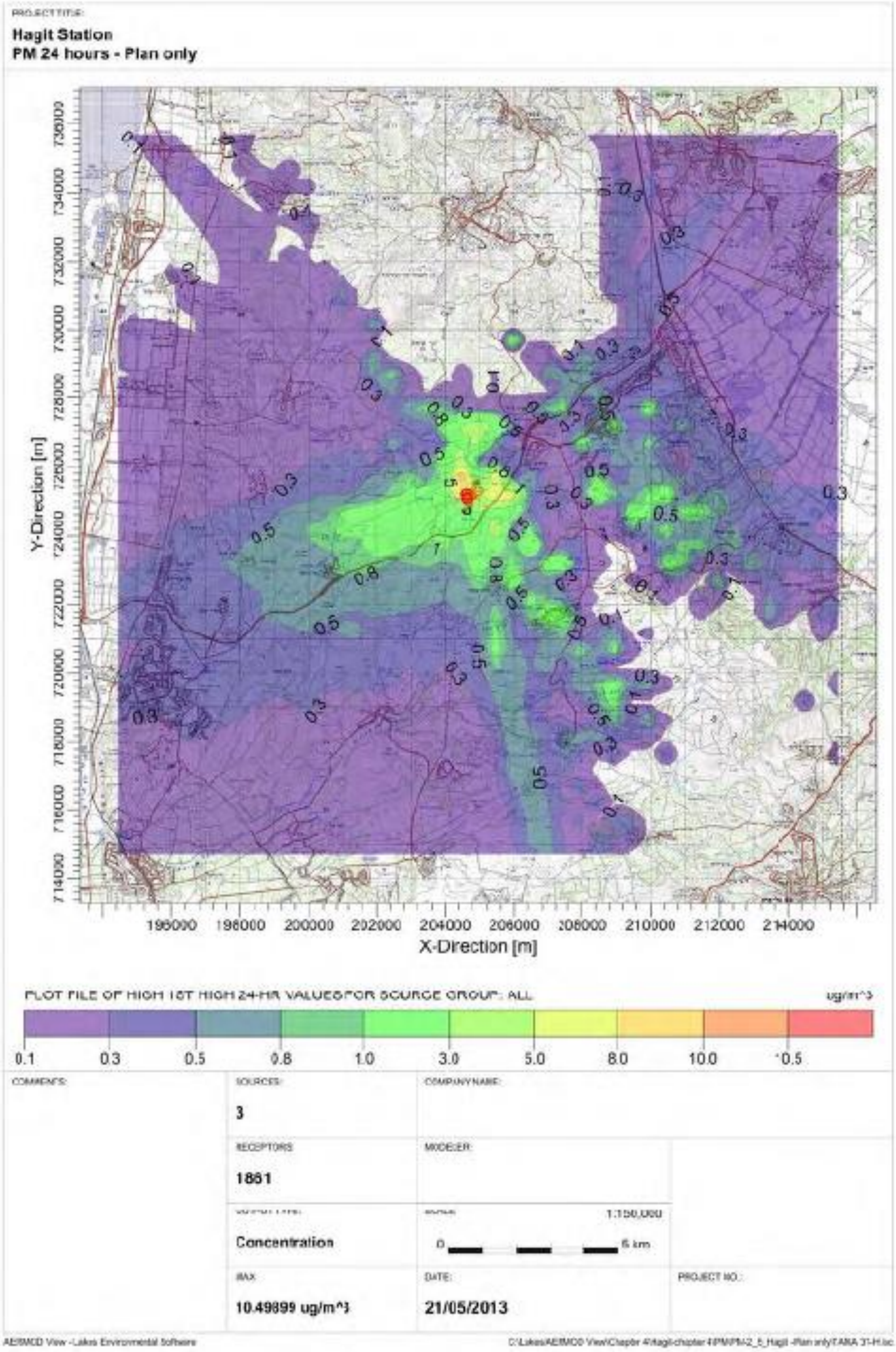
Isopleth map of particulate matter (PM) emissions, 3-hour average for 2016-2024 (diesel engine emissions only)



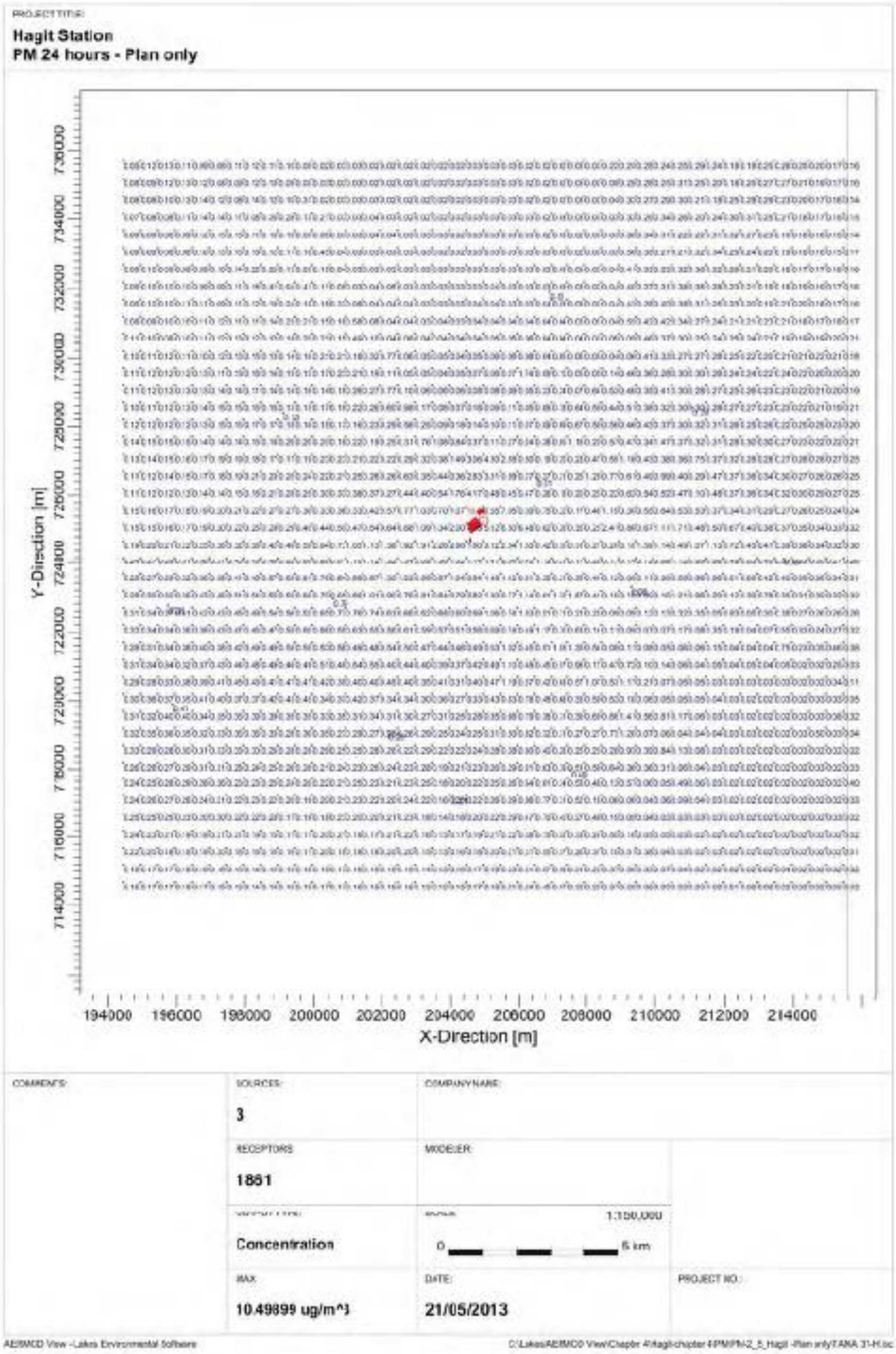
Lattice map of particulate matter (PM) emissions, 3-hour average for 2016-2024 (diesel engine emissions only)



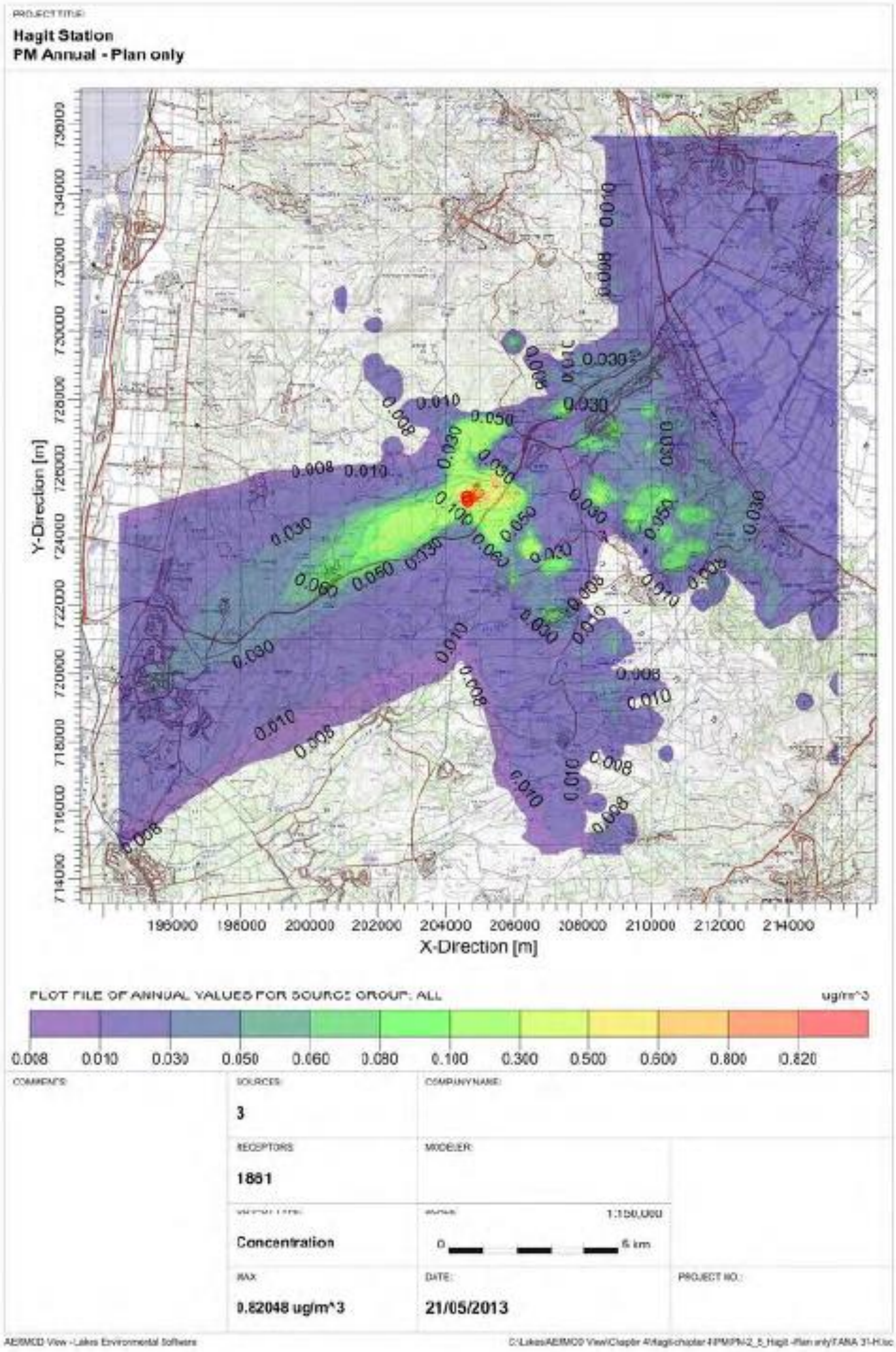
Isopleth map of particulate matter (PM) emissions, 24-hour average for 2016-2024 (diesel engine emissions only)



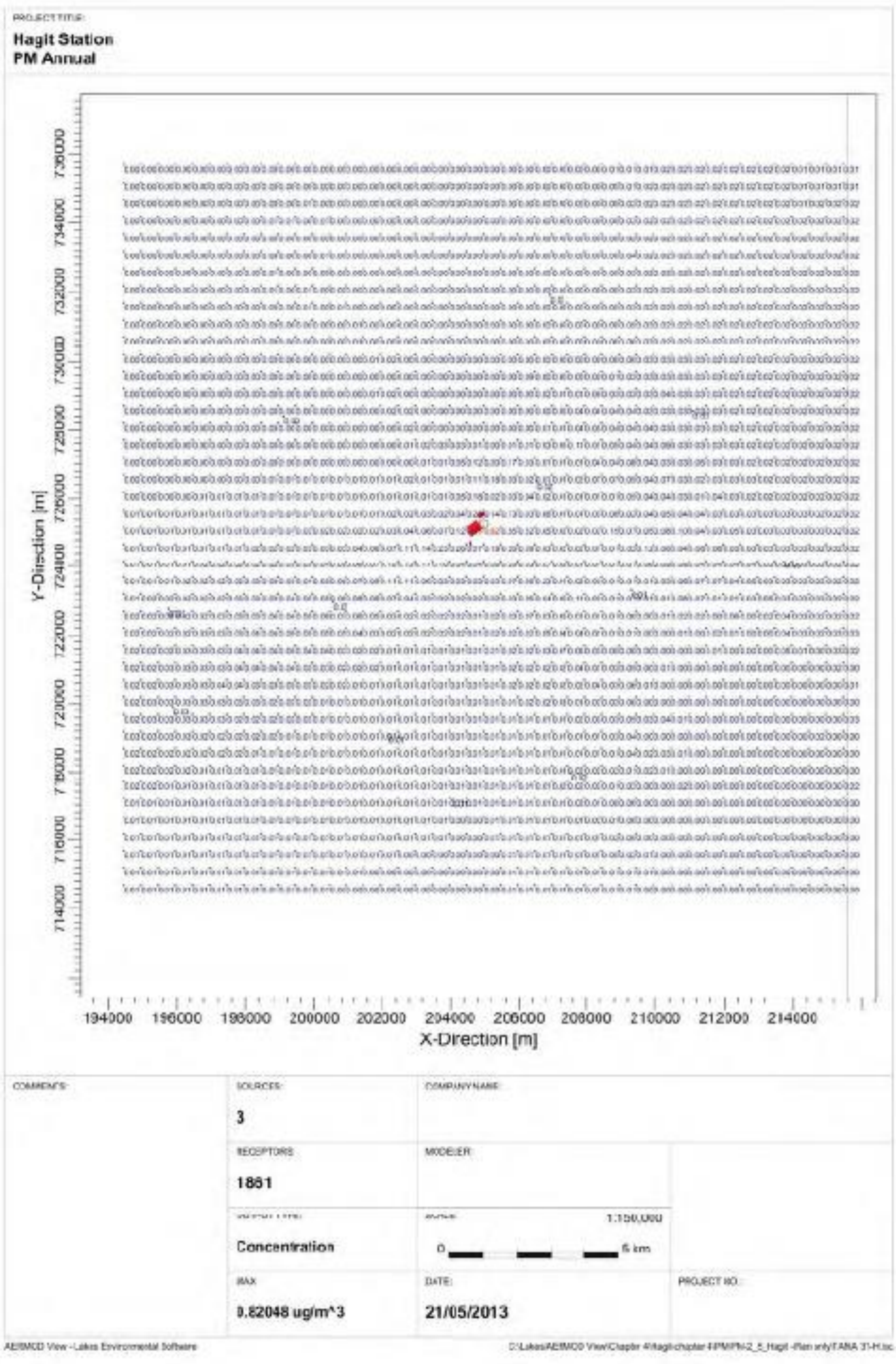
Lattice map of particulate matter (PM) emissions, 24-hour average for 2016-2024 (diesel engine emissions only)



Isopleth map of particulate matter (PM) emissions, annual average for 2016-2024 (diesel engine emissions only)

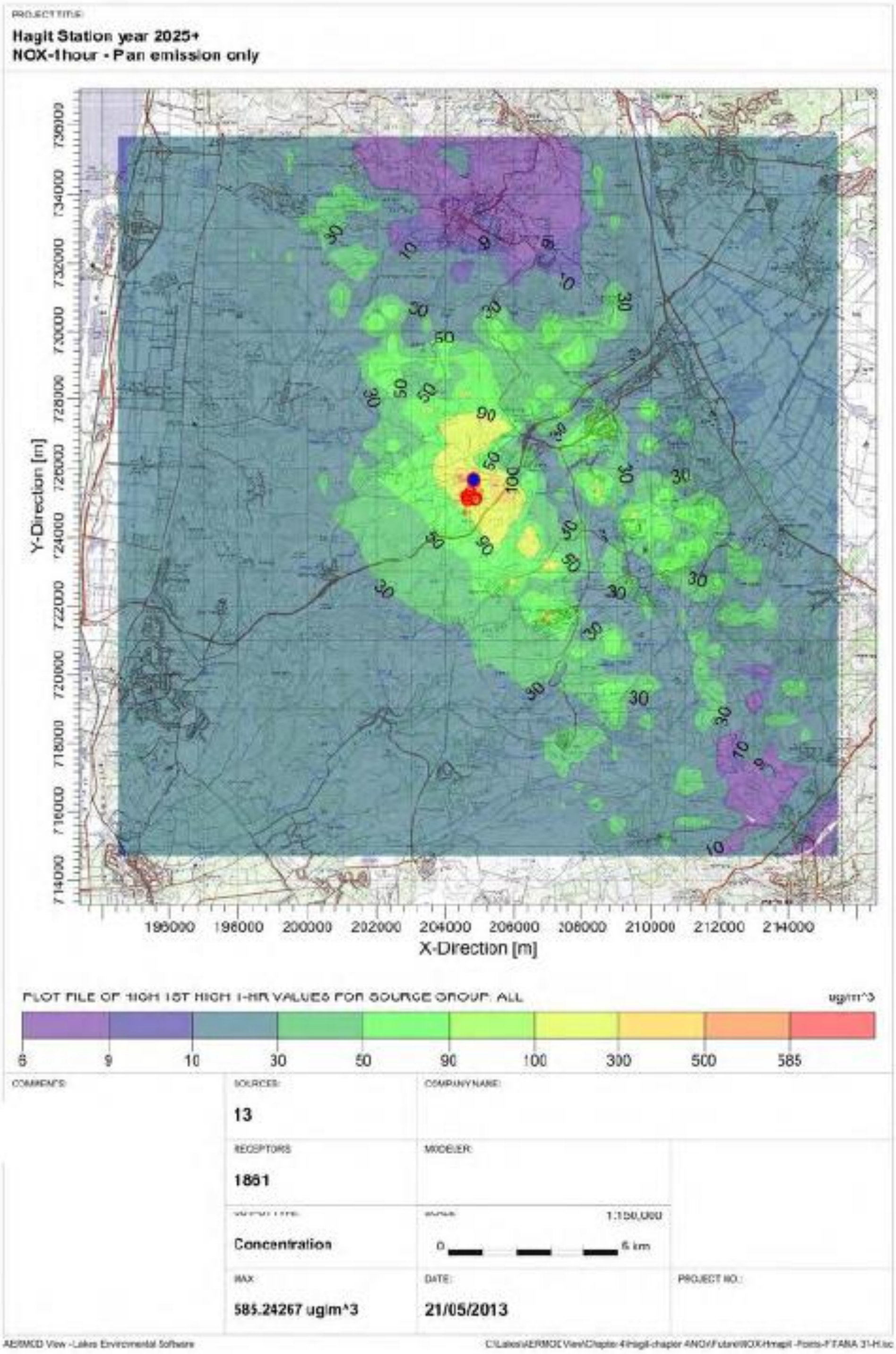


Lattice map of particulate matter (PM) emissions, annual average for 2016-2024 (diesel engine emissions only)

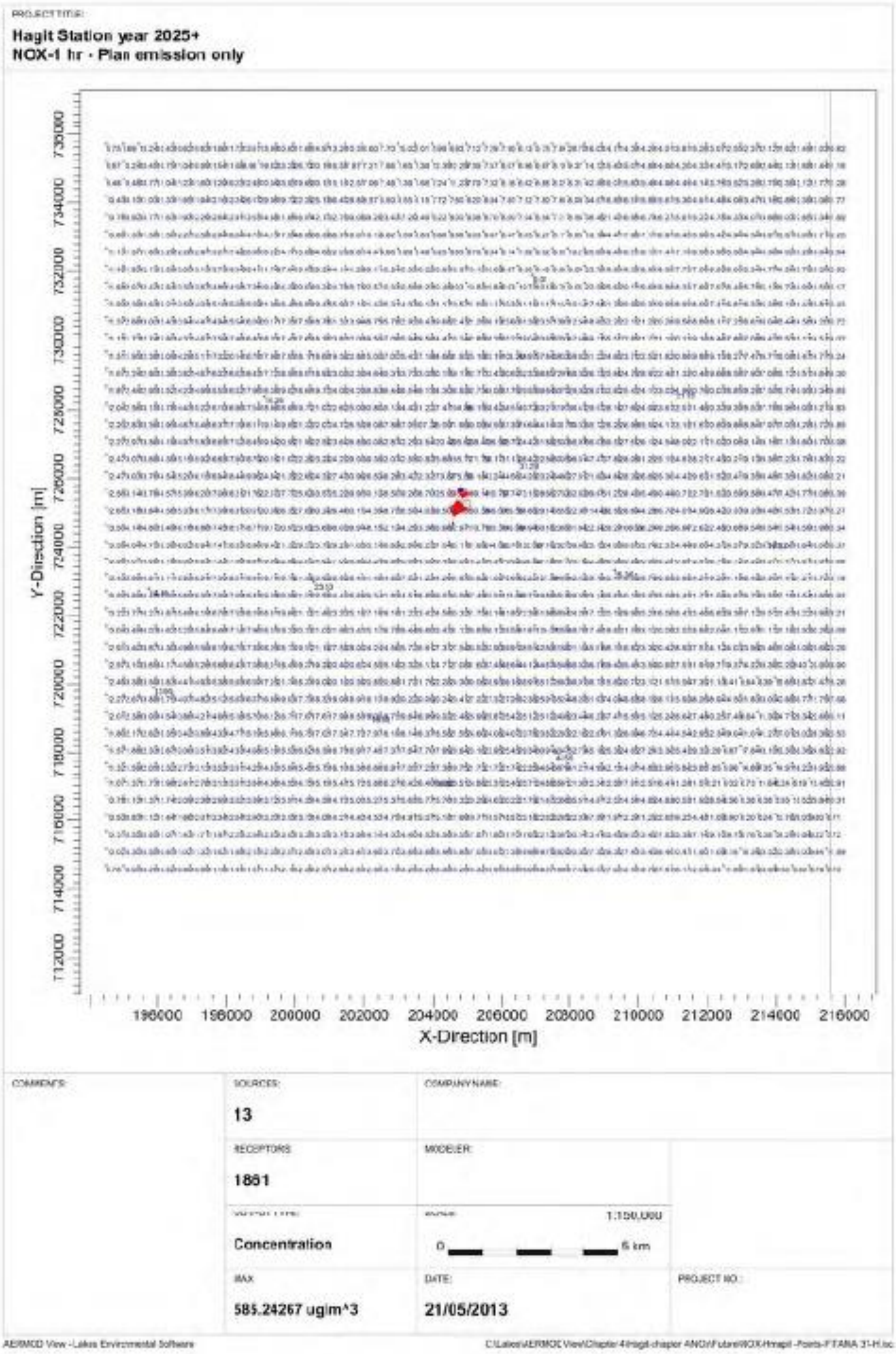


Future scenario (2016-2024) – Background emissions and emissions from natural gas treatment facilities and diesel engines

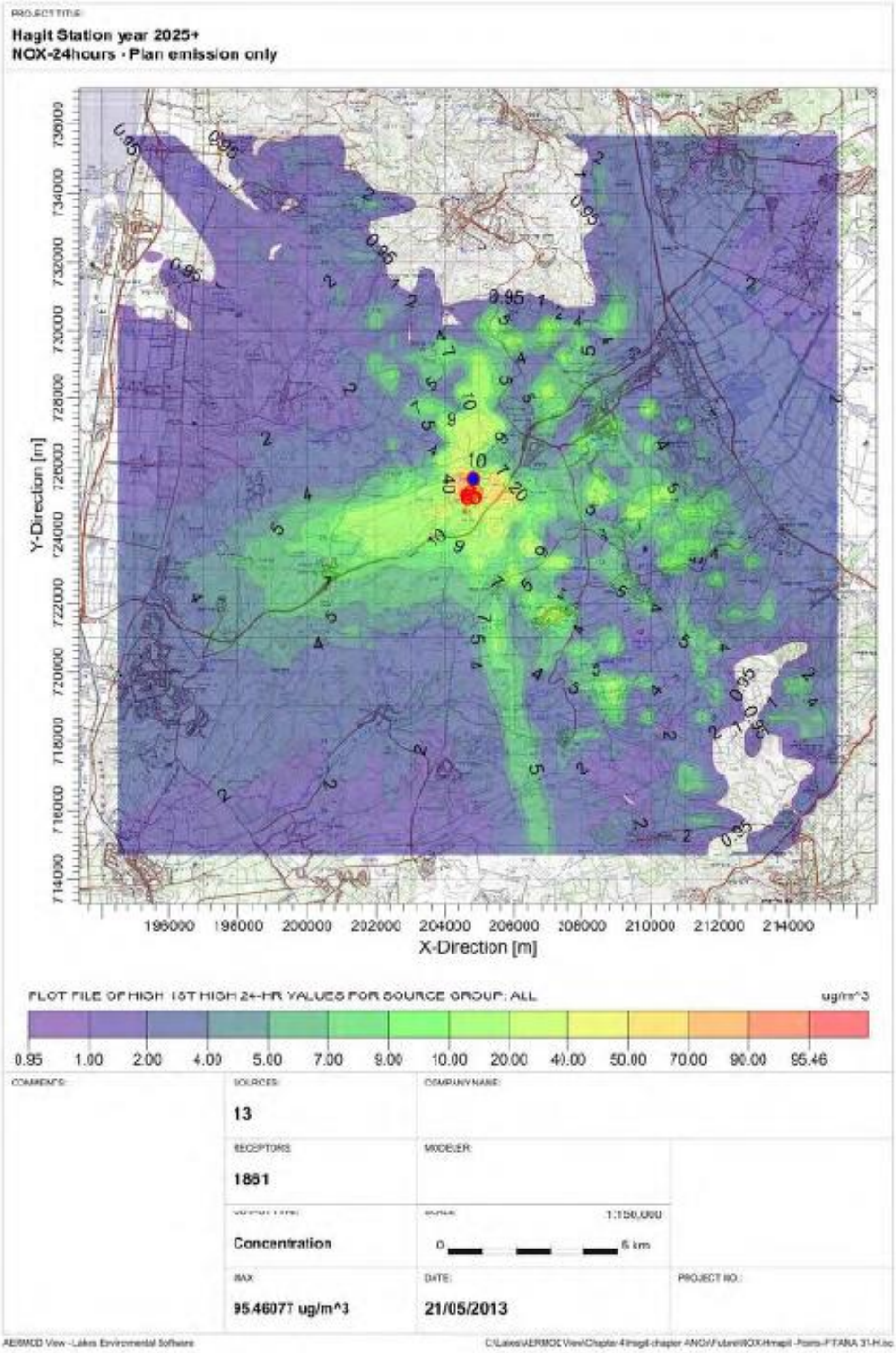
Isopleth map of nitrogen oxide (NOx) emissions, 1-hour average for 2016-2024,background emissions (points only) and emissions from natural gas treatment facilities and diesel engines



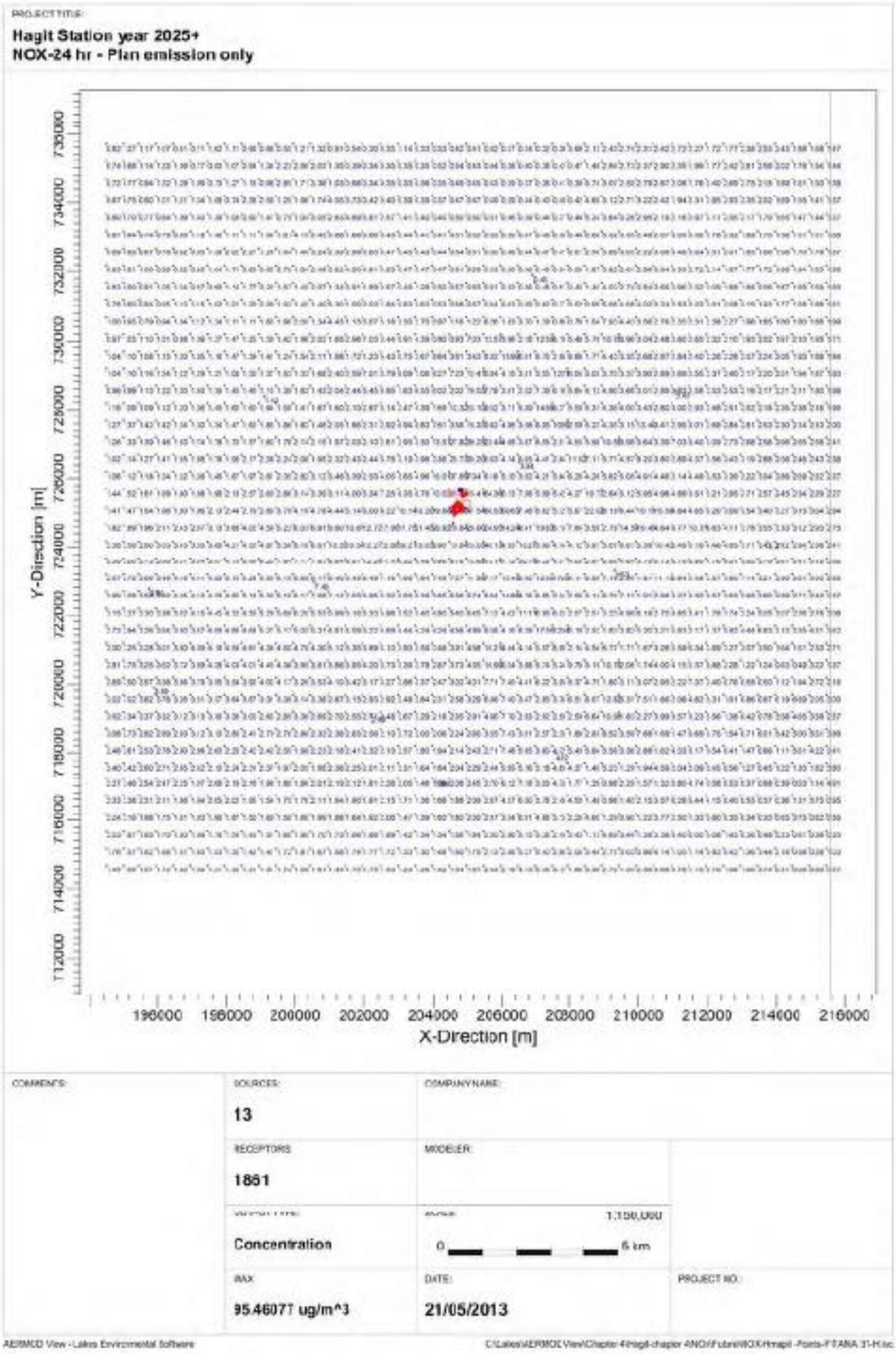
Lattice map of nitrogen oxide (NOx) emissions, 1-hour average for 2016-2024,background emissions (points only) and emissions from natural gas treatment facilities and diesel engines



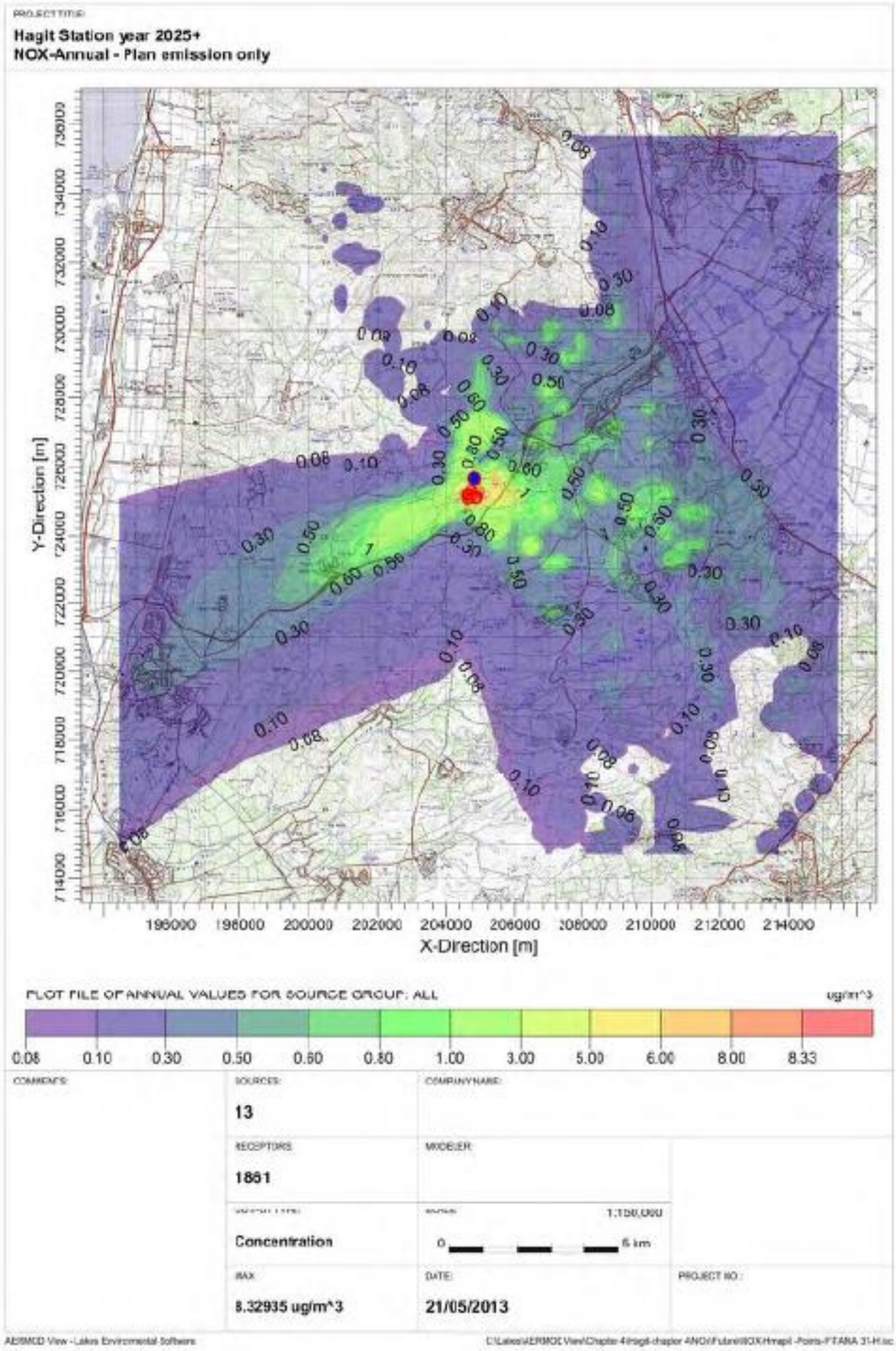
Isopleth map of nitrogen oxide (NOx) emissions, 24-hour average for 2016-2024,background emissions (points only) and emissions from natural gas treatment facilities and diesel engines



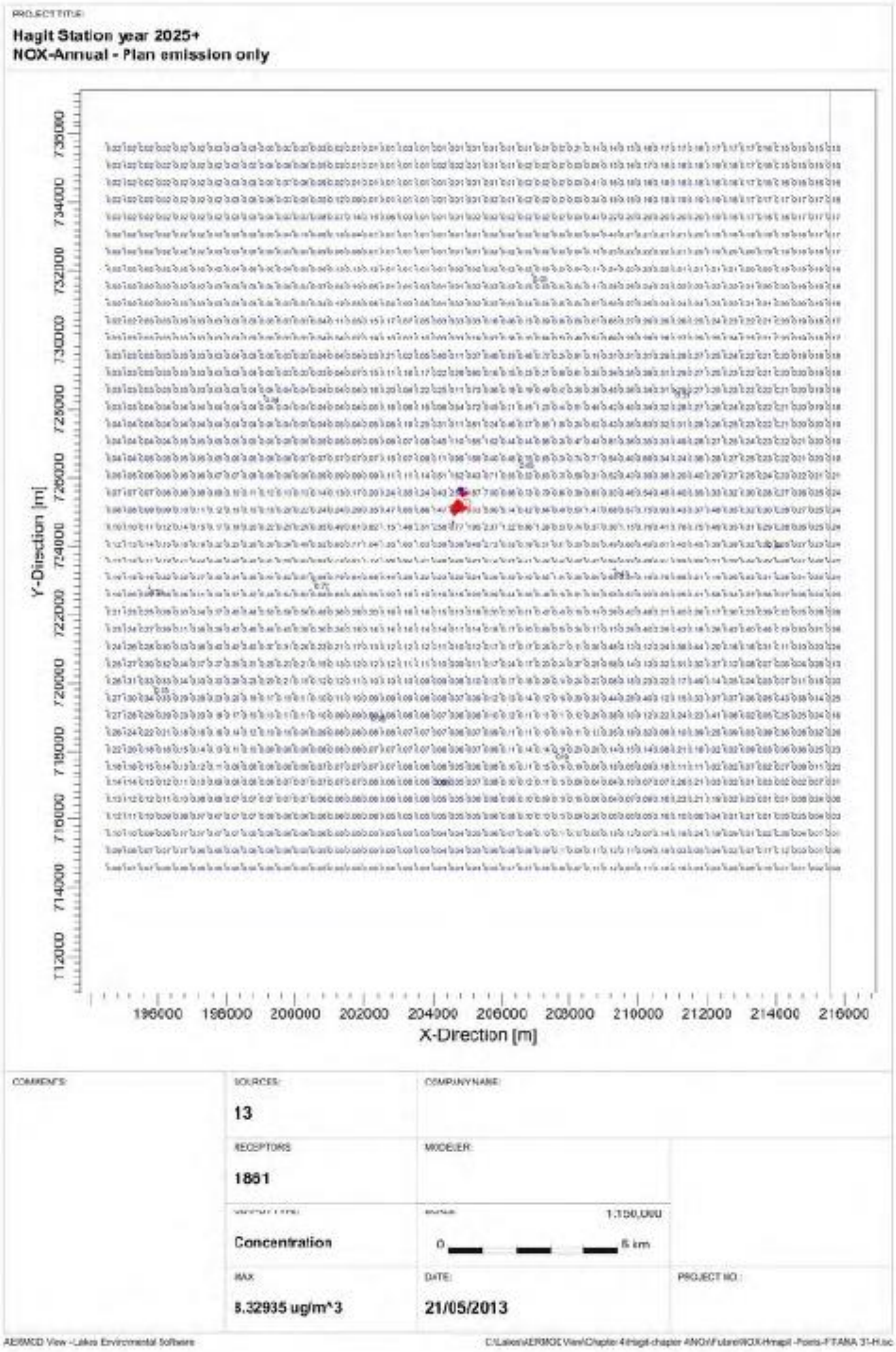
Lattice map of nitrogen oxide (NOx) emissions, 24-hour average for 2016-2024,background emissions (points only) and emissions from natural gas treatment facilities and diesel engines



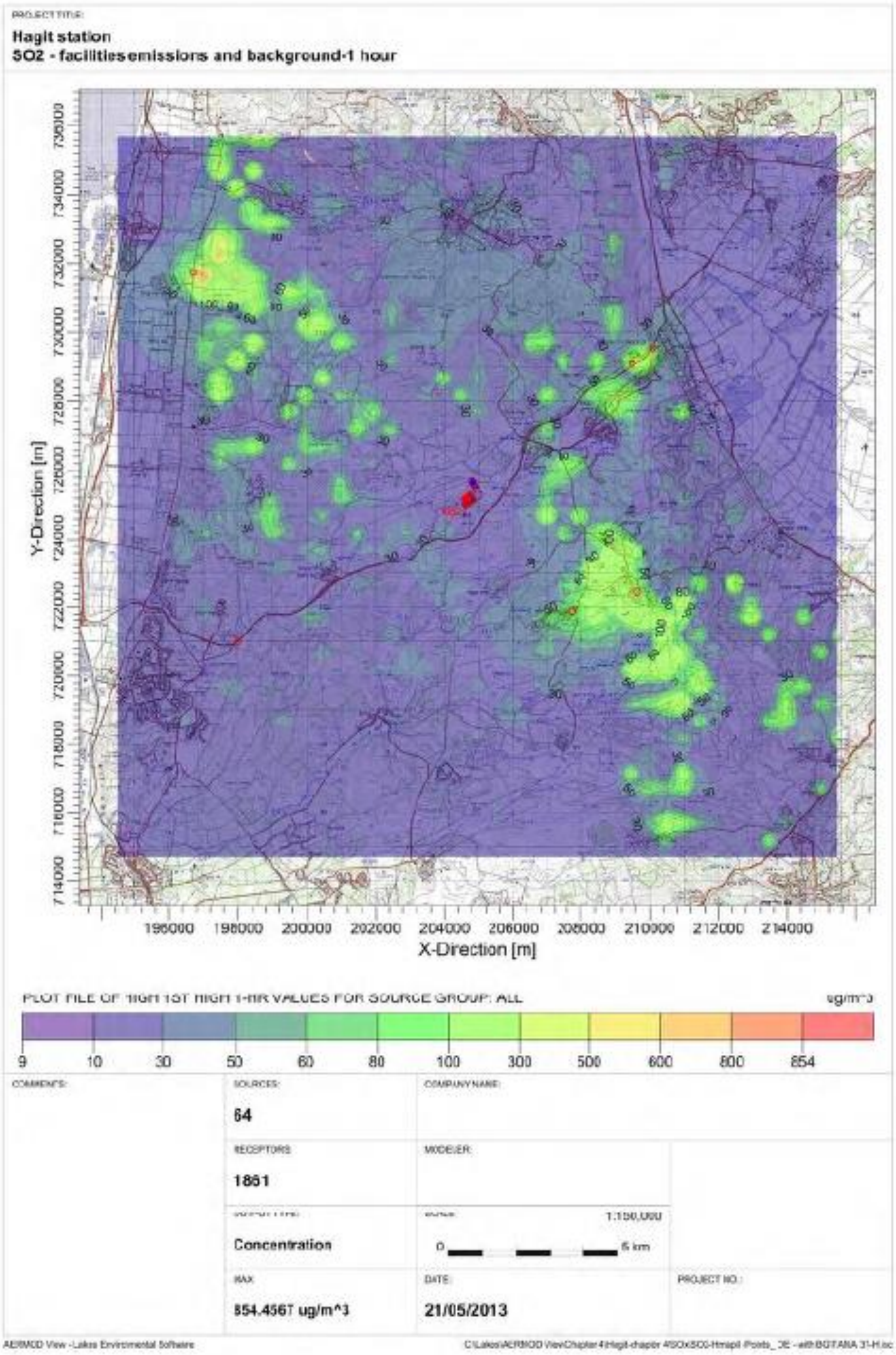
Isopleth map of nitrogen oxide (NOx) emissions, annual average for 2016-2024,background emissions (points only) and emissions from natural gas treatment facilities and diesel engines



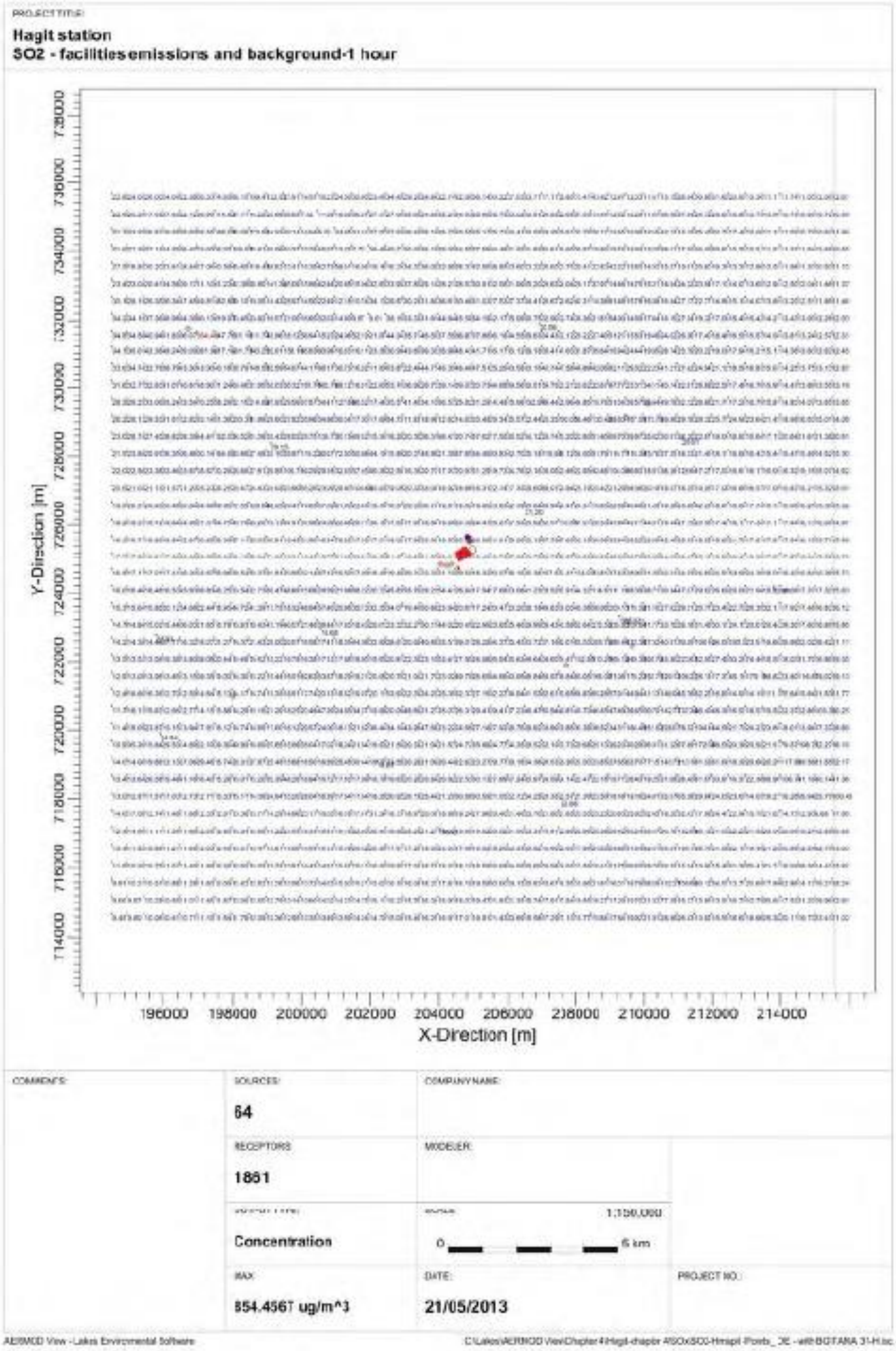
Lattice map of nitrogen oxide (NOx) emissions, annual average for 2016-2024,background emissions (points only) and emissions from natural gas treatment facilities and diesel engines



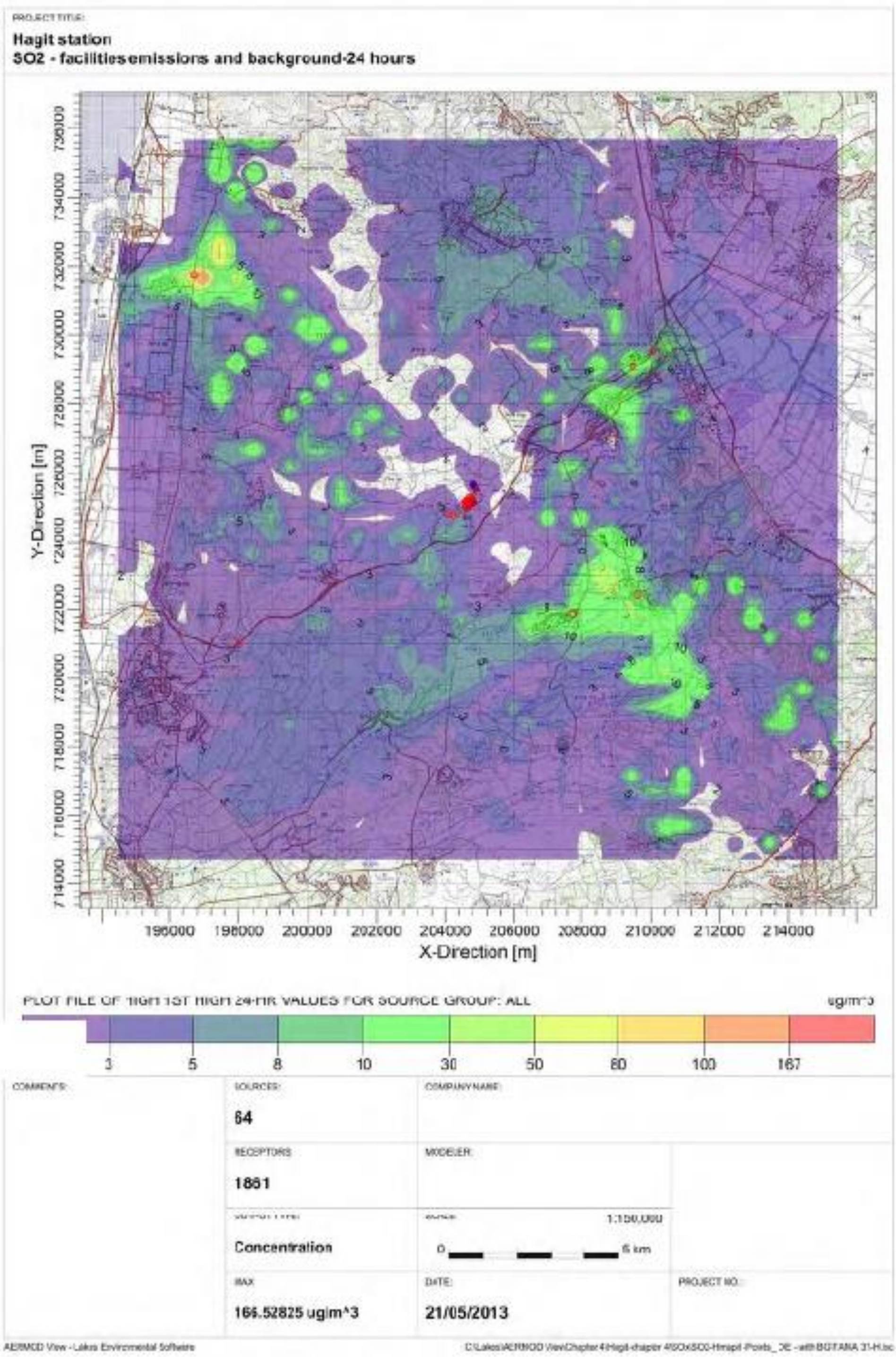
Isopleth map of sulfur dioxide (SO_2) emissions, 1-hour average for 2016-2024,background emissions (points only) and emissions from natural gas treatment facilities and diesel engines)



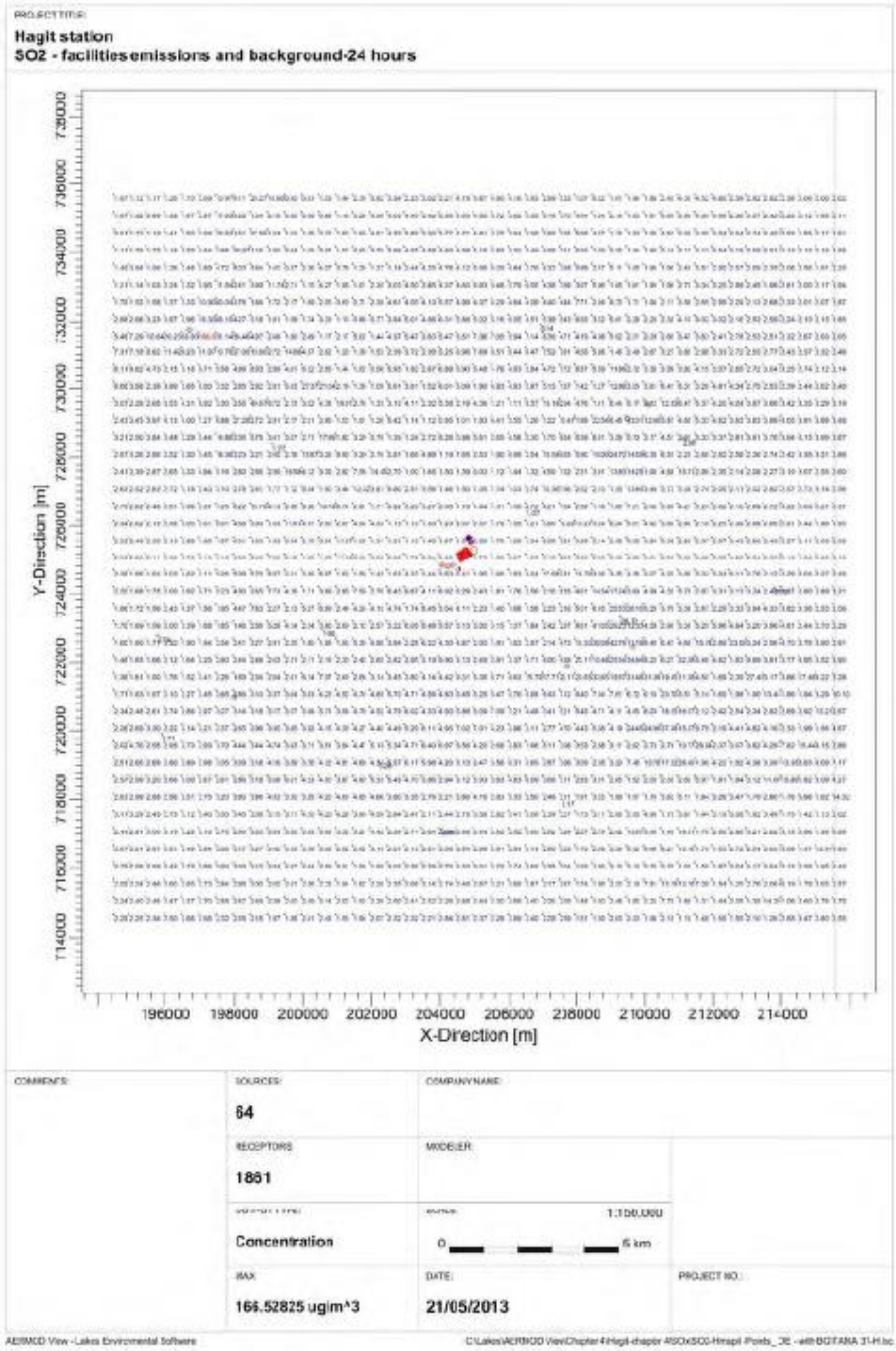
Lattice map of sulfur dioxide (SO_2) emissions, 1-hour average for 2016-2024,background emissions (points only) and emissions from natural gas treatment facilities and diesel engines)



Isopleth map of sulfur dioxide (SO_2) emissions, 24-hour average for 2016-2024,background emissions (points only) and emissions from natural gas treatment facilities and diesel engines)



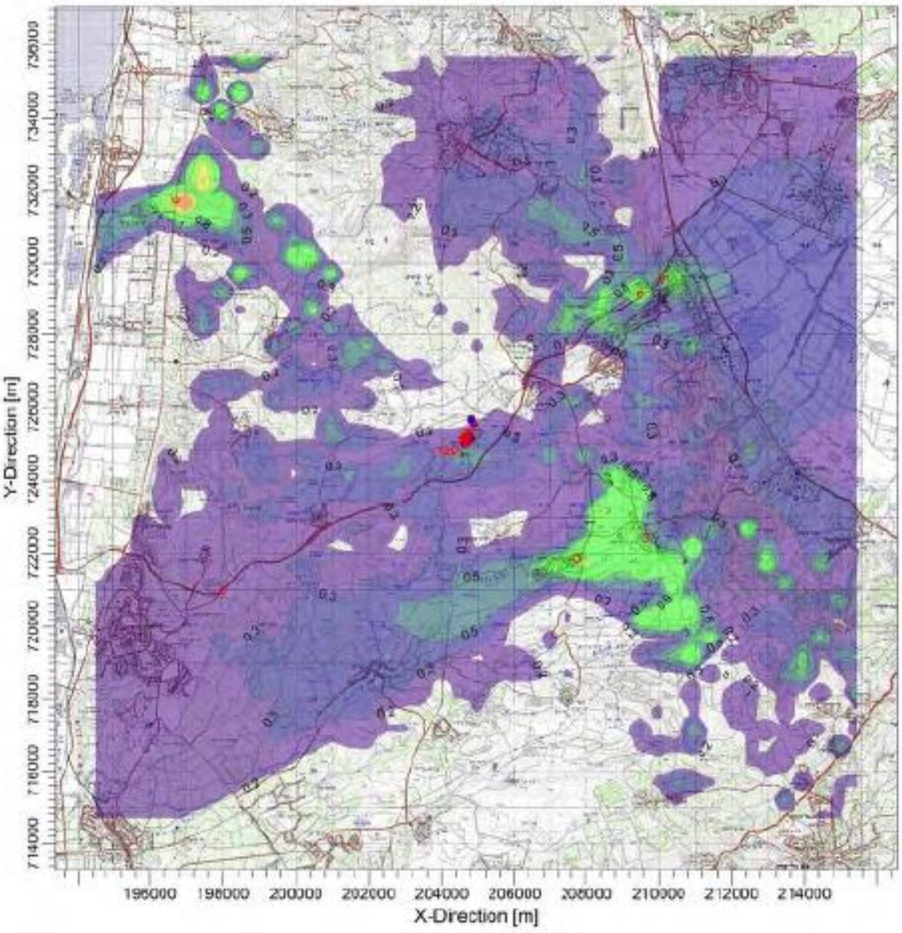
Lattice map of sulfur dioxide (SO_2) emissions, 24-hour average for 2016-2024,background emissions (points only) and emissions from natural gas treatment facilities and diesel engines)



Isopleth map sulfur dioxide (SO_2) emissions, annual average for 2016-2024,background emissions (points only) and emissions from natural gas treatment facilities and diesel engines)

PROJECT TITLE:

Hagit station
SO2 - facilities emissions and background-Annual



PLOT FILE OF ANNUAL VALUES FOR SOURCE GROUP: ALL — ug/m^3

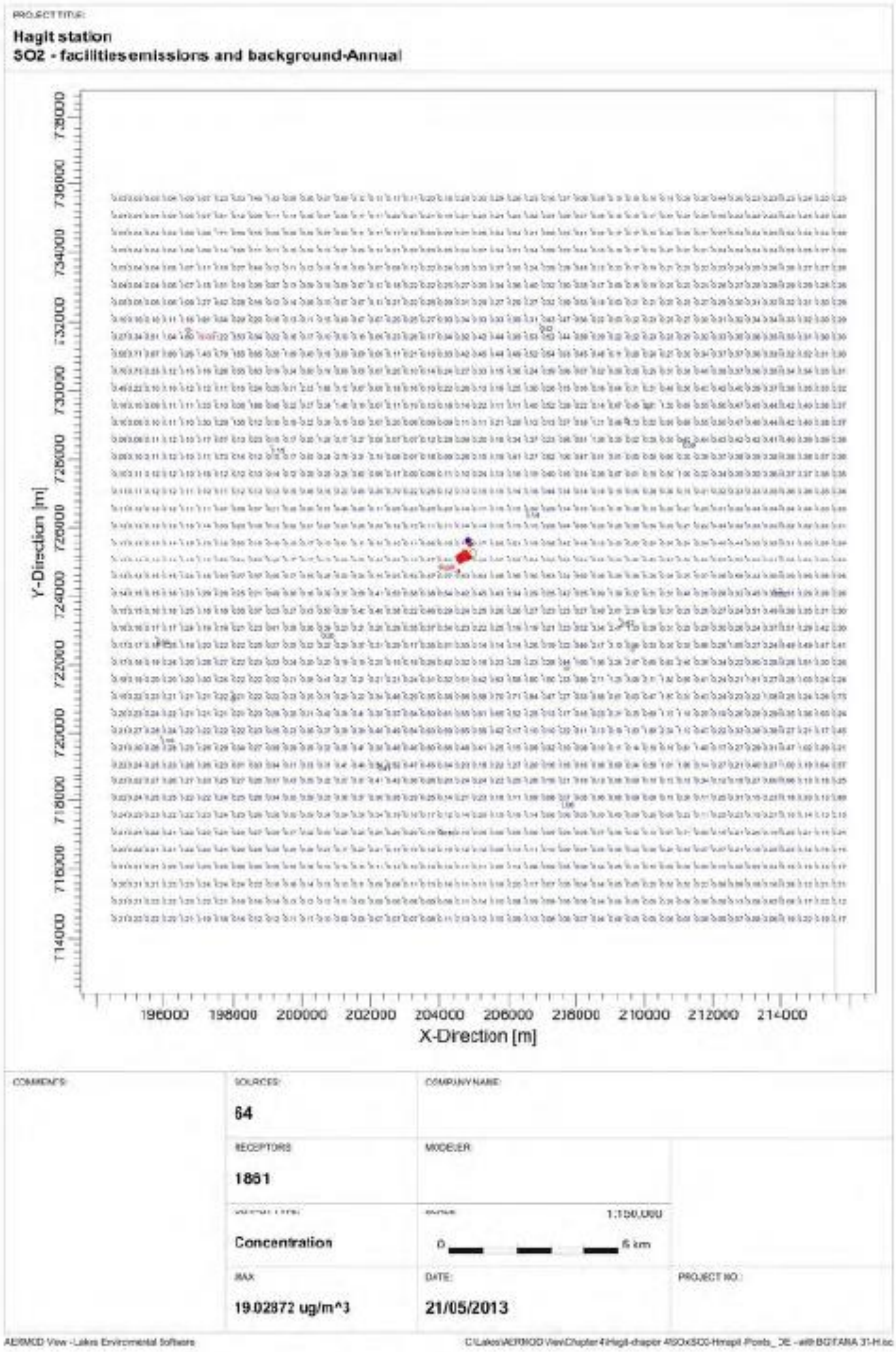
0.2 | 0.3 | 0.5 | 0.8 | 1.0 | 3.0 | 5.0 | 8.0 | 10.0 | 19.0

COMMENTS:	SOURCES:	COMPANY NAME:	
	64		
	RECEPTORS:	MODELER:	
	1861		
	OUTPUT TYPE:	SCALE: 1:150,000	
	Concentration	0 — 5 km	
	MAX:	DATE:	PROJECT NO.:
	19.02872 ug/m^3	21/05/2013	

AERMOD View - Lakes Environmental Software

C:\Lakes\AERMOD View\Chapter 4\Hagit-chapter 4\SOx\SO2-Hmapit-Points_ 3E - with BOTANA 31-H.isc

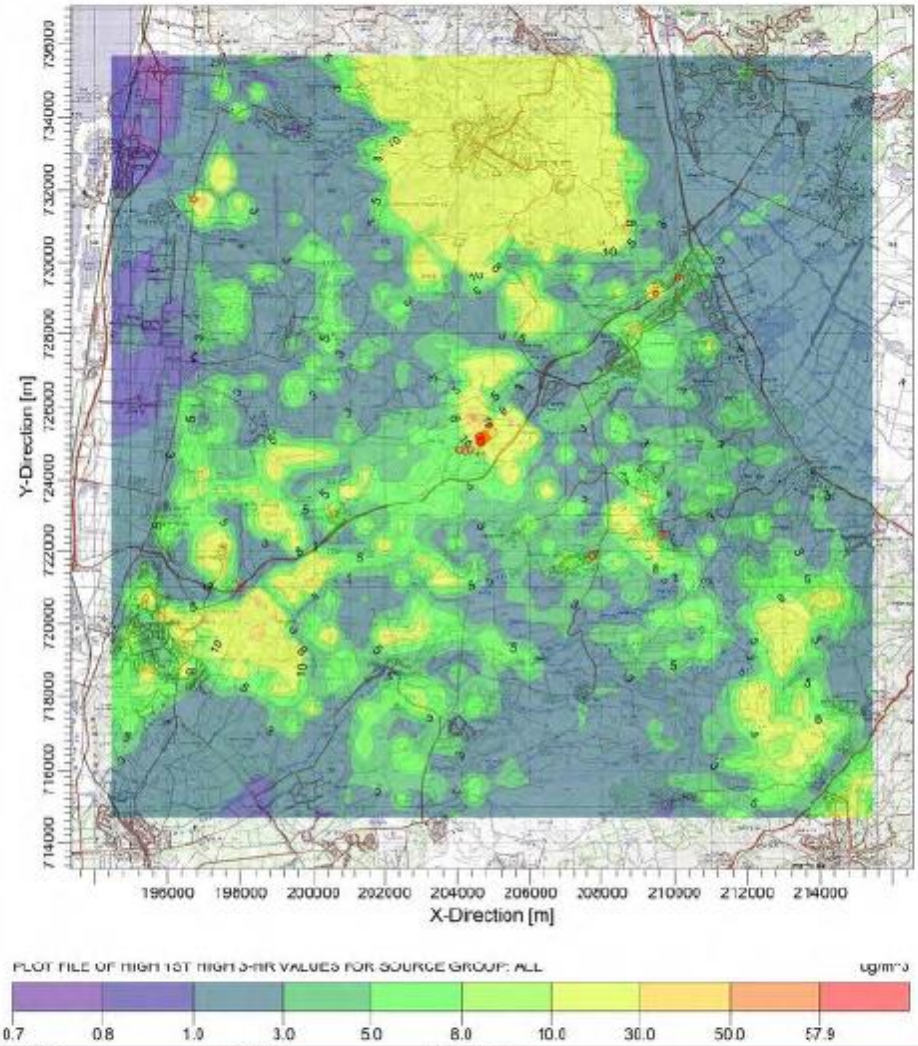
Lattice map of sulfur dioxide (SO_2) emissions, annual average for 2016-2024,background emissions (points only) and emissions from natural gas treatment facilities and diesel engines)



Isopleth map of particulate matter (PM) emissions, 3-hour average for 2016-2024, background emissions (points only) and diesel engine emissions

PROJECT TITLE:

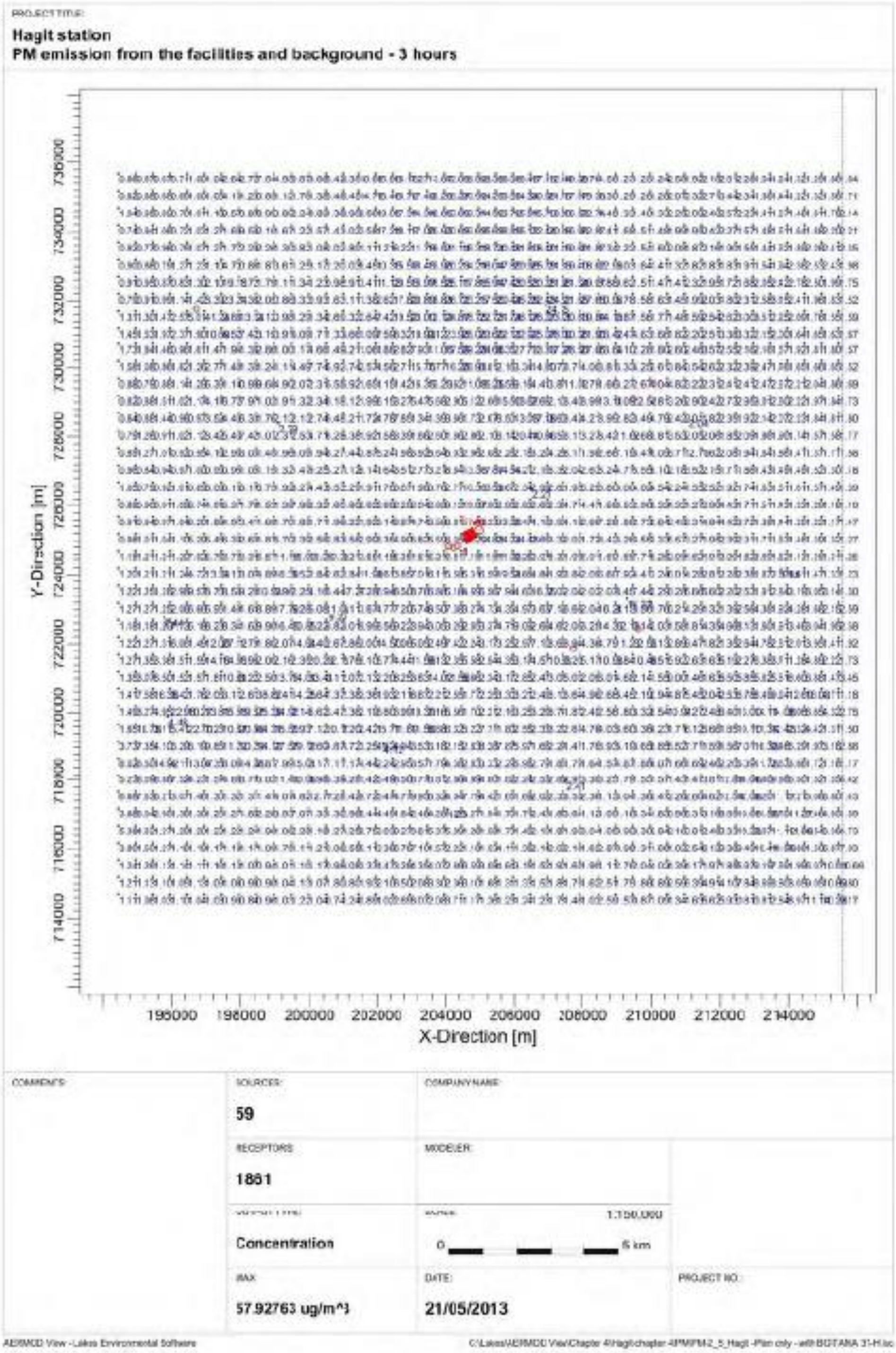
Hagit station
PM emission from the facilities and background - 3 hours



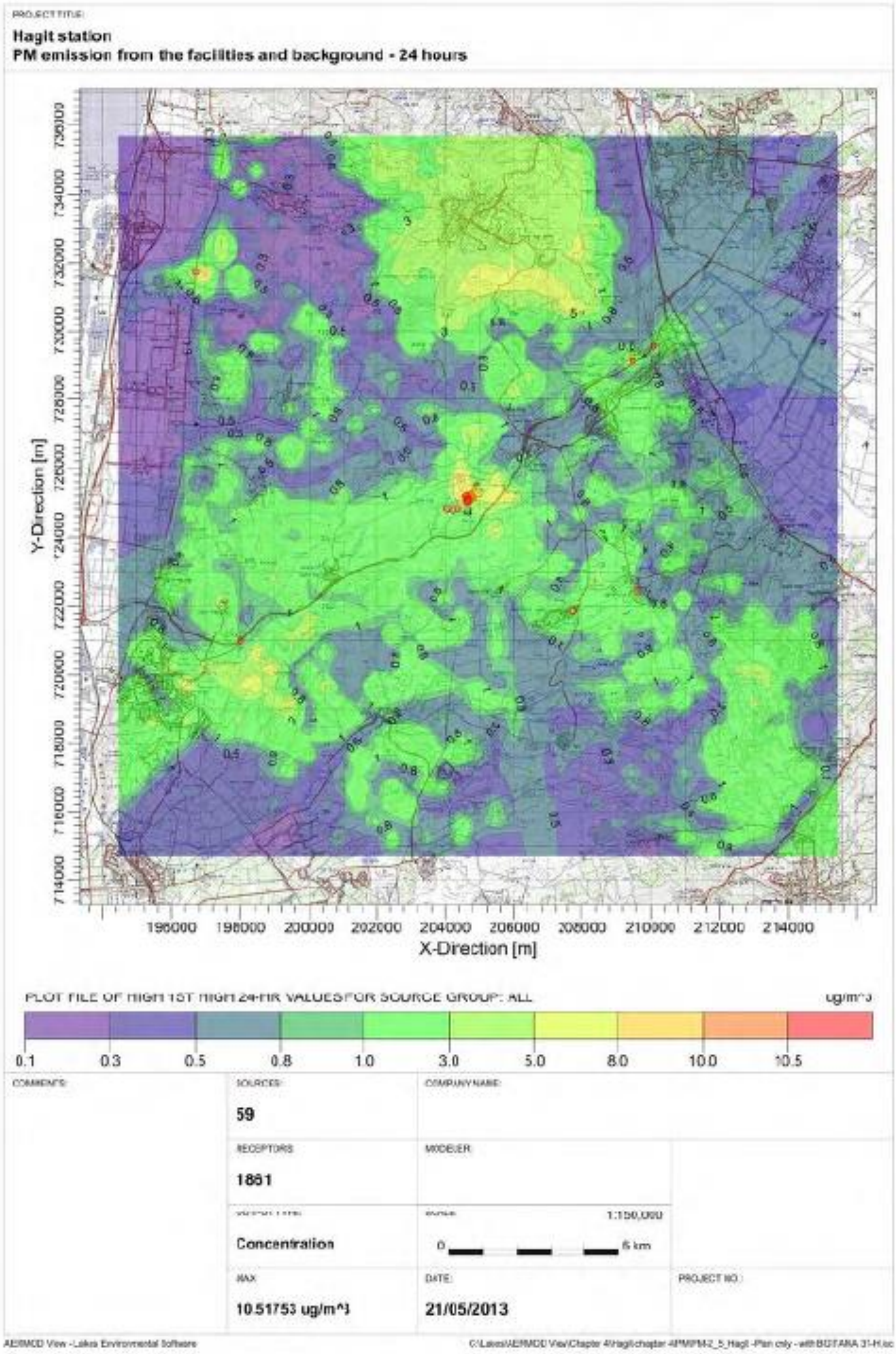
COMMENTS:	SOURCES: **59**	COMPANY NAME:	
	RECEPTORS: **1861**	MODELER:	
	OUTPUT TYPE: **Concentration**	SCALE: 1:150,000 0 5 km	
	MAX: **57.92763 ug/m^3**	DATE: **21/05/2013**	PROJECT NO.:

AERMOD View - Lakes Environmental Software C:\Lakes\AERMOD View\Chapter 4\Hagit\chapter 4PM\PM-2_5_Hagit -Plan only - with BGTANA 31-H.isc

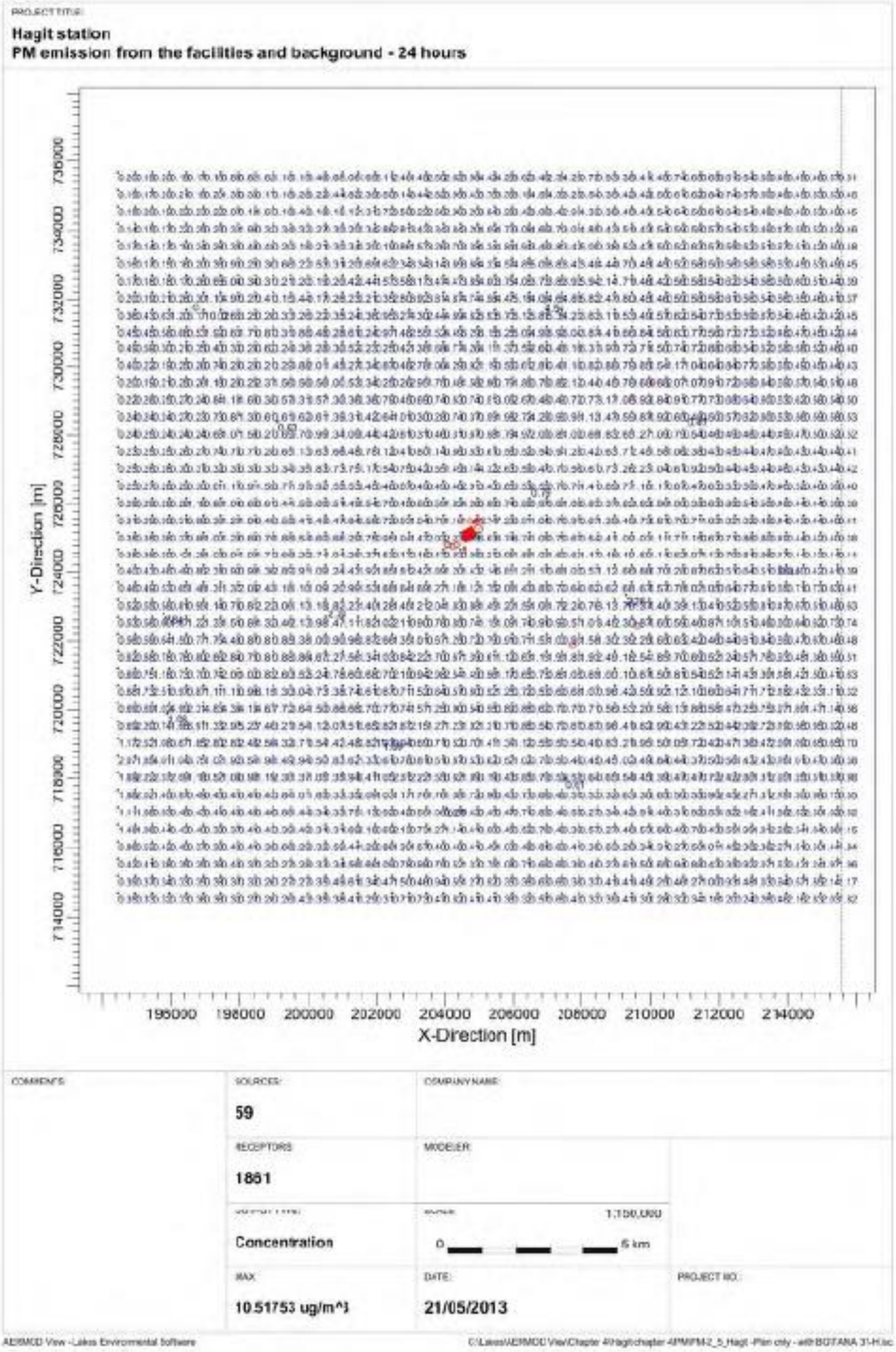
Lattice map of particulate matter (PM) emissions, 3-hour average for 2016-2024,background emissions (points only) and diesel engine emissions



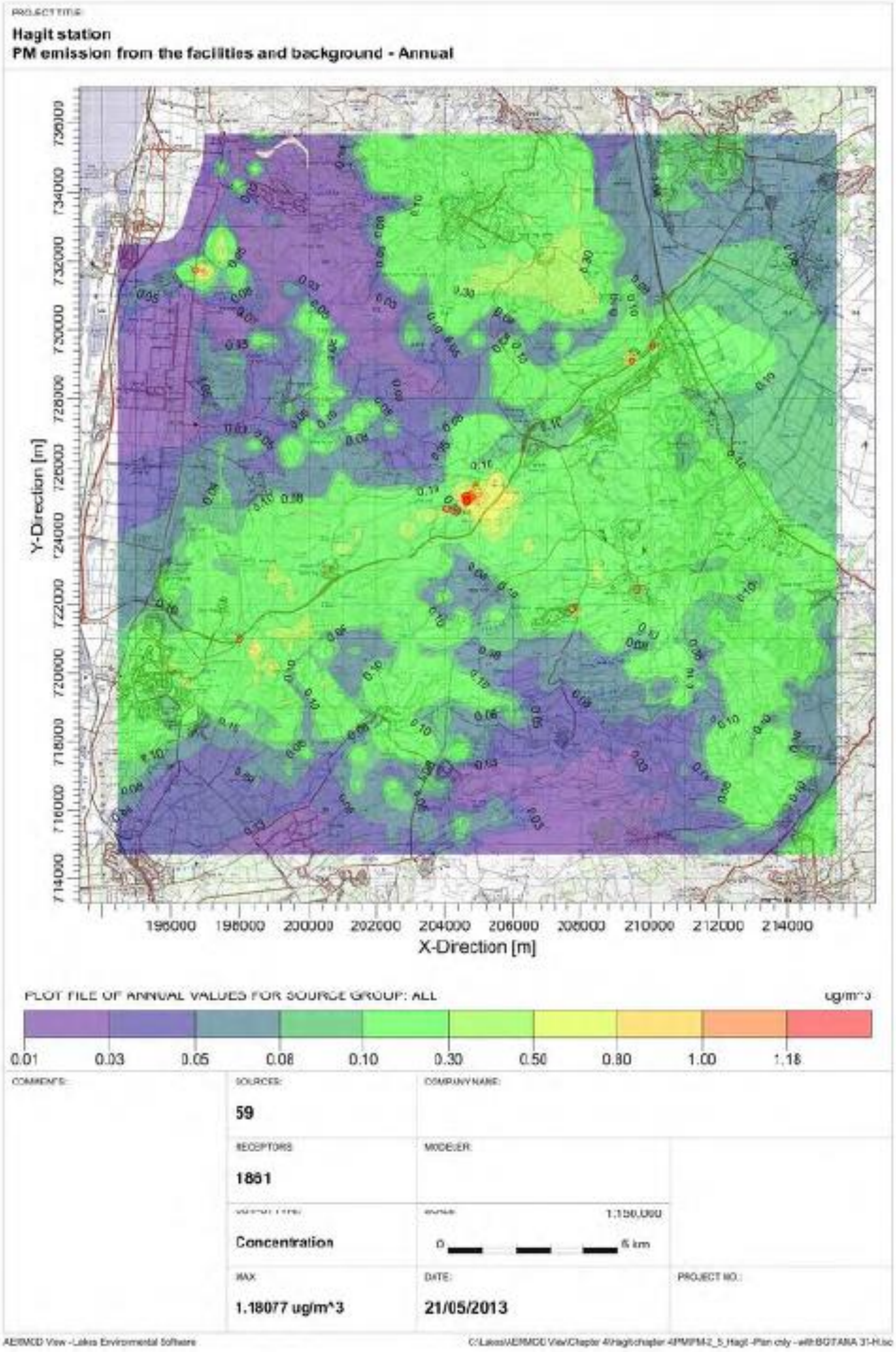
Isopleth map of particulate matter (PM) emissions, 24-hour average for 2016-2024,background emissions (points only) and diesel engine emissions



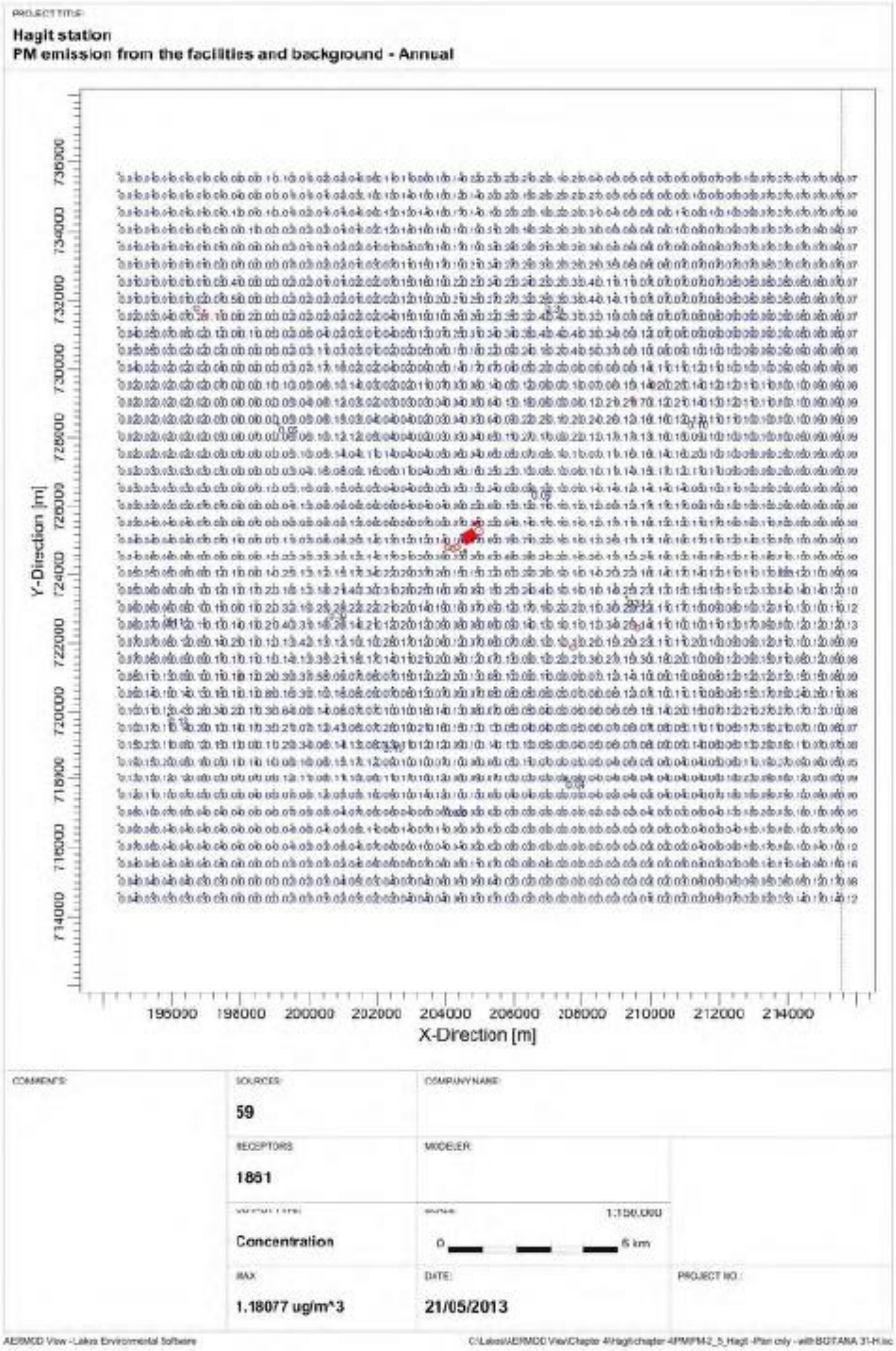
Lattice map of particulate matter (PM) emissions, 24-hour average for 2016-2024,background emissions (points only) and diesel engine emissions



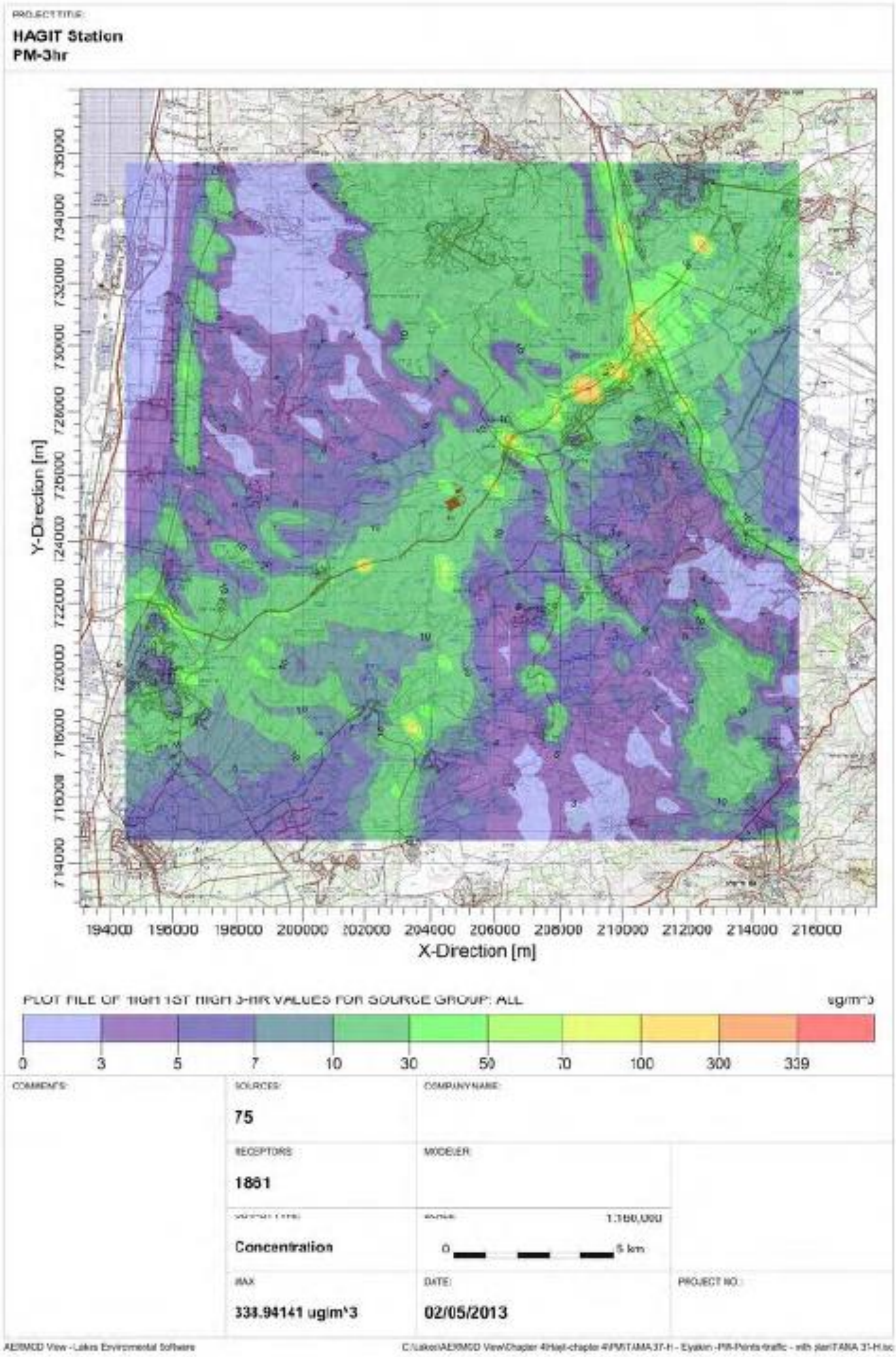
Isopleth map of particulate matter (PM) emissions, annual average for 2016-2024, background emissions (points only) and diesel engine emissions



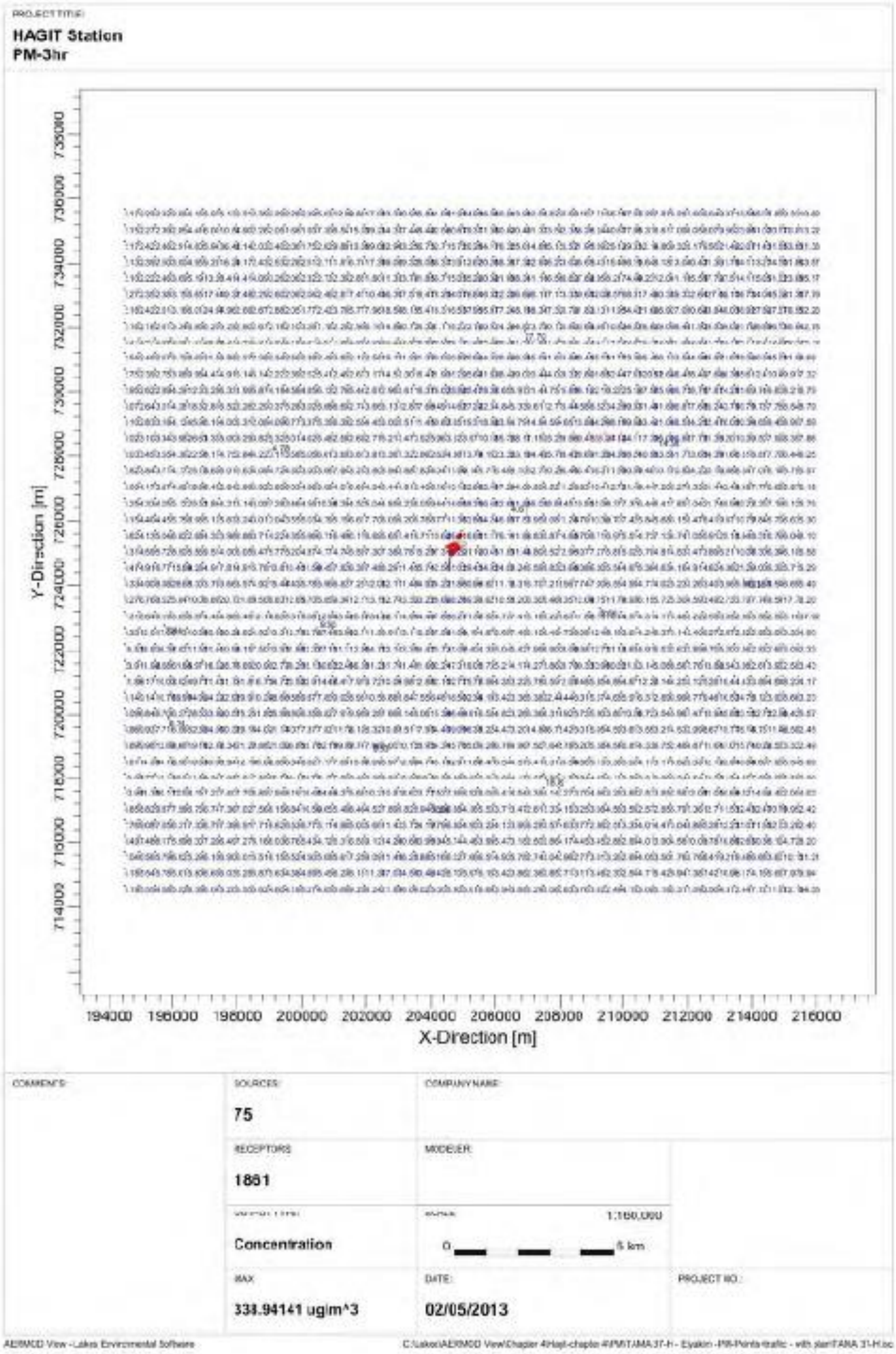
Lattice map of particulate matter (PM) emissions, annual average for 2016-2024,background emissions (points only) and diesel engine emissions



Isopleth map of particulate matter (PM) emissions, 3-hour average for 2016-2024, background emissions (points and transport) and diesel engine emissions



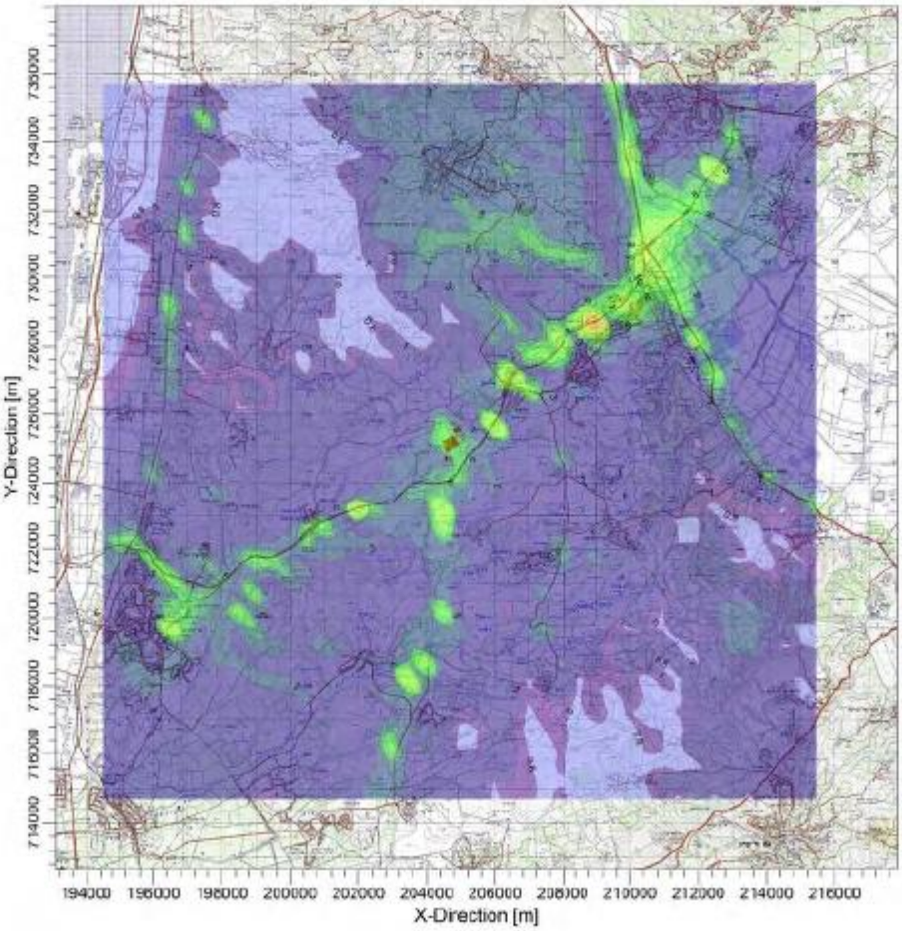
Lattice map of particulate matter (PM) emissions, 3-hour average for 2016-2024, background emissions (points and transport) and diesel engine emissions



Isopleth map of particulate matter (PM) emissions, 24-hour average for 2016-2024, background emissions (points and transport) and diesel engine emissions

PROJECT TITLE:

HAGIT Station
PM-24hr



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL

ug/m^3

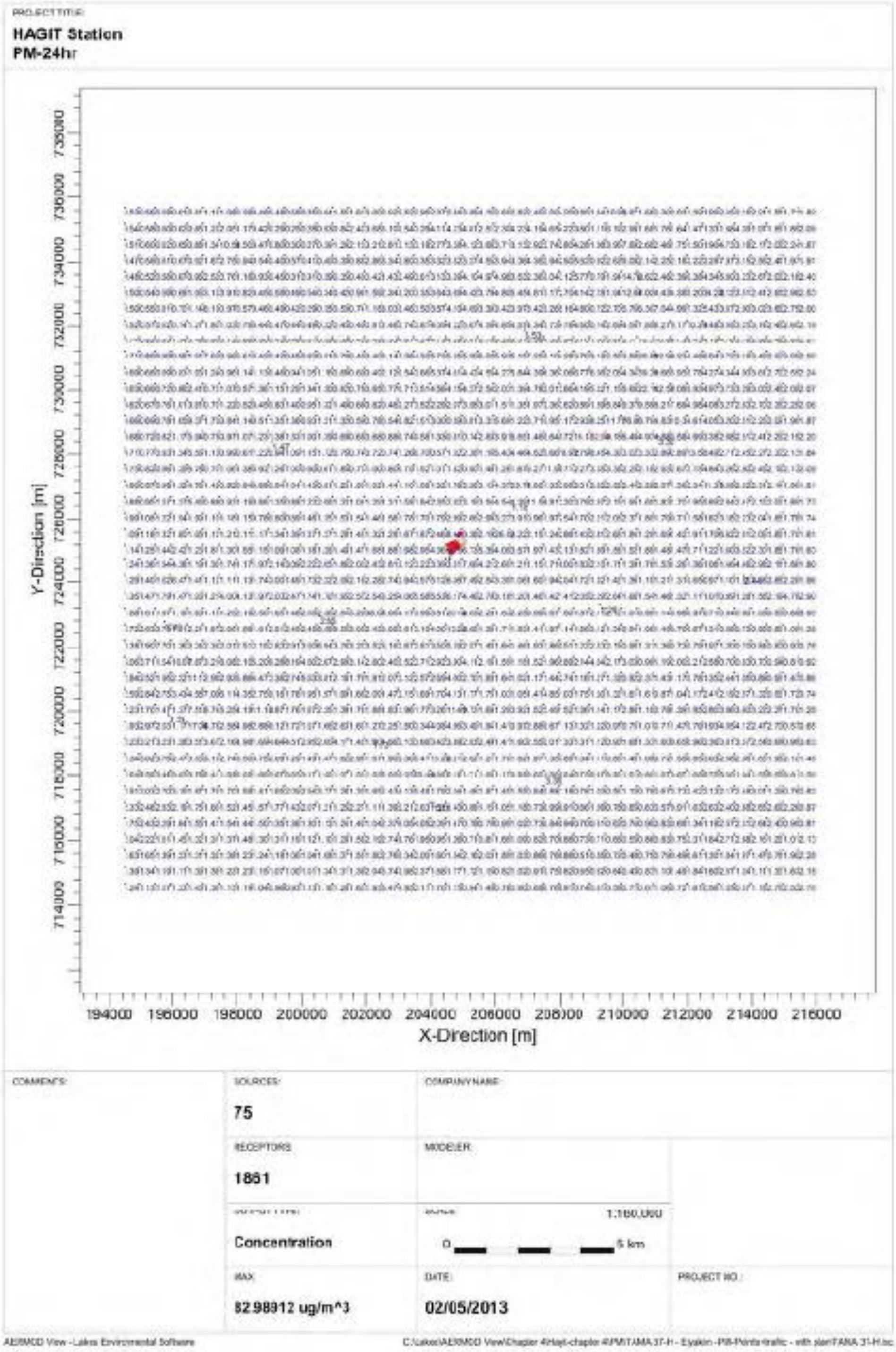
0.0 0.8 1.0 3.0 5.0 6.0 8.0 10.0 30.0 50.0 60.0 80.0 83.0

COMMENTS:	SOURCES: 75	COMPANY NAME:	
	RECEPTORS: 1861	MODELER:	
	OUTPUT TYPE: Concentration	SCALE: 1:168,000 0 5 km	
	MAX: 82.98912 ug/m^3	DATE: 02/05/2013	PROJECT NO.:

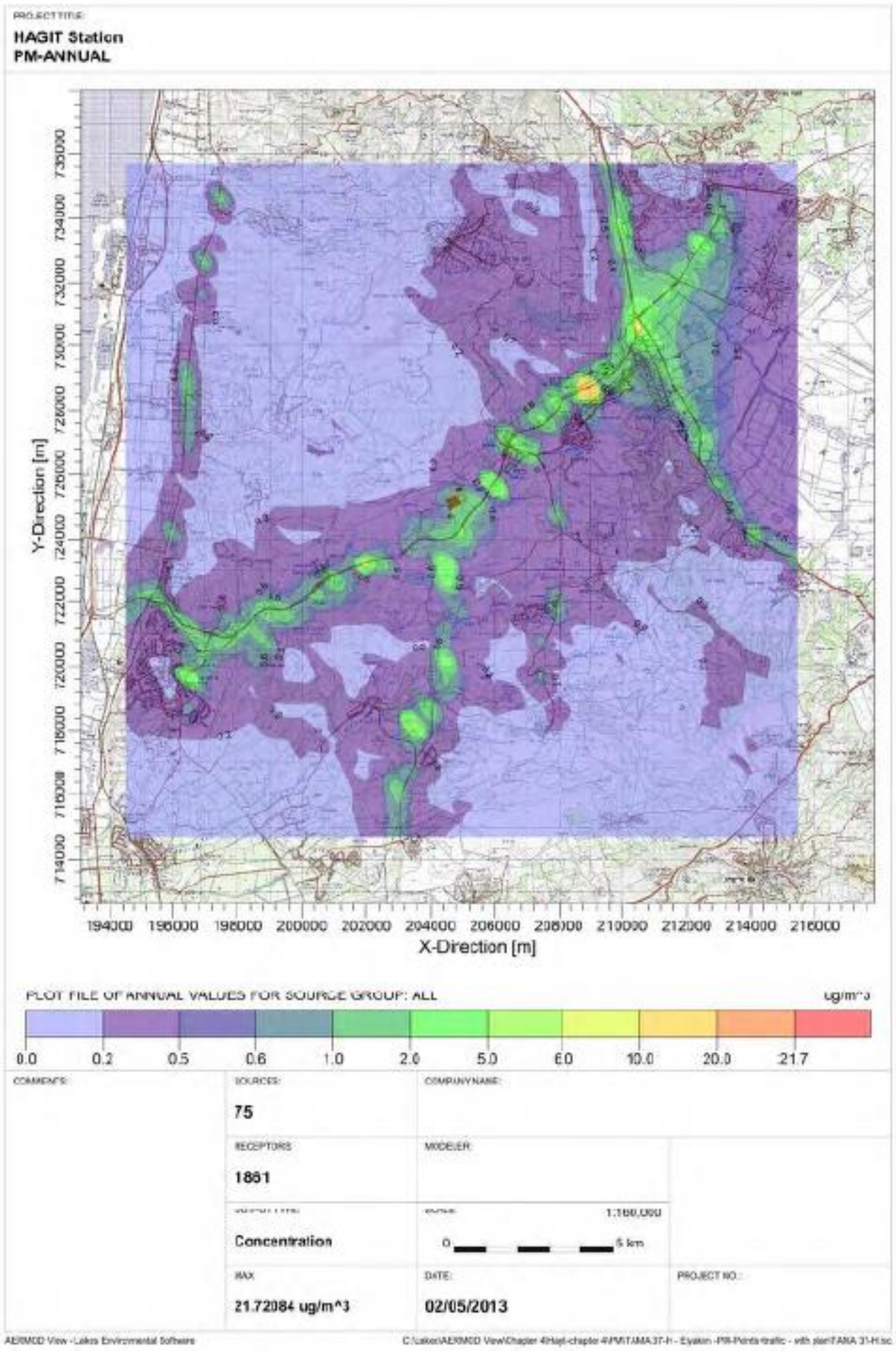
AERMOD View - Lakes Environmental Software

C:\Lakes\AERMOD View\Chapter 4\Hagit-chapter 4\PM\TAMA 37-H - Eyakim -PM-Penta-trafic - with plan\TAMA 37-H.isc

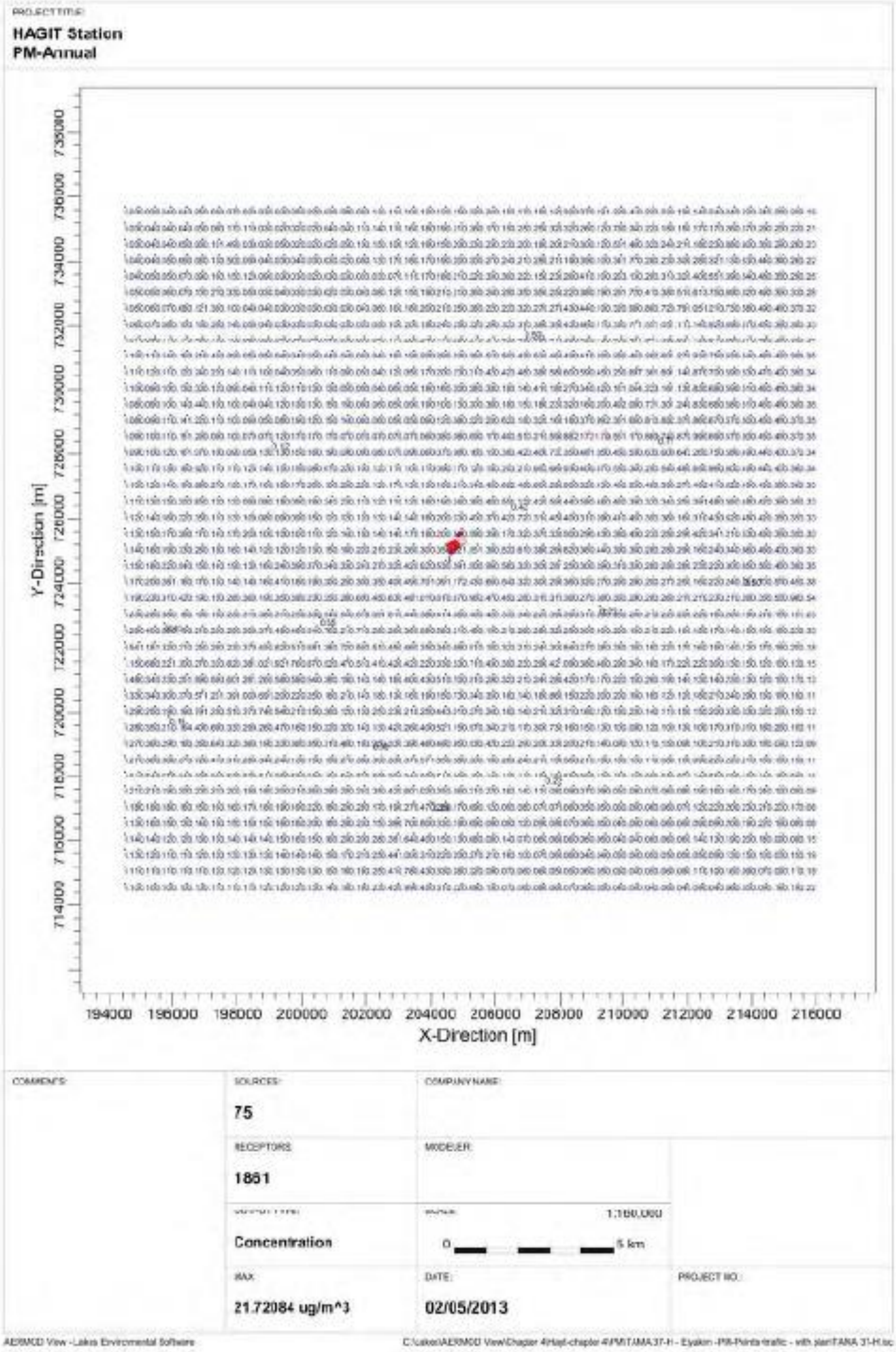
Lattice map of particulate matter (PM) emissions, 24-hour average for 2016-2024, background emissions (points and transport) and diesel engine emissions



Isopleth map of particulate matter (PM) emissions, annual average for 2016-2024, background emissions (points and transport) and diesel engine emissions

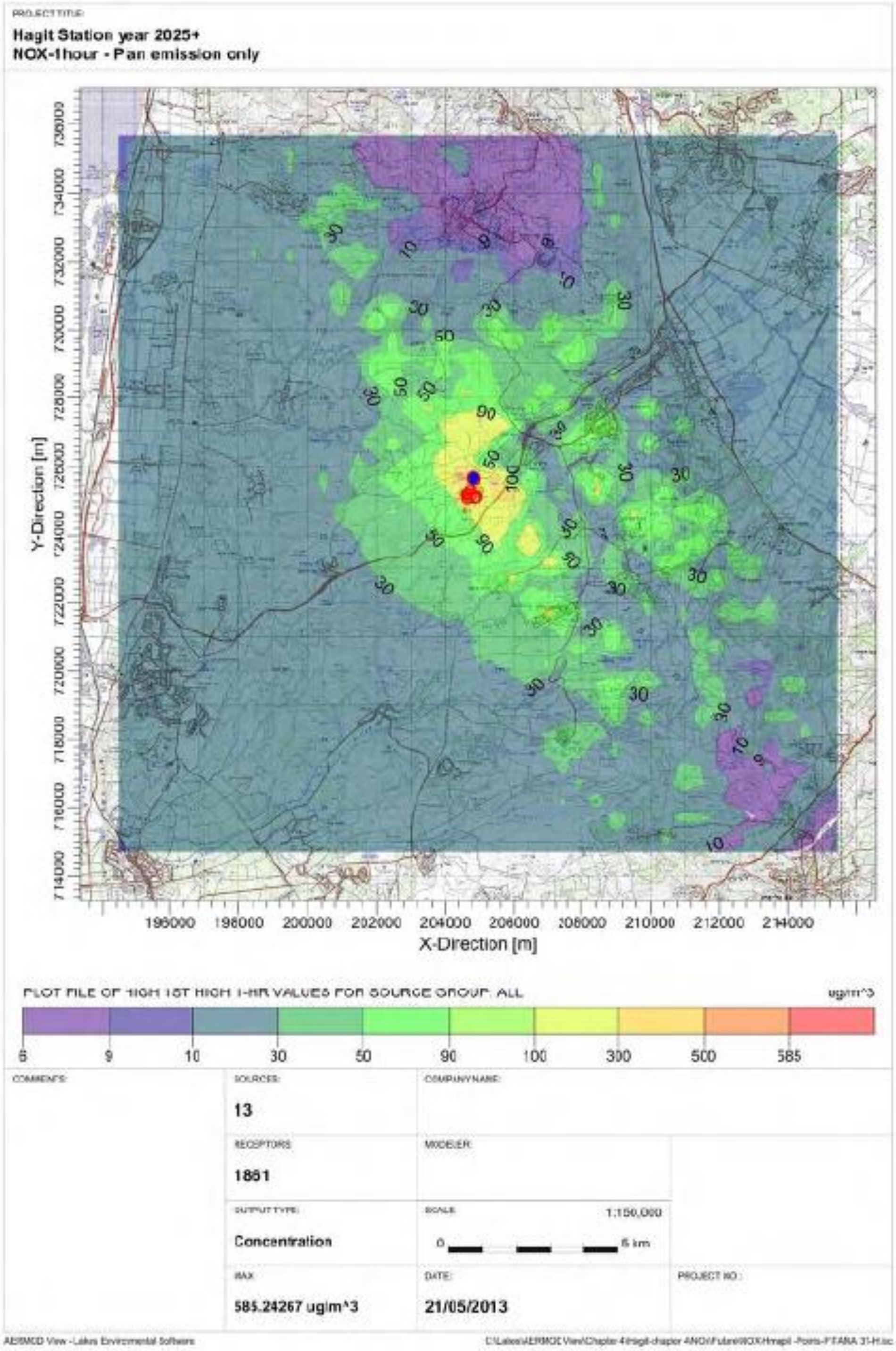


Lattice map of particulate matter (PM) emissions, annual average for 2016-2024, background emissions (points and transport) and diesel engine emissions



Plan future scenario(2025+) – from natural gas-powered facilities and from diesel engines

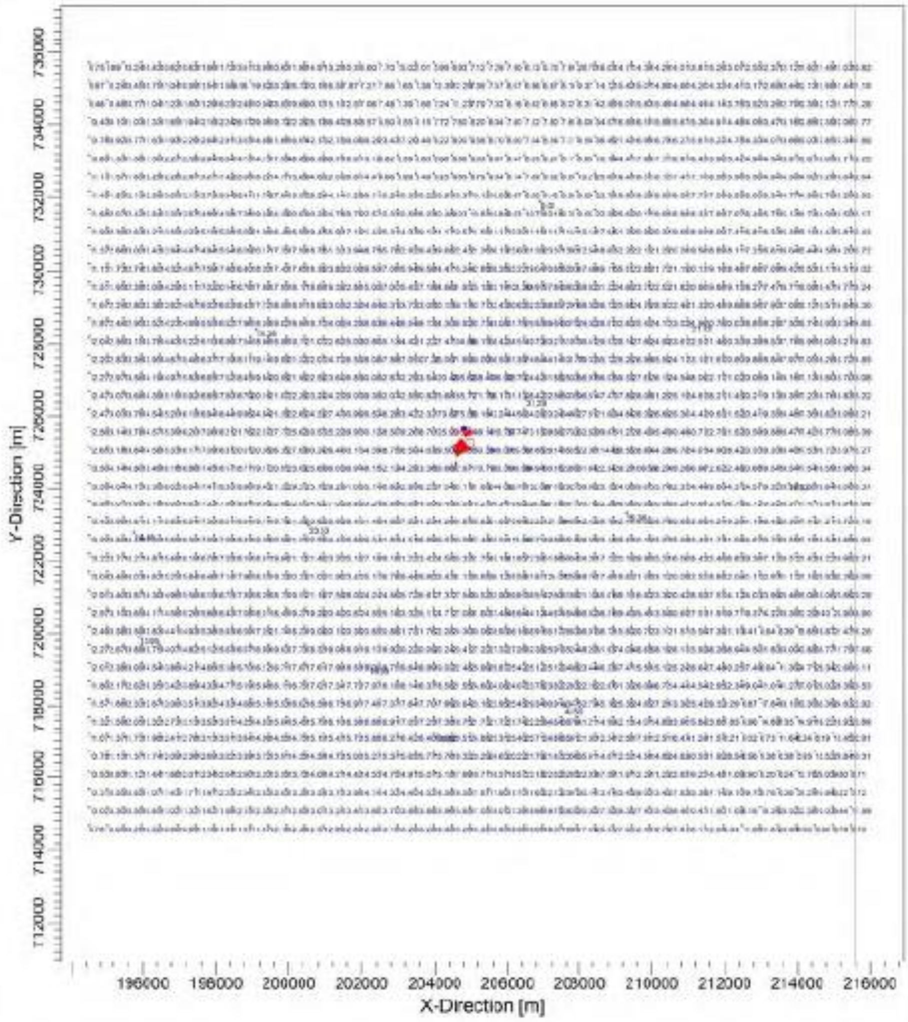
Isopleth map of nitrogen oxide (NOx) emissions, 1-hour average for 2025+, emissions from natural gas-powered facilities and diesel engines



Lattice map of nitrogen oxide (NOx) emissions, 1-hour average for 2025+, emissions from natural gas-powered facilities and diesel engines

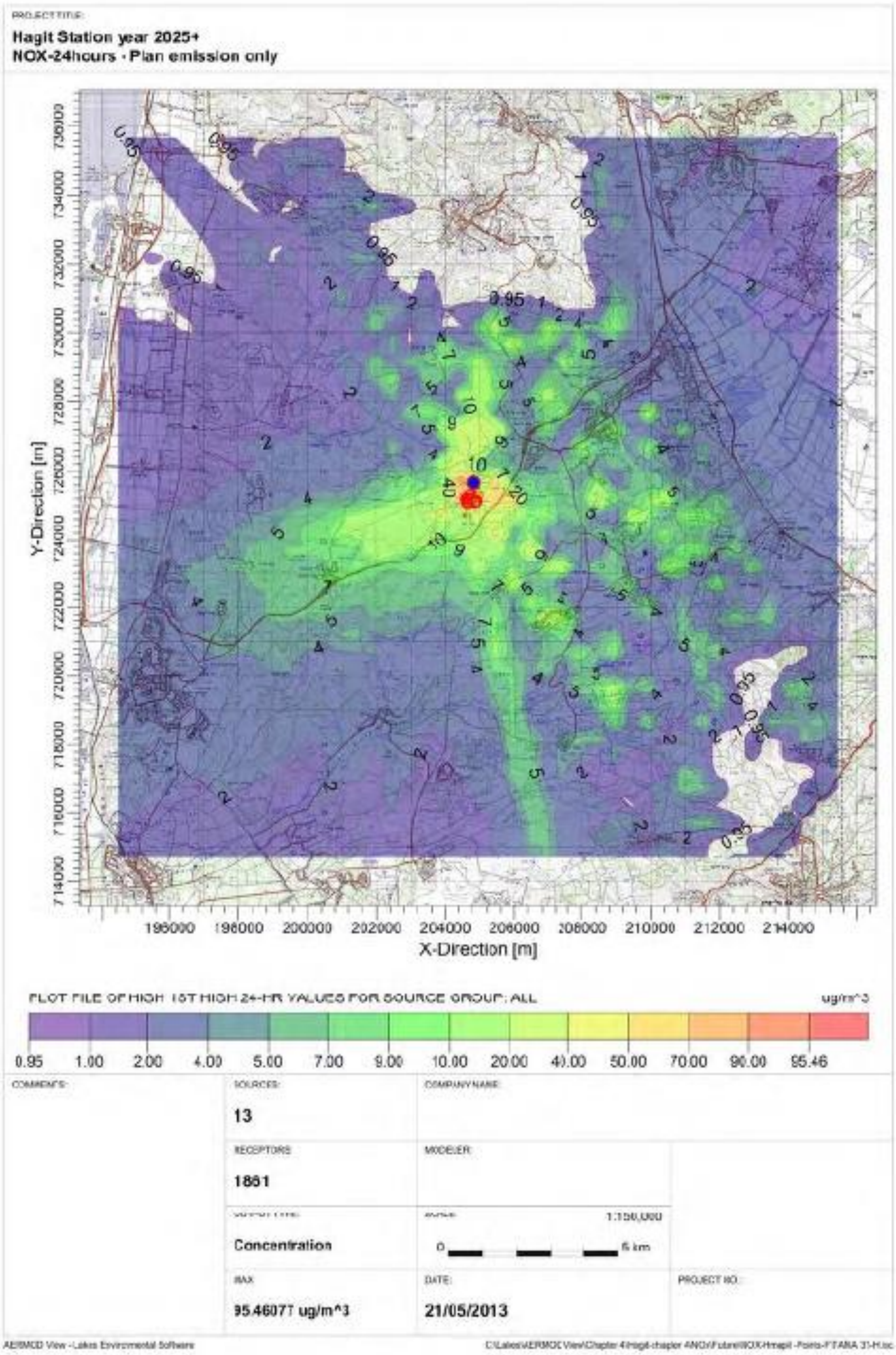
PROJECT TITLE:

Hagit Station year 2025+
NOX-1 hr - Plan emission only

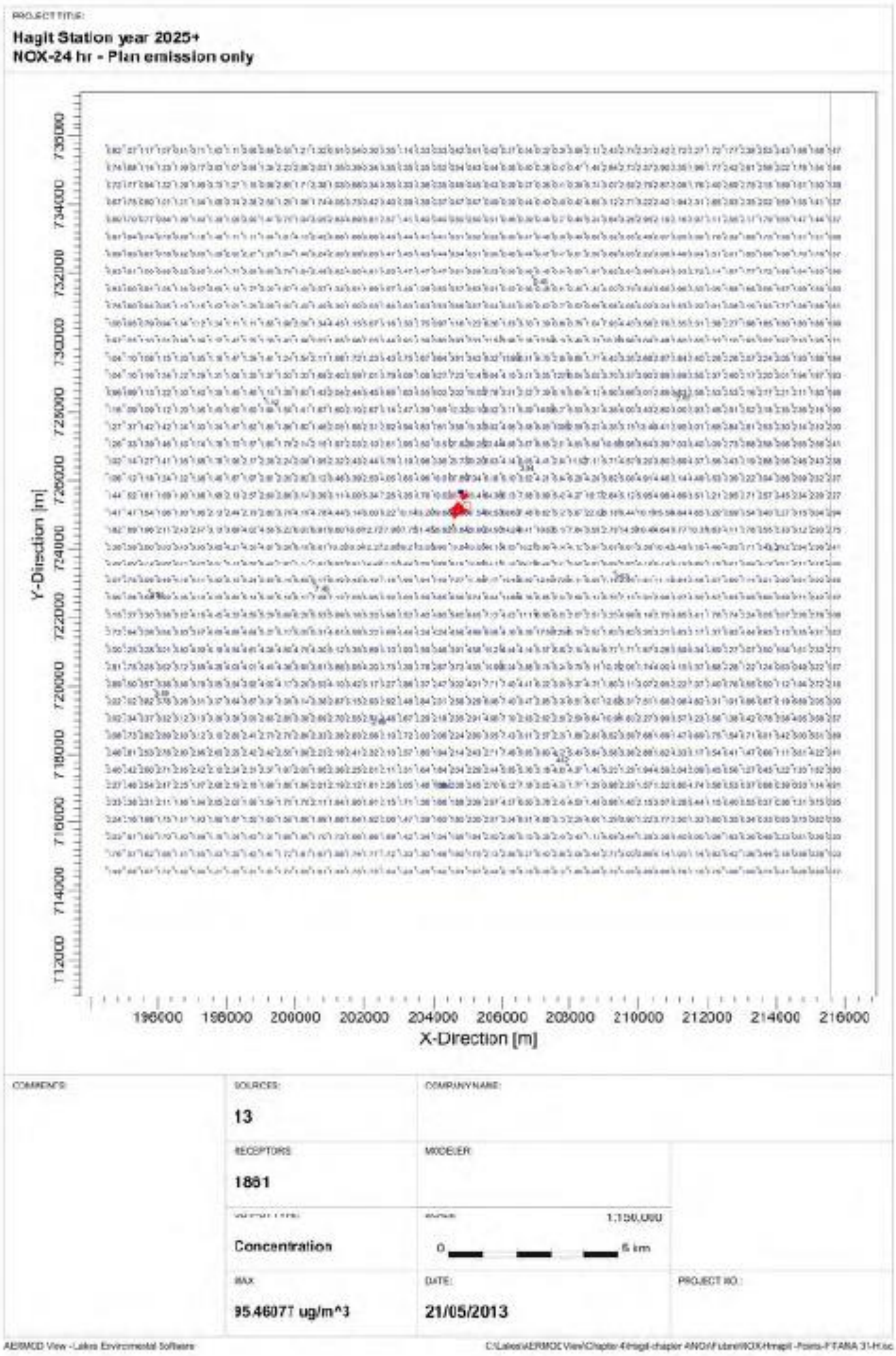


COMMENTS:	SOURCES: 13	COMPANY NAME:	
	RECEPTORS: 1861	MODELER:	
	OUTPUT TYPE: Concentration	SCALE: 1:150,000 0 5 km	
	MAX: 585.24267 ug/m^3	DATE: 21/05/2013	PROJECT NO.:

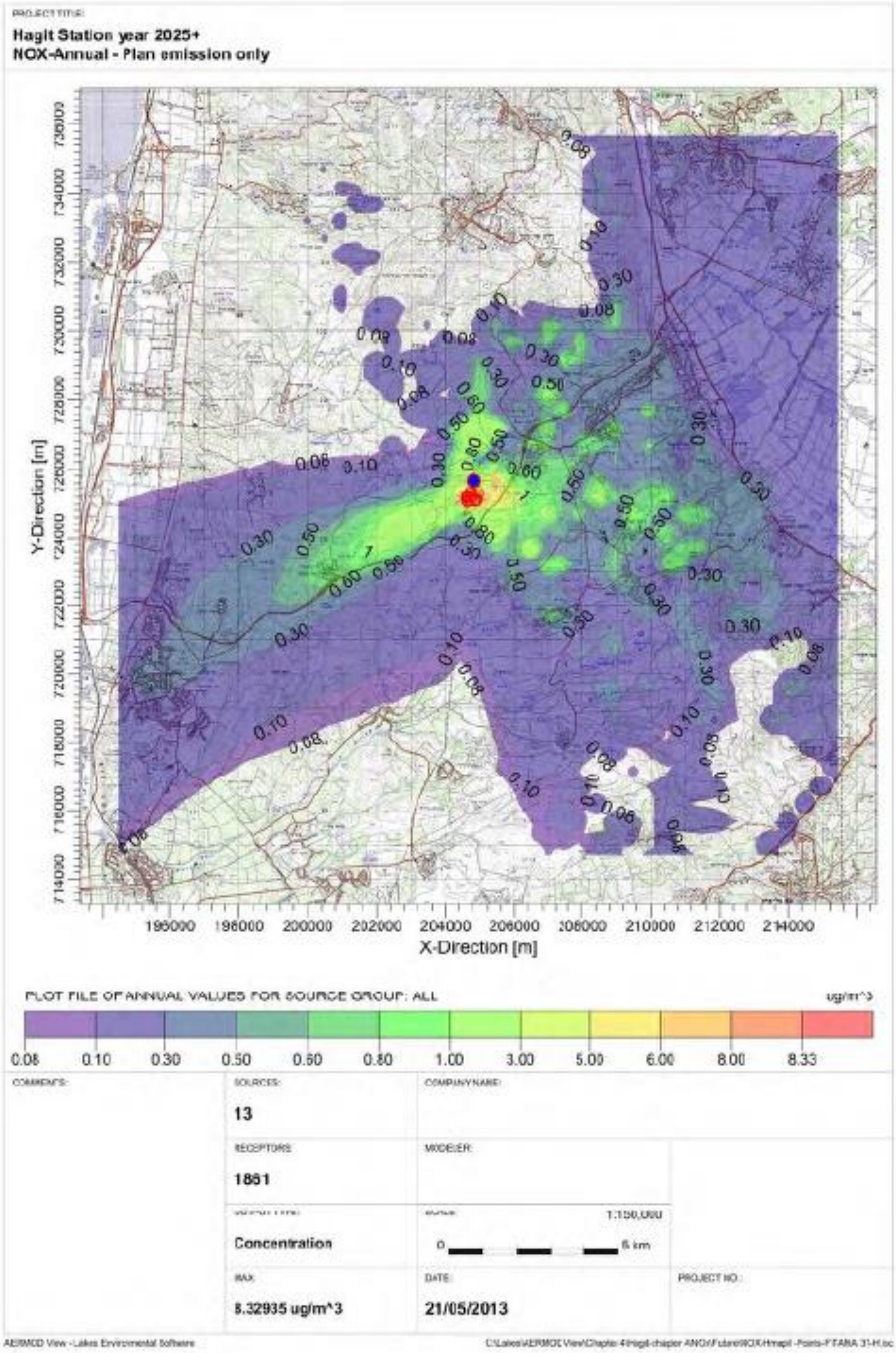
Isopleth map of nitrogen oxide (NOx) emissions, 24-hour average for 2025+, emissions from natural gas-powered facilities and diesel engines



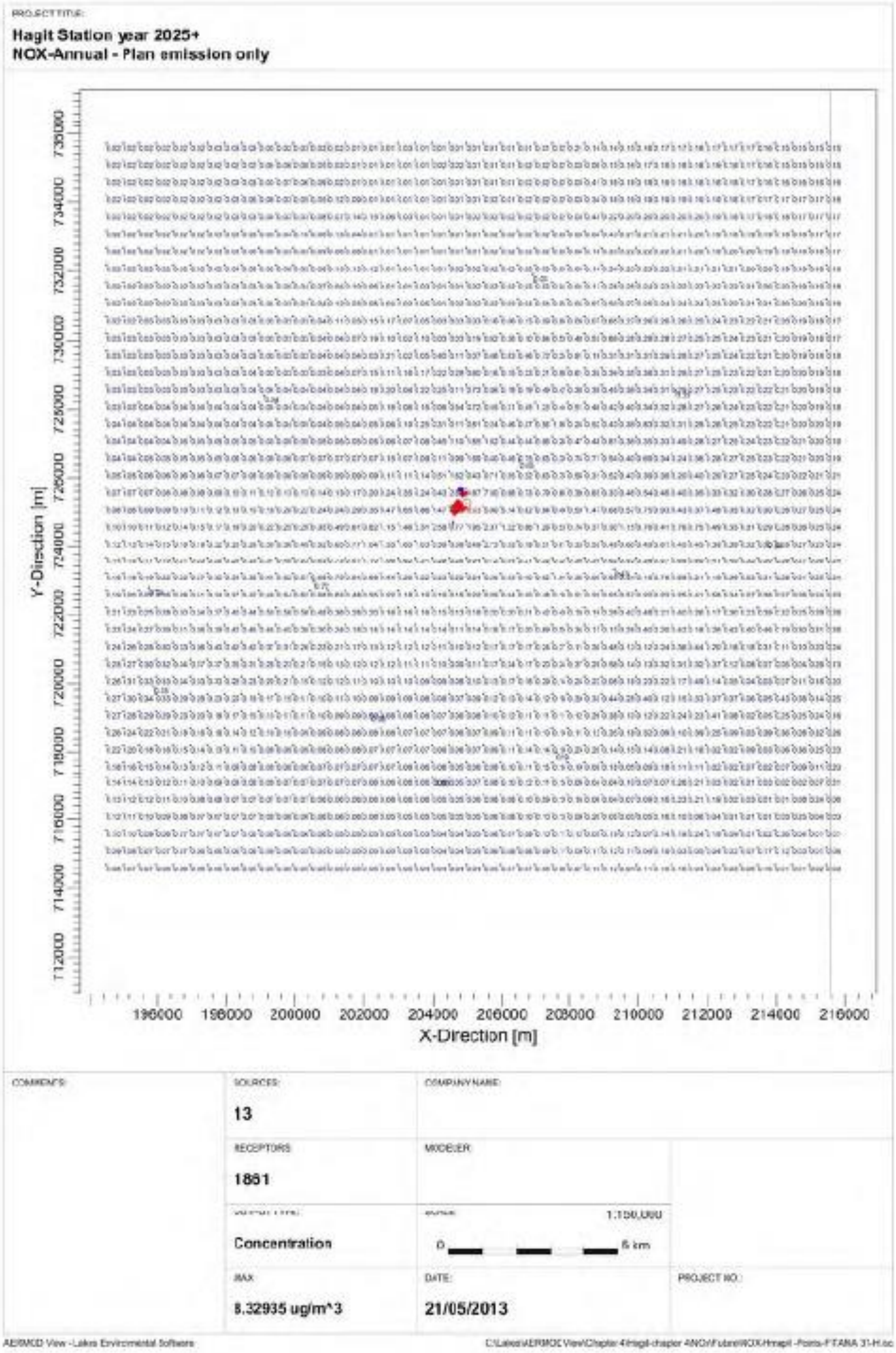
Lattice map of nitrogen oxide (NOx) emissions, 24-hour average for 2025+, emissions from natural gas-powered facilities and diesel engines



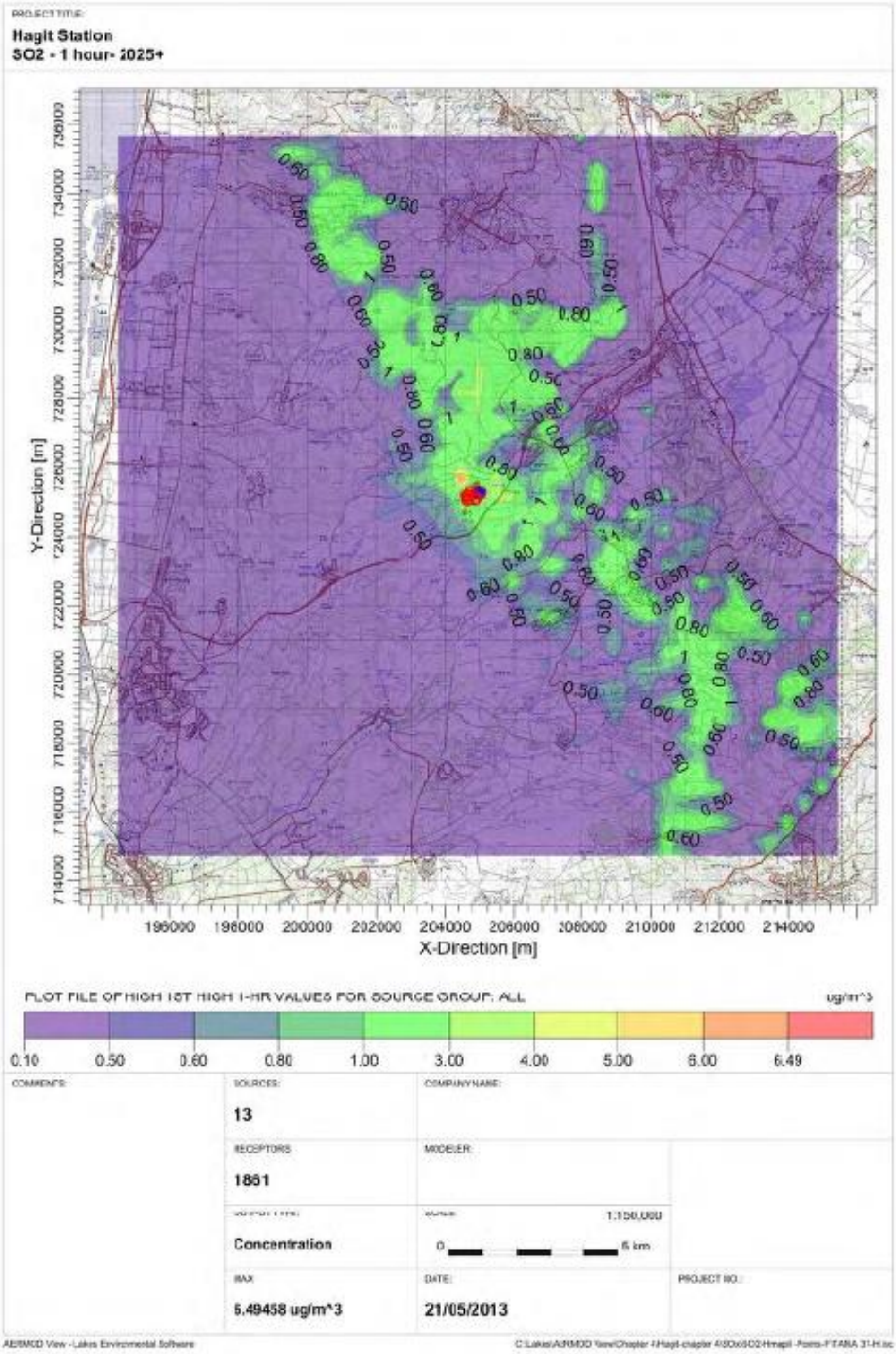
Isopleth map of nitrogen oxide (NOx) emissions, annual average for 2025+, emissions from natural gas-powered facilities and diesel engines



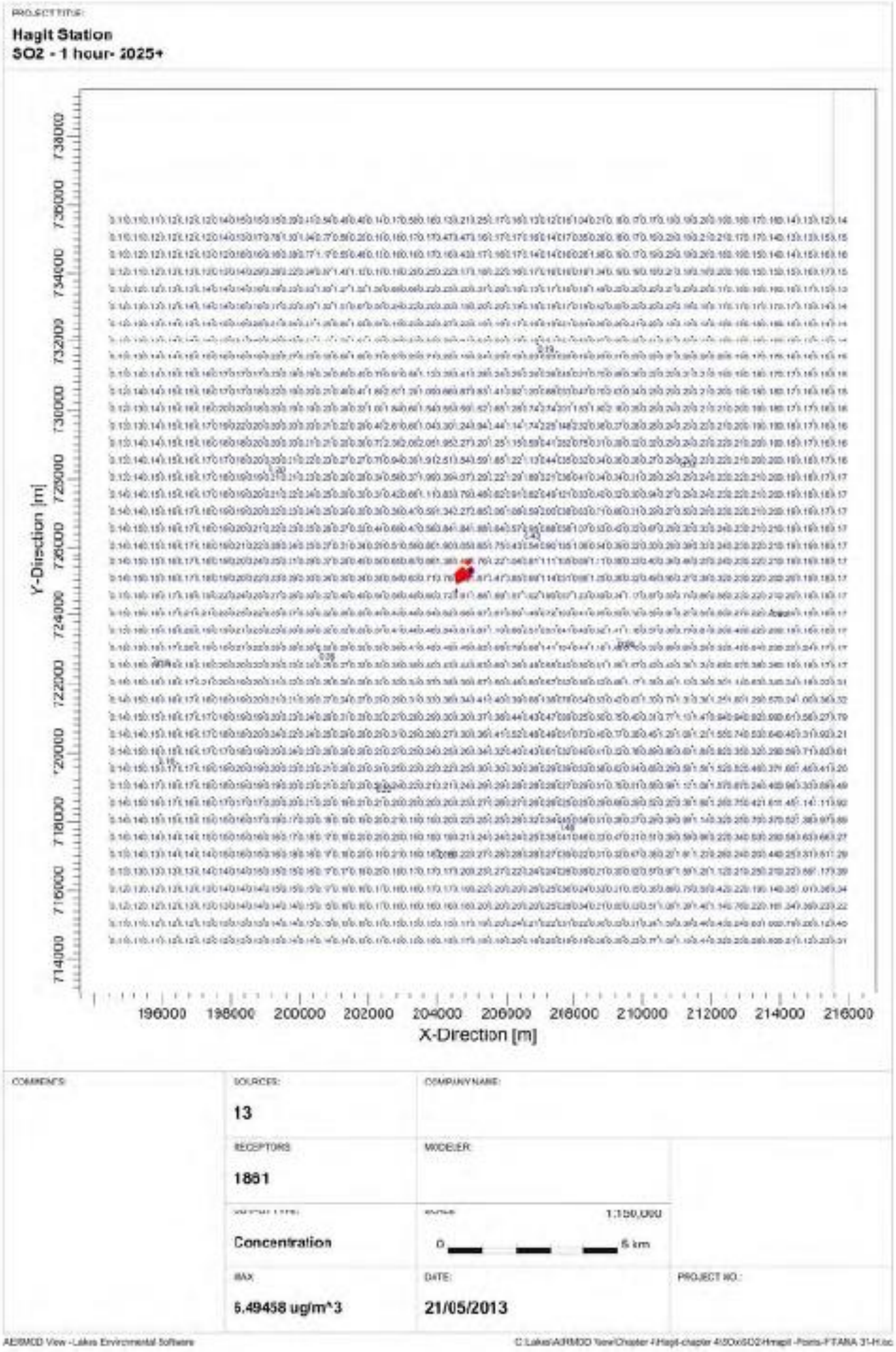
Lattice map of nitrogen oxide (NOx) emissions, annual average for 2025+, emissions from natural gas-powered facilities and diesel engines



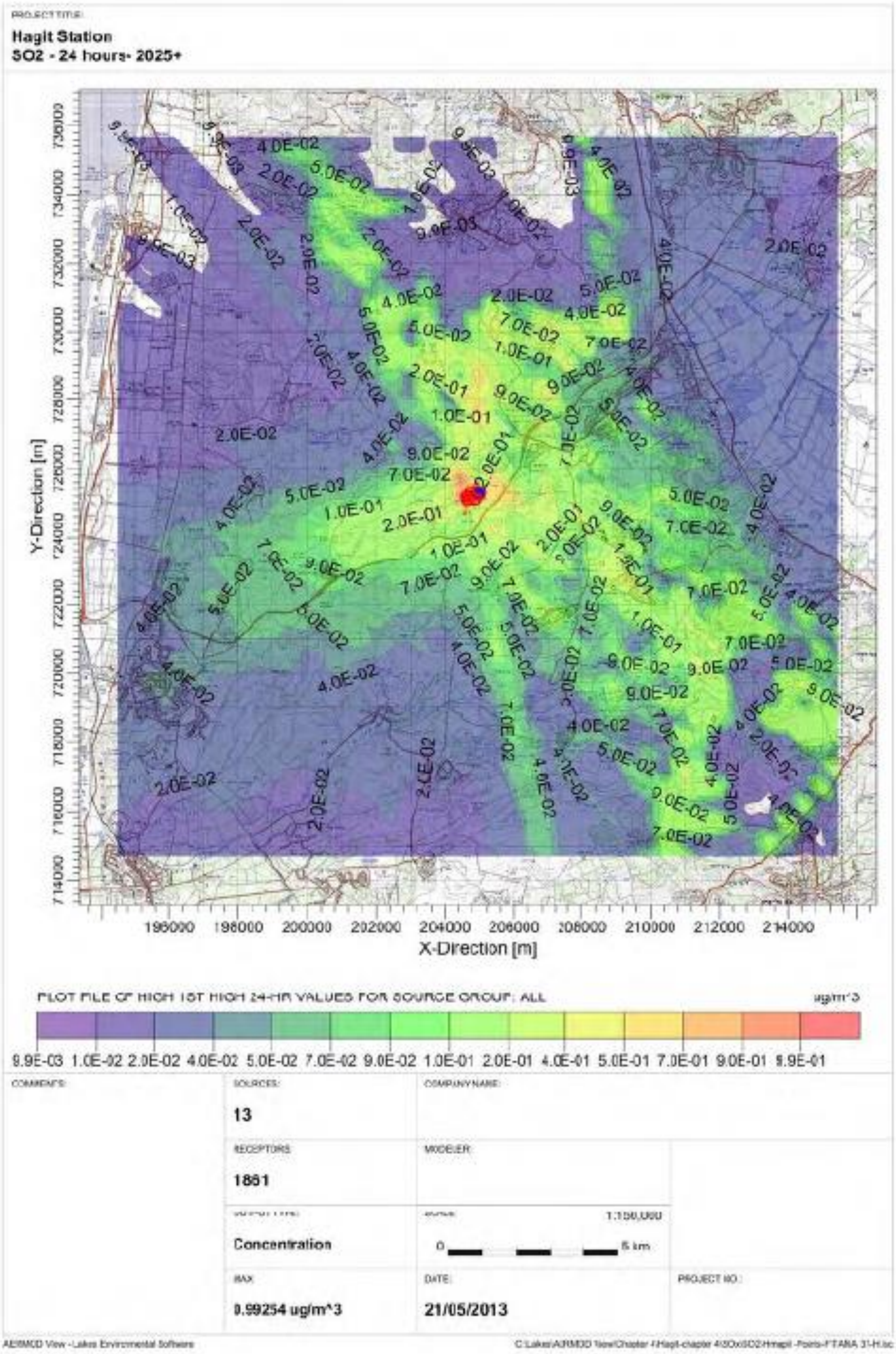
Isopleth map of sulfur dioxide (SO2) emissions 1-hour average for 2025+, emissions from natural gas-powered facilities and diesel engines



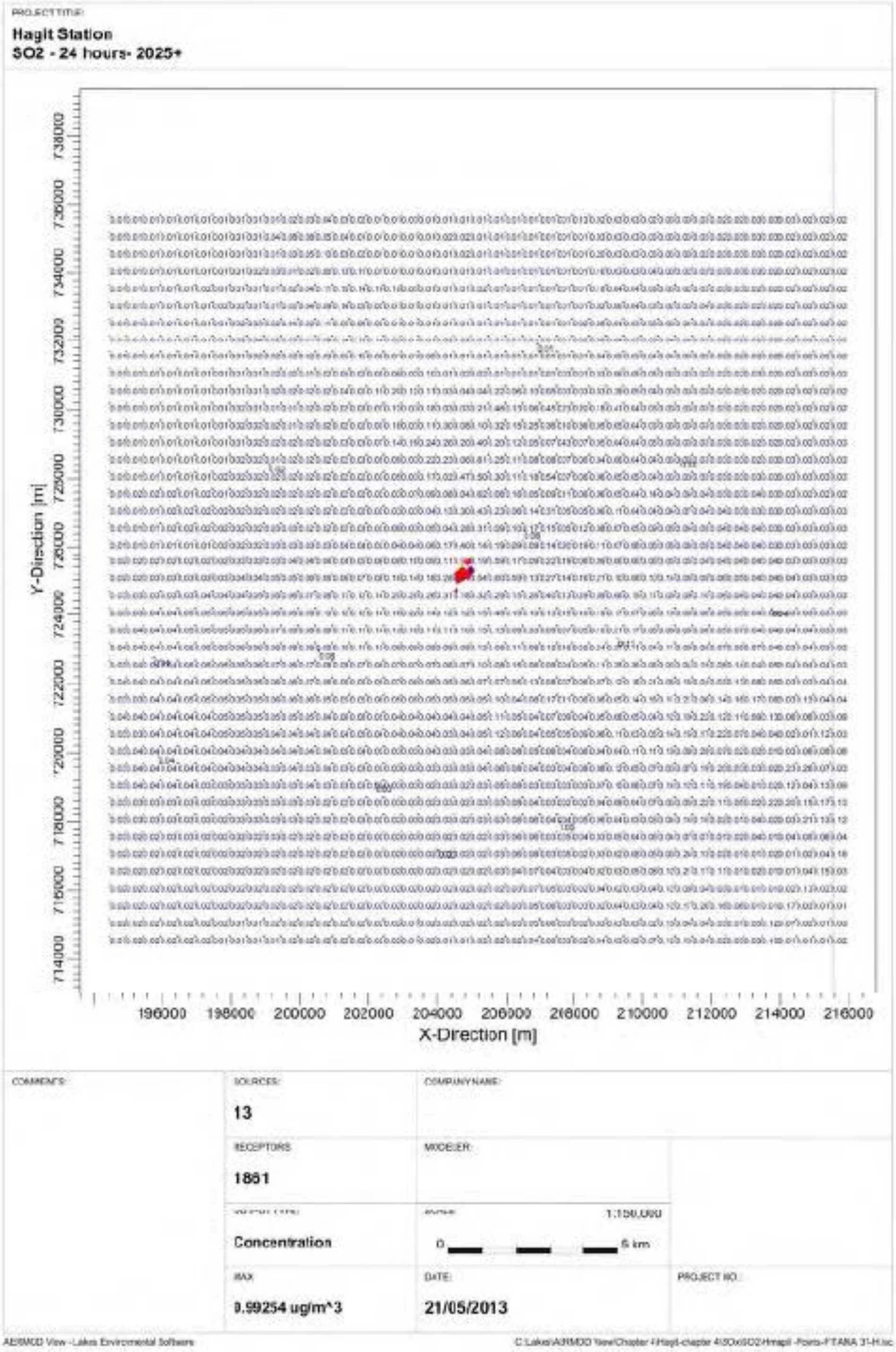
Lattice map of sulfur dioxide (SO2) emissions 1-hour average for 2025+, emissions from natural gas-powered facilities and diesel engines



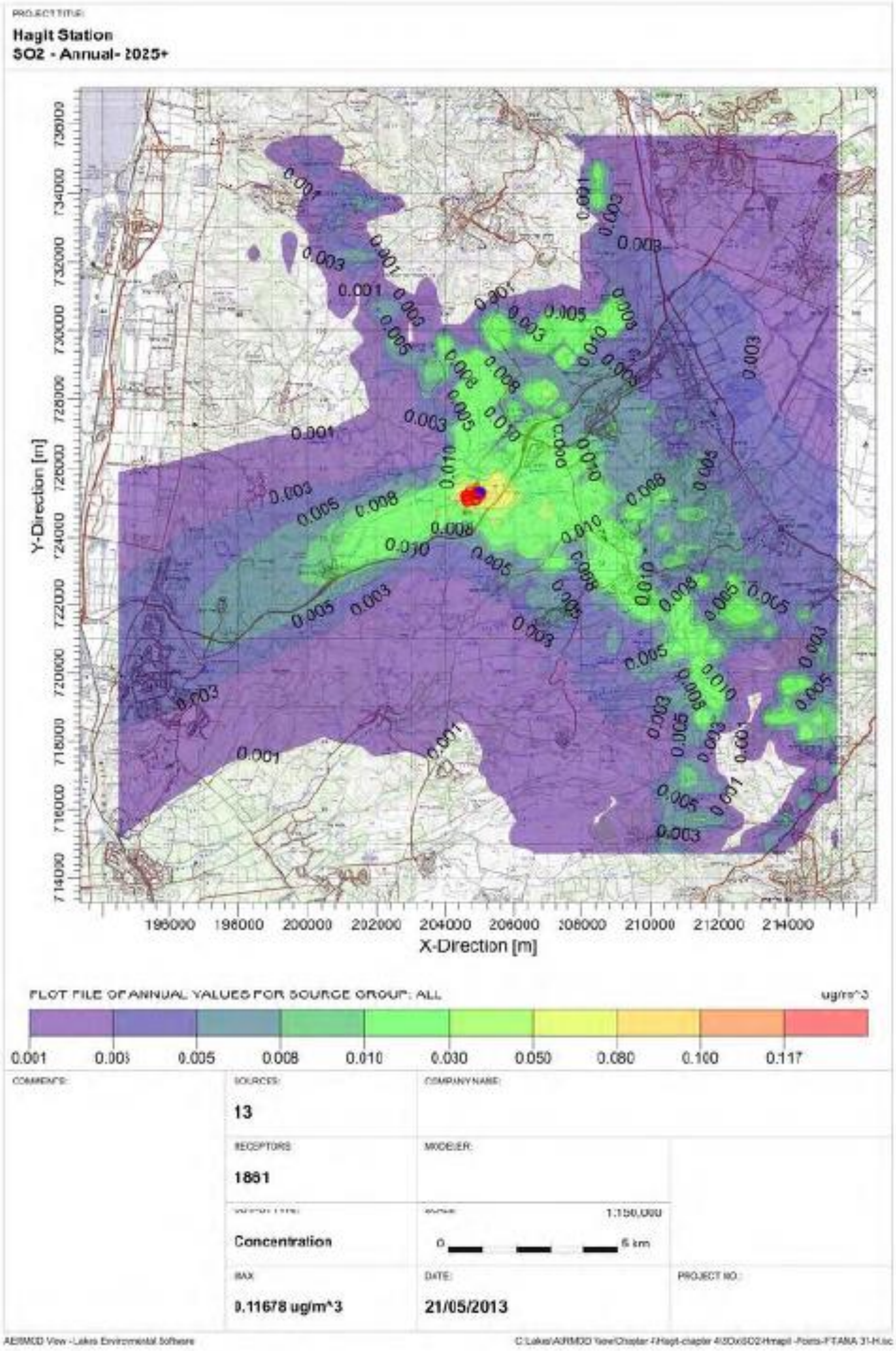
Isopleth map of sulfur dioxide (SO2) emissions 24-hour average for 2025+, emissions from natural gas-powered facilities and diesel engines



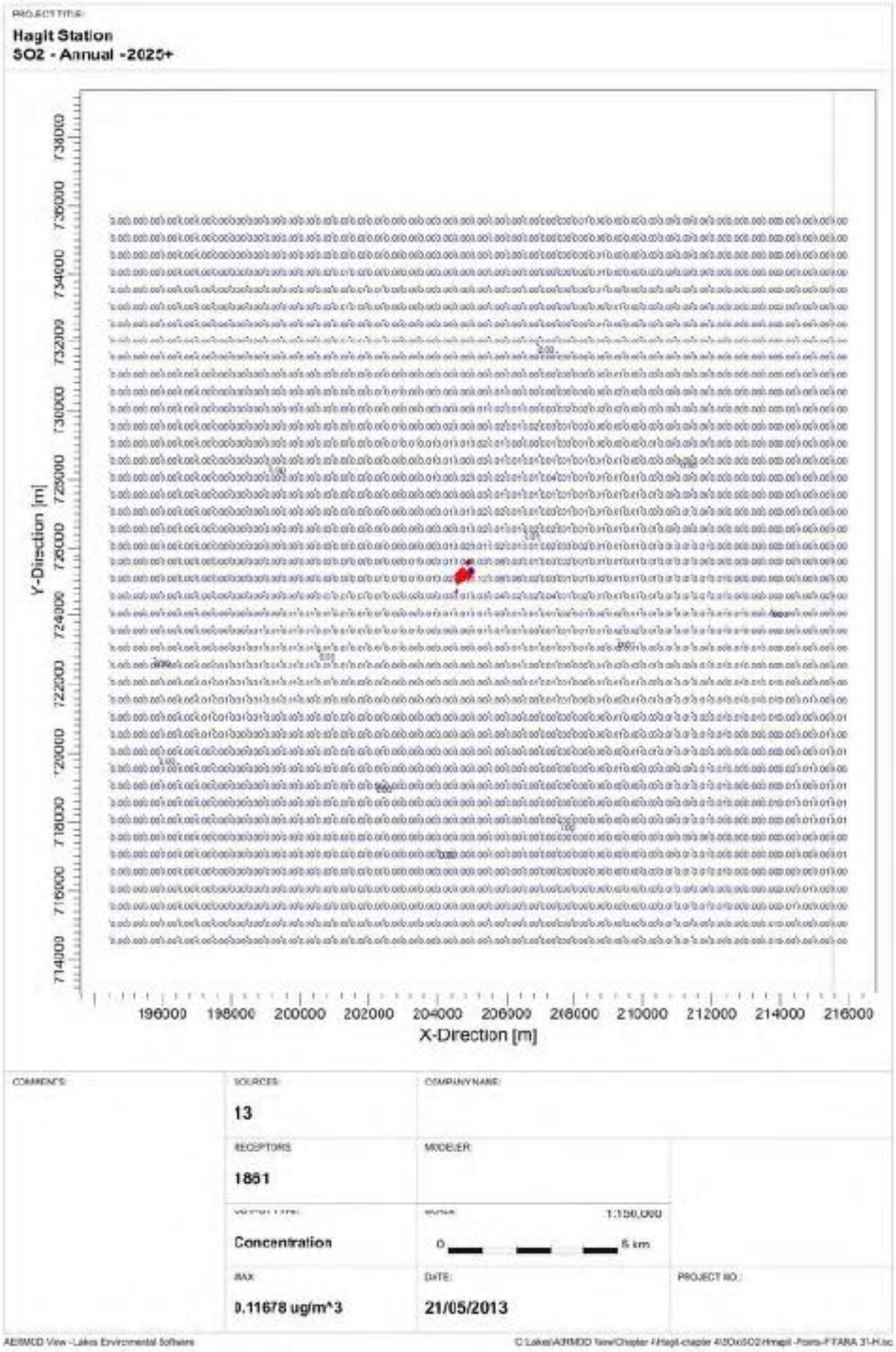
Lattice map of sulfur dioxide (SO2) emissions 24-hour average for 2025+, emissions from natural gas-powered facilities and diesel engines



Isopleth map of sulfur dioxide (SO2) emissions annual average for 2025+, emissions from natural gas-powered facilities and diesel engines

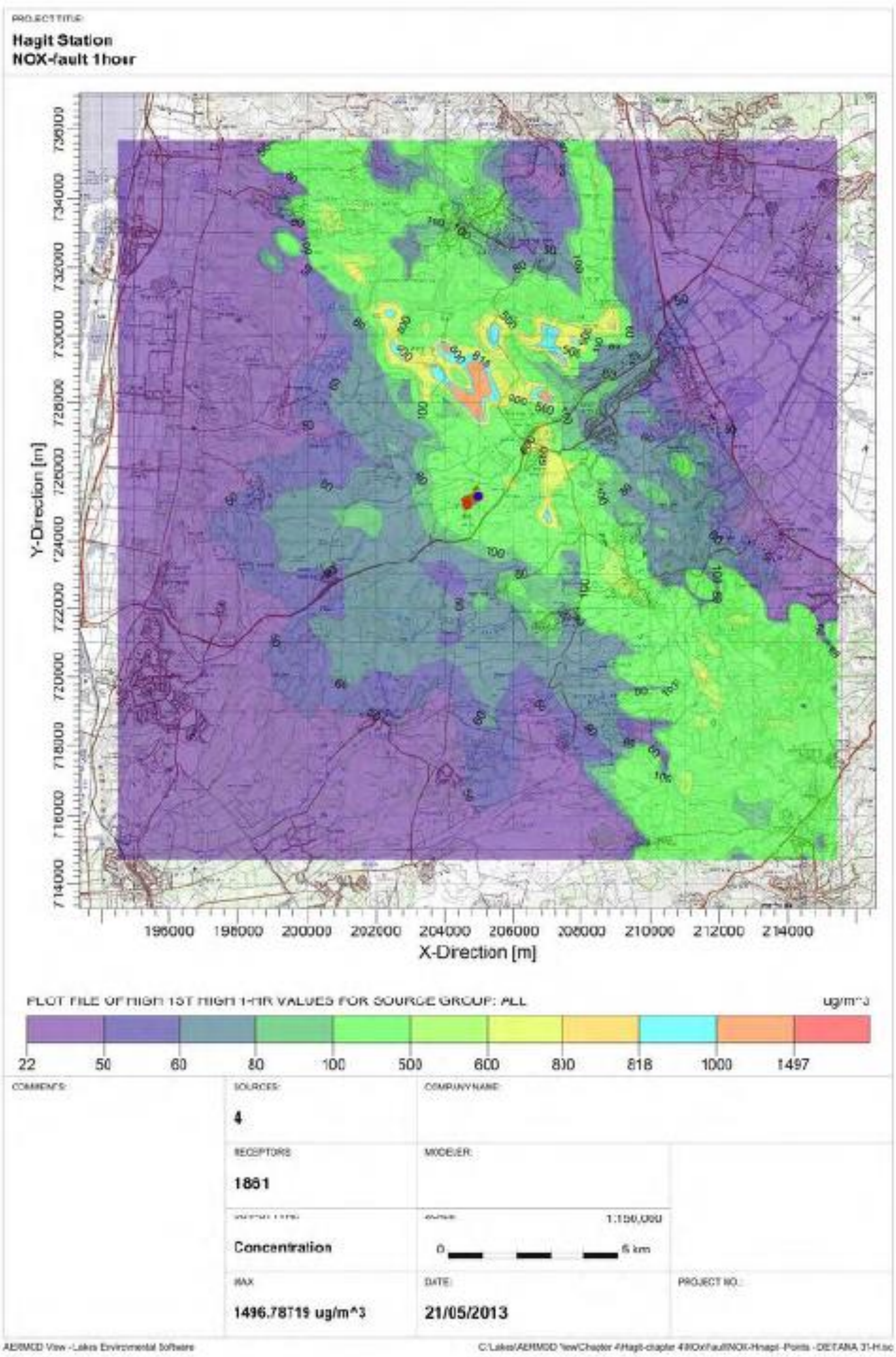


Lattice map of sulfur dioxide (SO_2) emissions annual average for 2025+, emissions from natural gas-powered facilities and diesel engines



Results of running an operational fault model

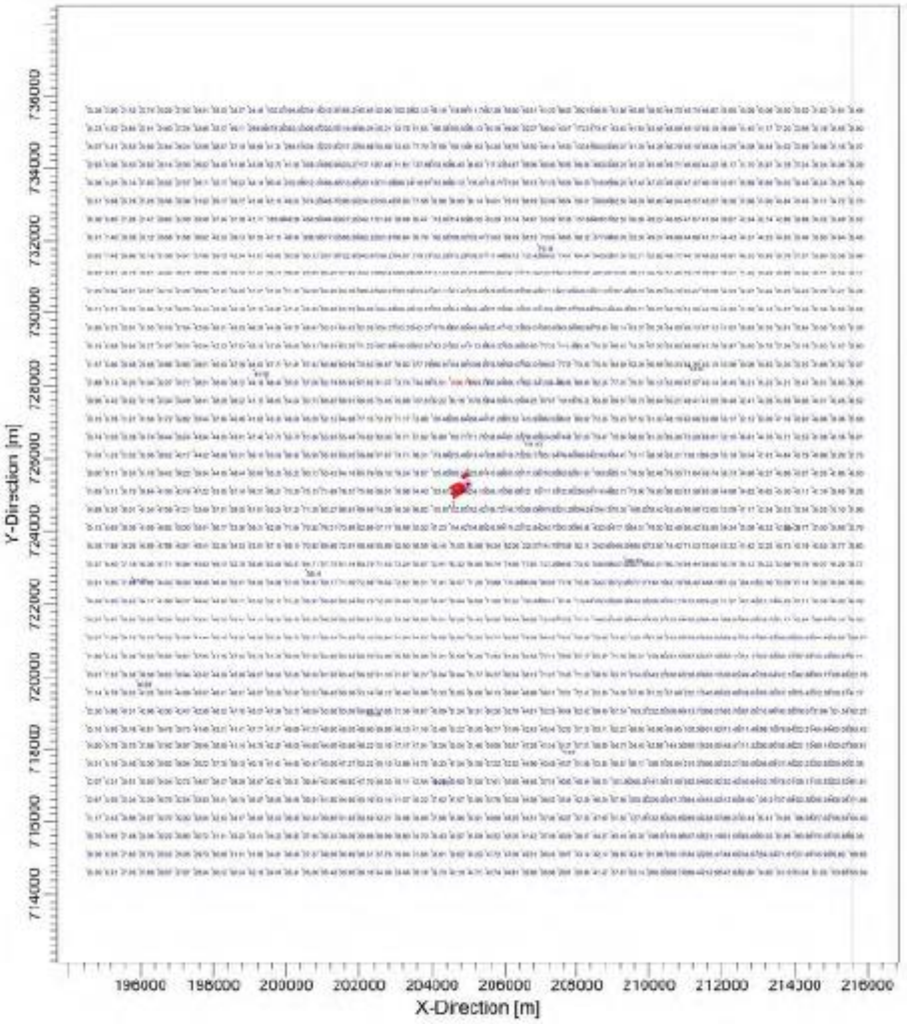
Isopleth map of nitrogen oxide(NOx) emissions, 1-hour average for operational fault, emissions from flare and diesel engines



Lattice map of nitrogen oxide (NOx) emissions, 1-hour average for operational fault, emissions from flare and diesel engines

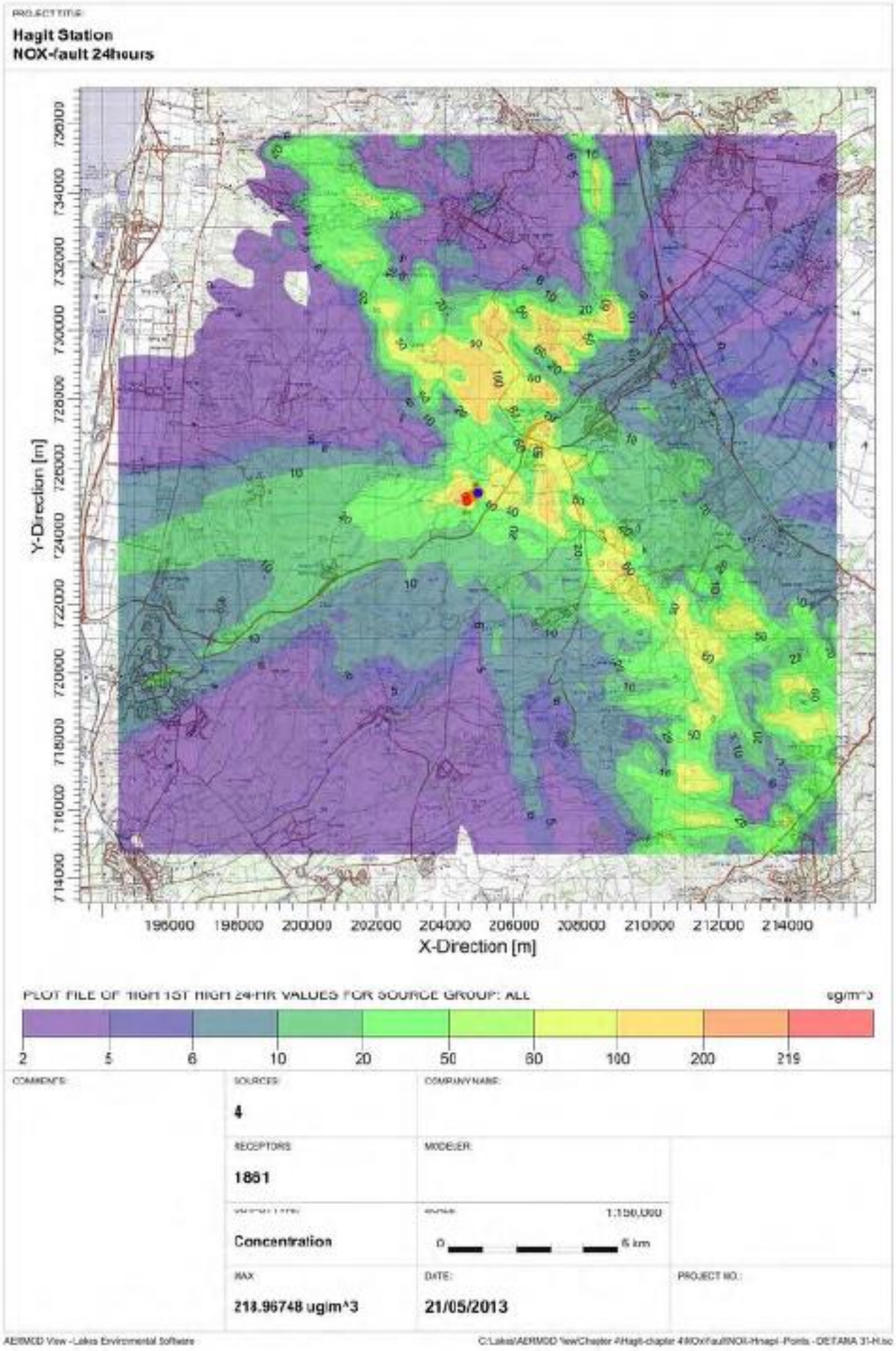
PROJECT TITLE:

Hagit Station
NOX-fault 1hr

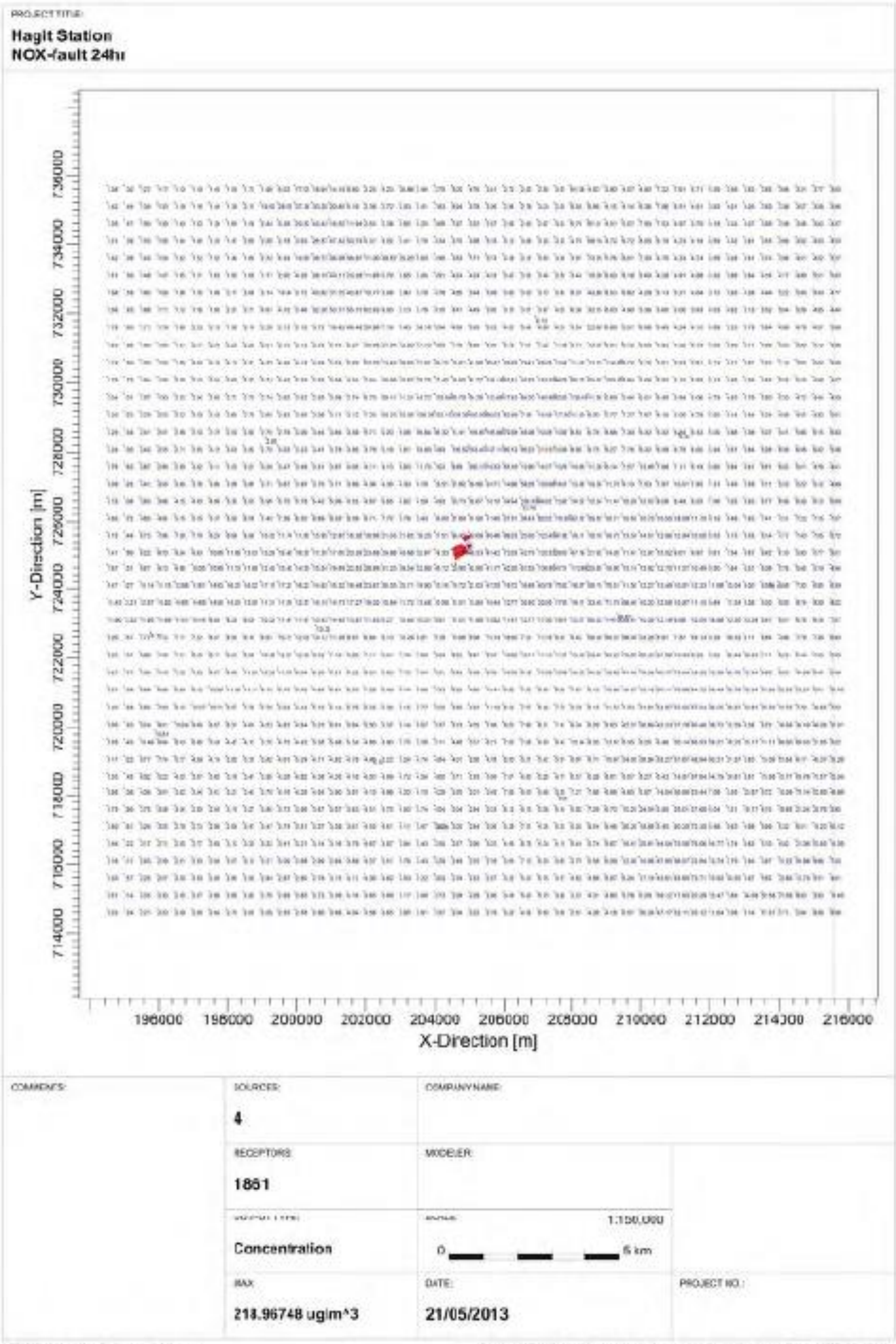


COMMENTS:	SOURCES: **4**	COMPANY NAME:	
	RECEPTORS: **1861**	MODELER:	
	OUTPUT TYPE: **Concentration**	SCALE: 1:150,000 0 5 km	
	MAX: **1496.78719 ug/m^3**	DATE: **21/05/2013**	PROJECT NO.:

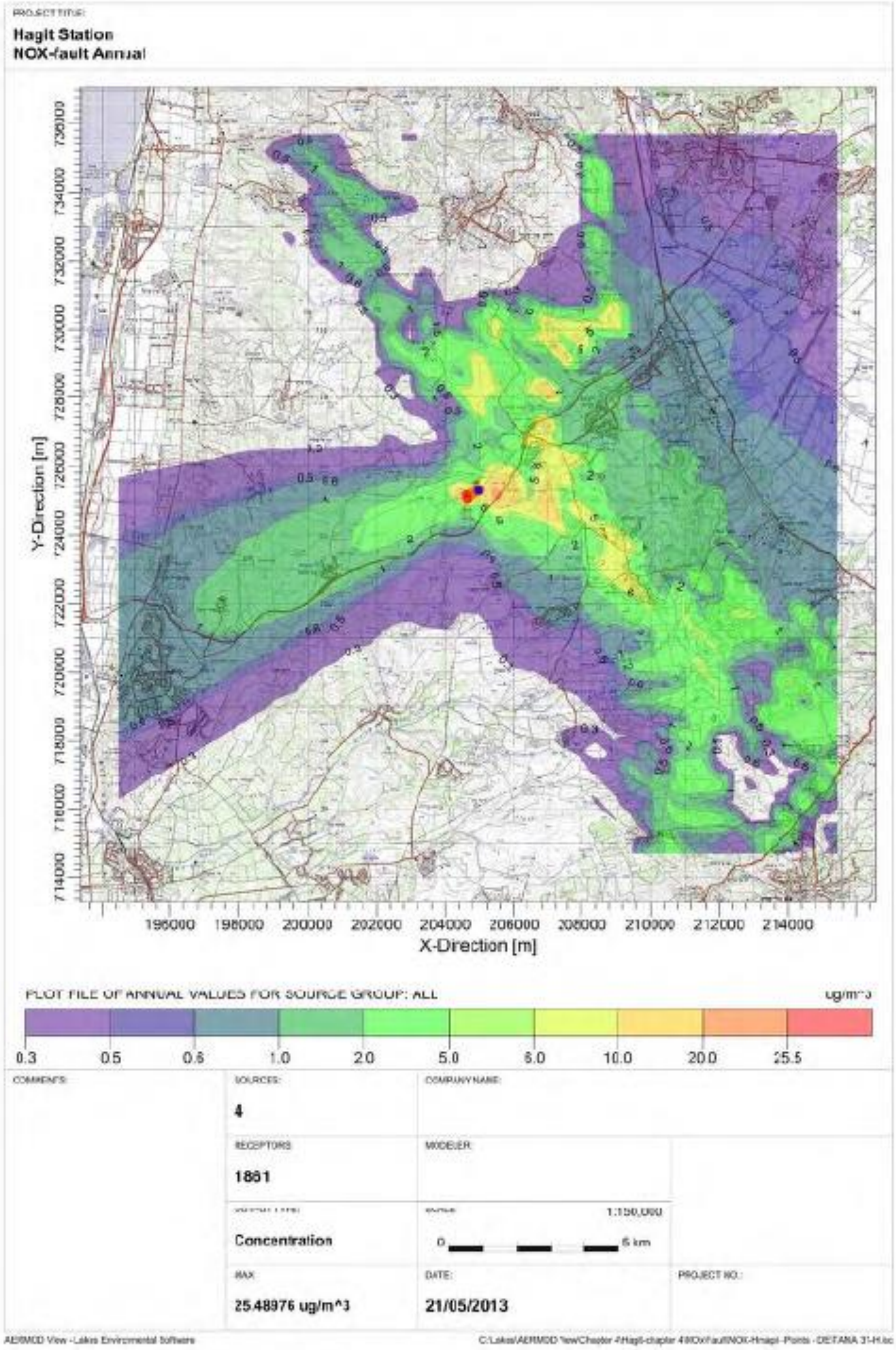
Isopleth map of nitrogen oxide (NOx) emissions, 24-hour average for operational fault, emissions from flare and diesel engines



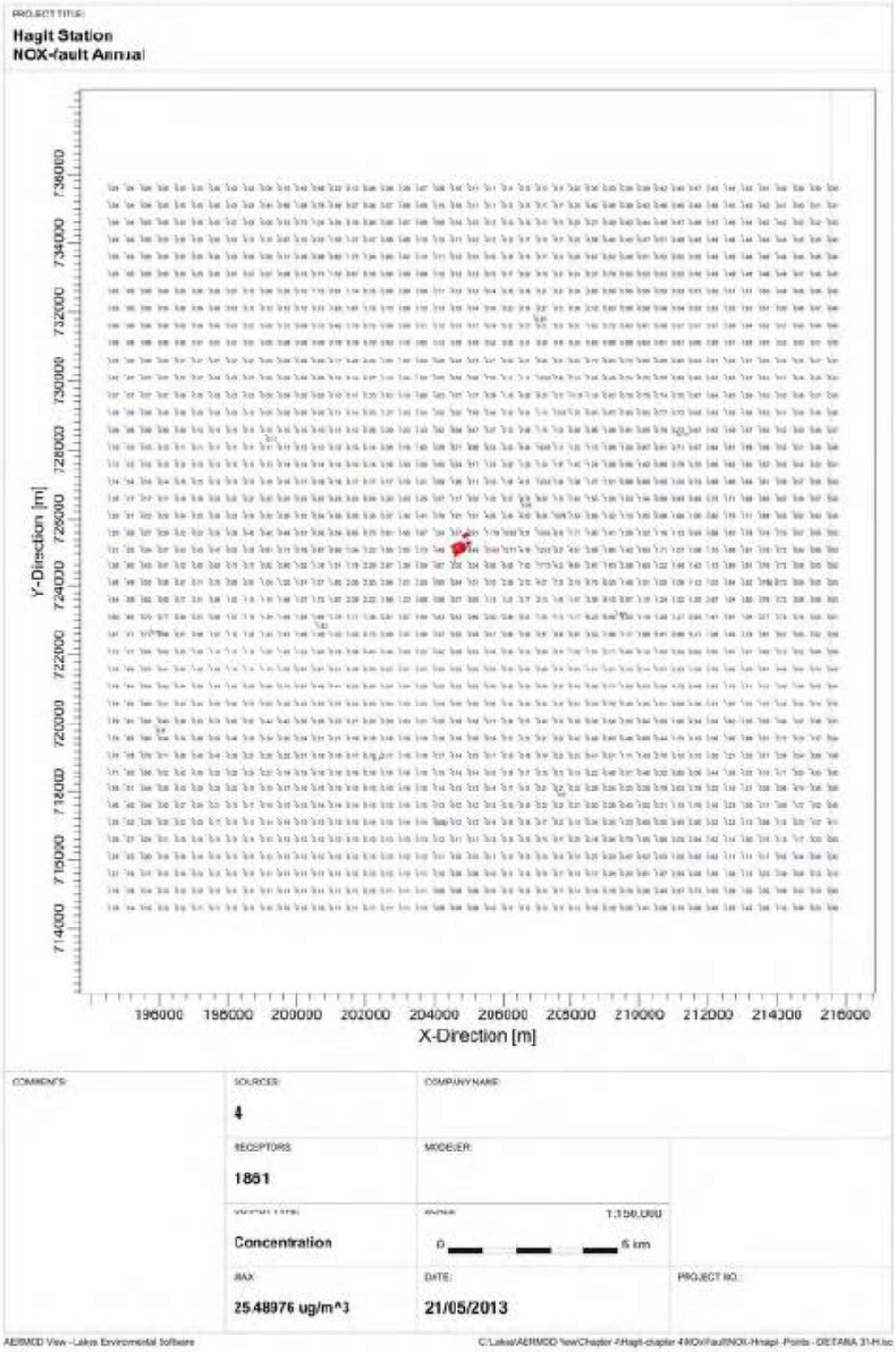
Lattice map of nitrogen oxide (NOx) emissions, 24-hour average for operational fault, emissions from flare and diesel engines



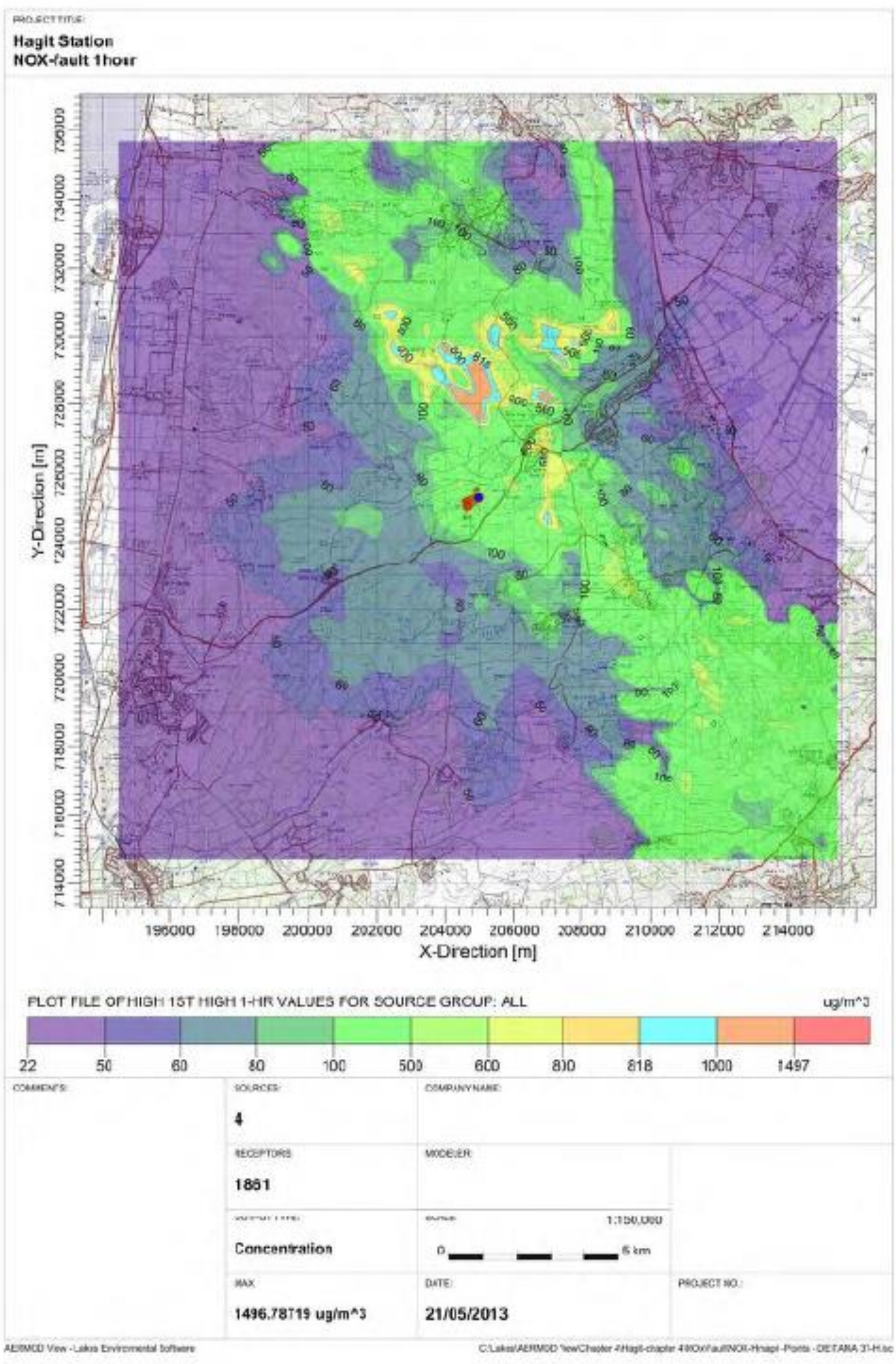
Isopleth map of nitrogen oxide (NOx) emissions, annual average for operational fault, emissions from flare and diesel engines



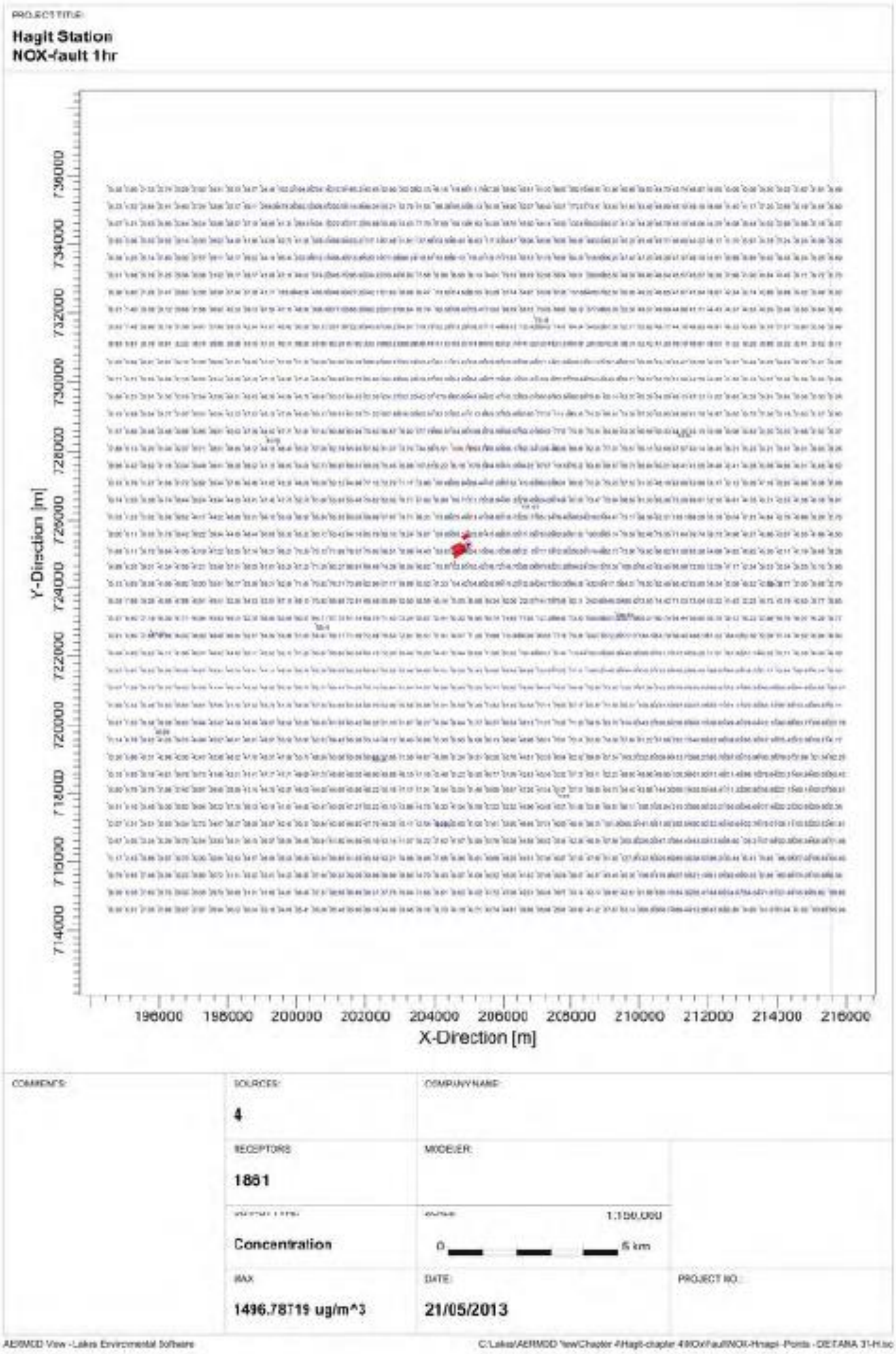
Lattice map of nitrogen oxide (NOx) emissions, annual average for operational fault, emissions from flare and diesel engines



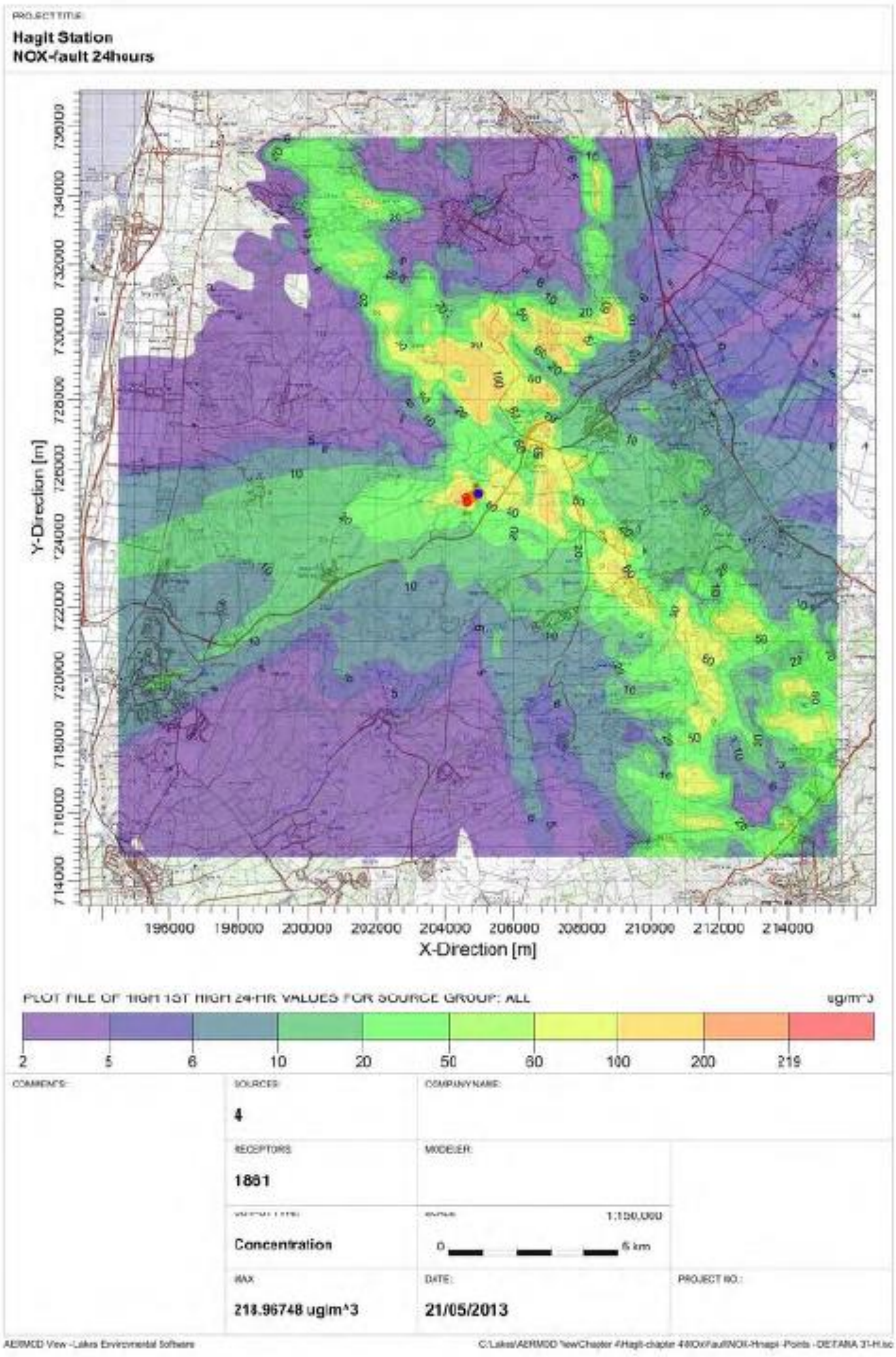
Isopleth map of nitrogen oxide (NOx) emissions, 1-hour average for operational fault, background emissions (points) and emissions from flare and diesel engines



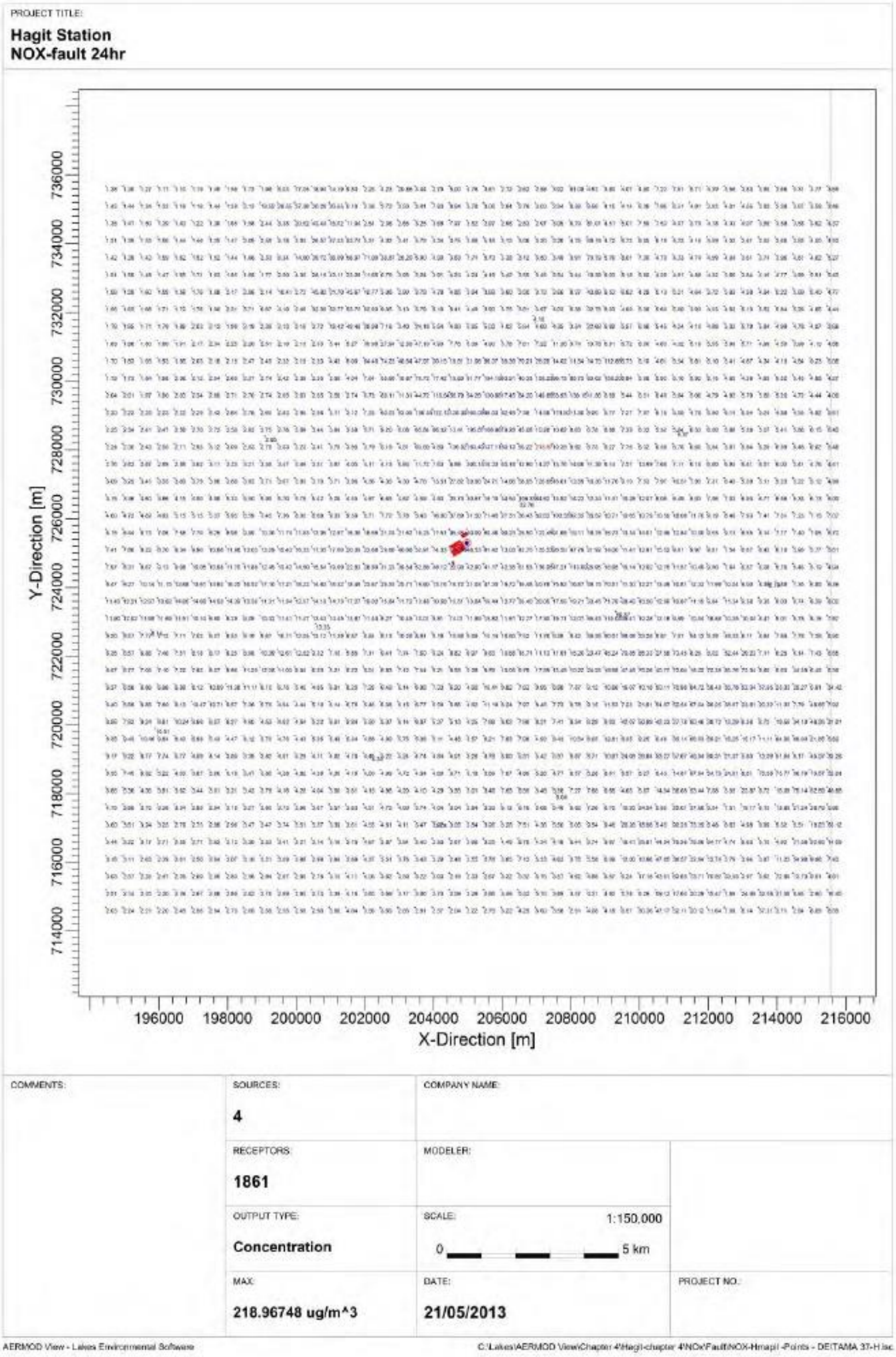
Lattice map of nitrogen oxide (NOx) emissions, 1-hour average for operational fault, background emissions (points) and emissions from flare and diesel engines



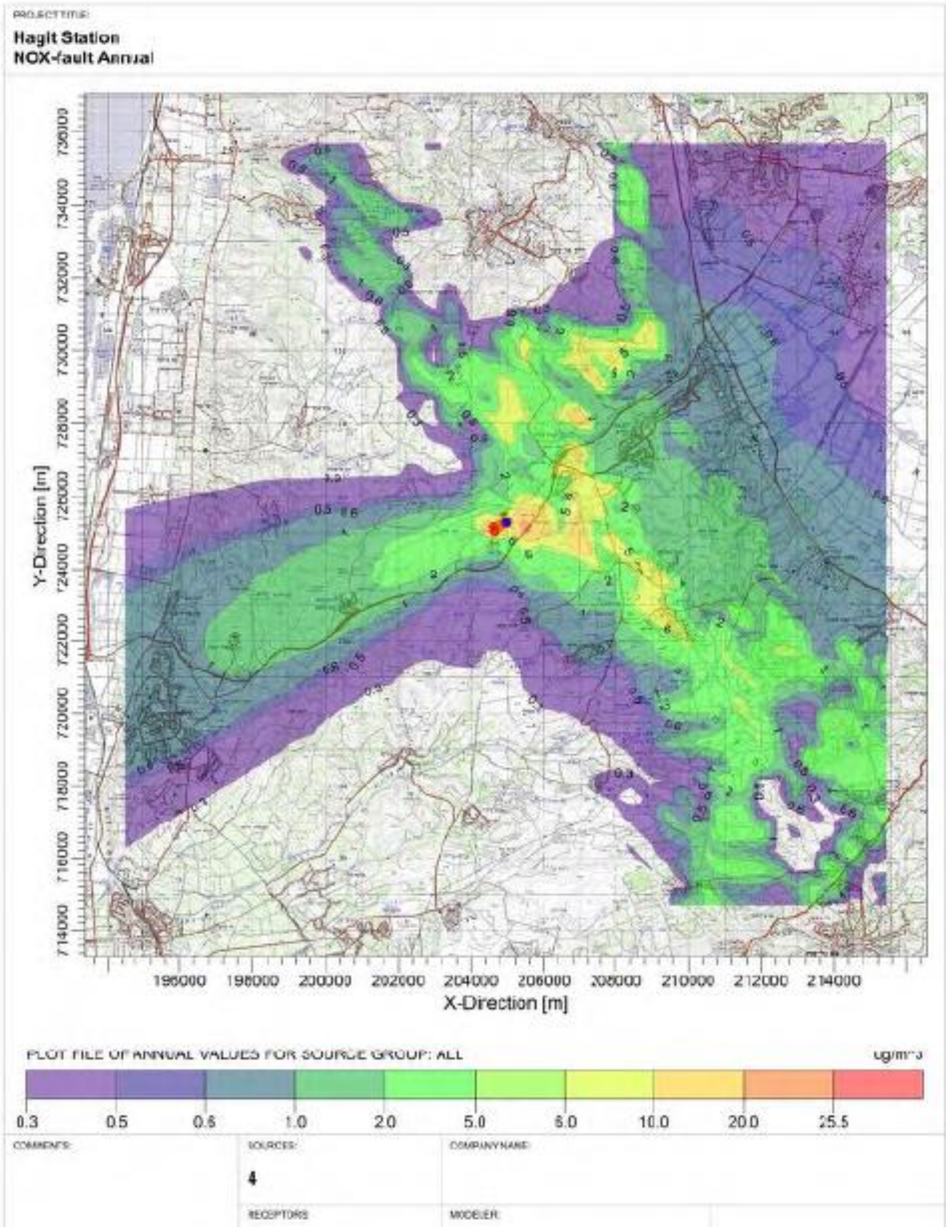
Isopleth map of nitrogen oxide (NOx) emissions, 24-hour average for operational fault, background emissions (points) and emissions from flare and diesel engines



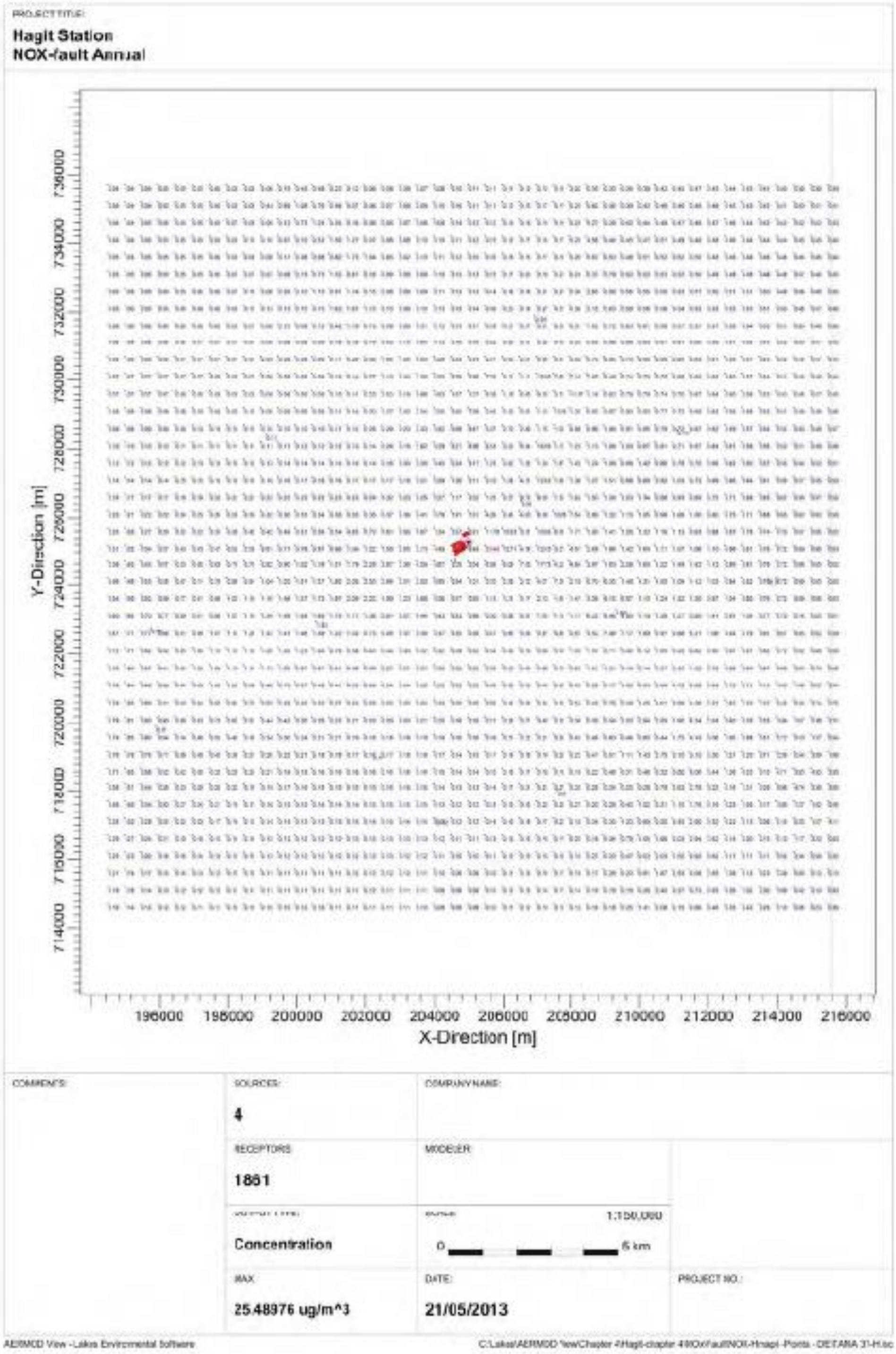
Lattice map of nitrogen oxide (NOx) emissions, 24-hour average for operational fault, background emissions (points) and emissions from flare and diesel engines



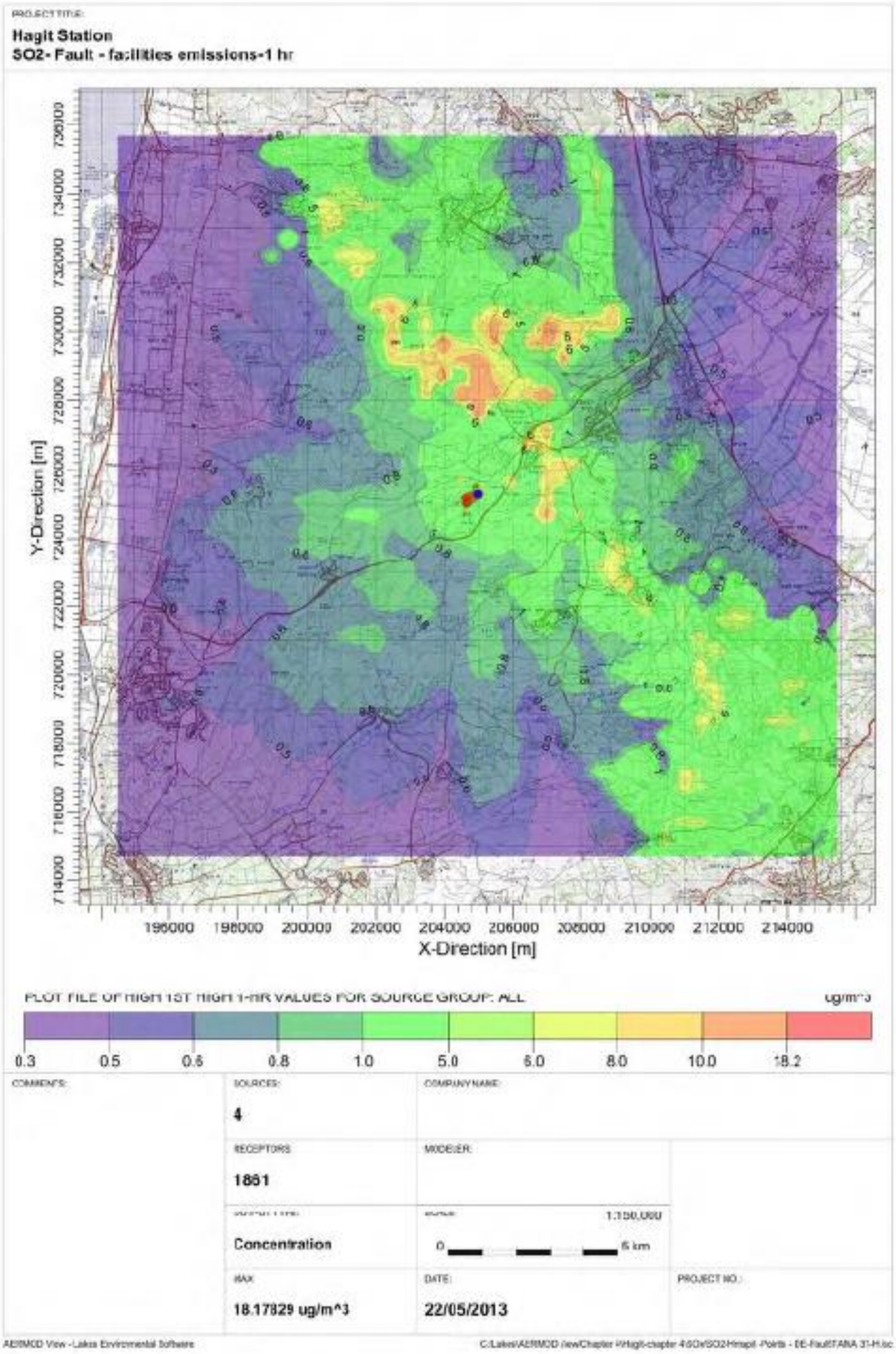
Isopleth map of nitrogen oxide (NOx) emissions, annual average for operational fault, background emissions (points) and emissions from flare and diesel engines



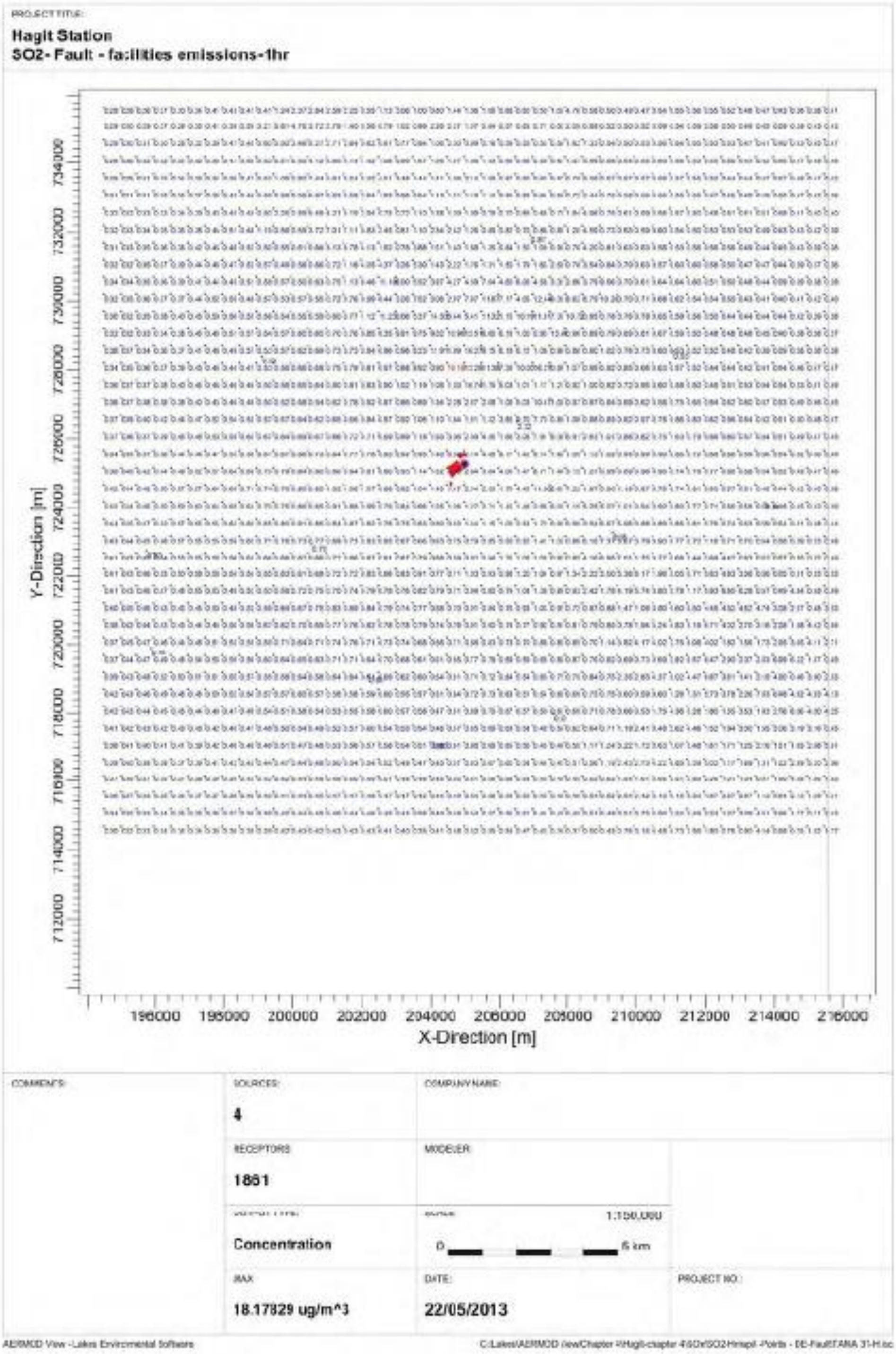
Lattice map of nitrogen oxide (NOx) emissions, annual average for operational fault, background emissions (points) and emissions from flare and diesel engines



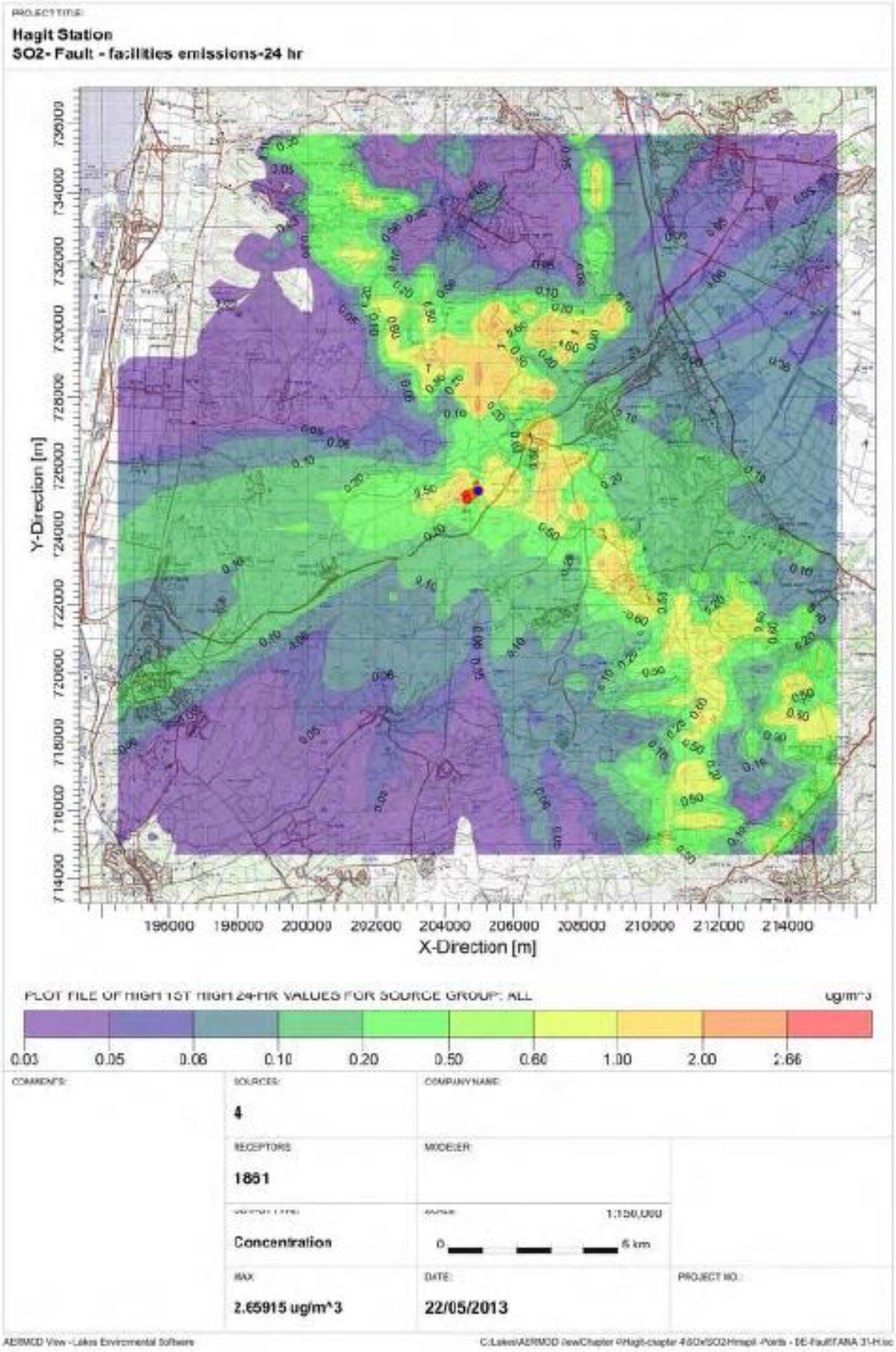
Isopleth map of sulfur dioxide(SO_2) emissions, 1-hour average for operational fault, emissions from flare and diesel engines



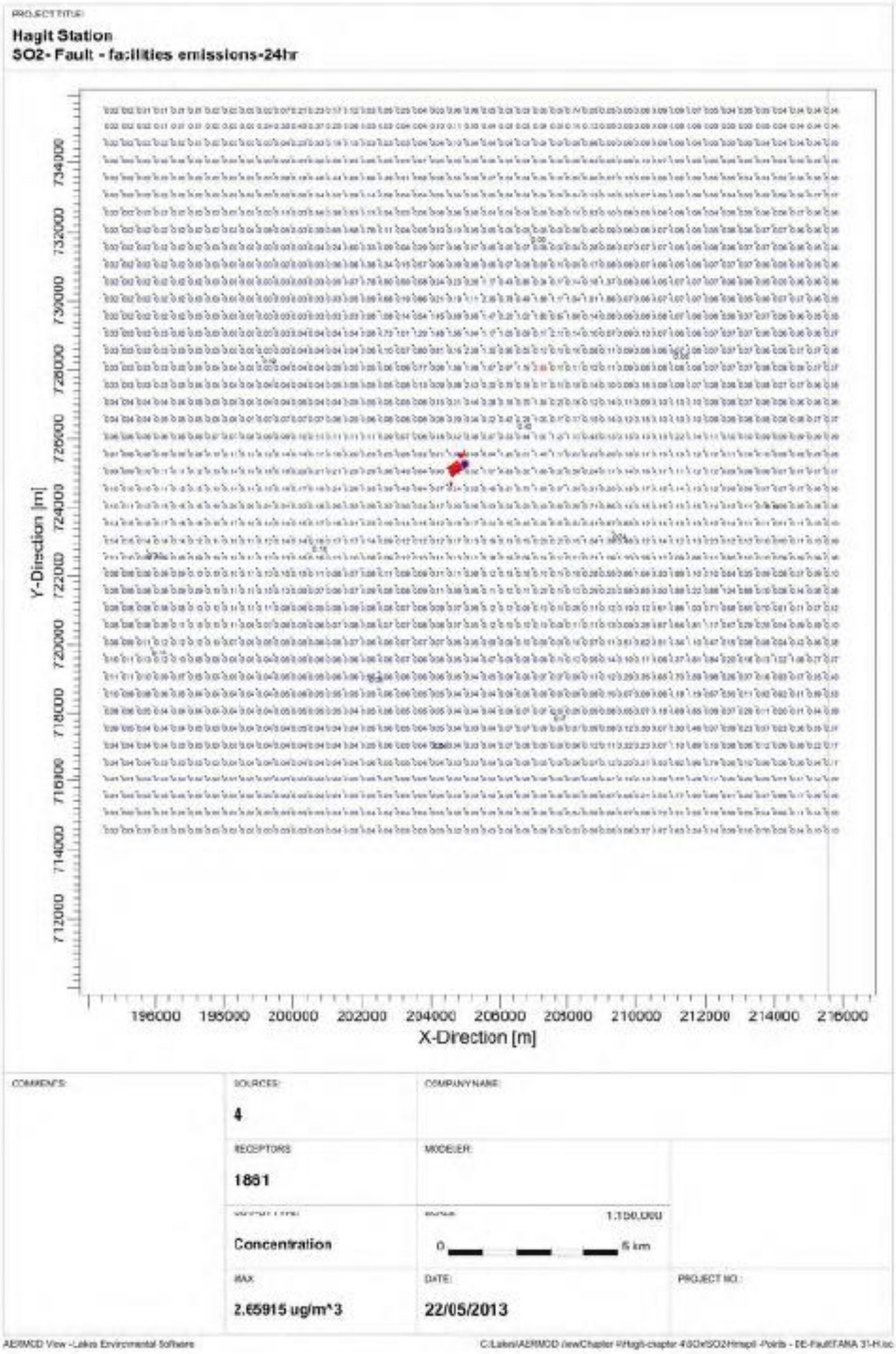
Lattice map of sulfur dioxide (SO_2) emissions,1-hour average for operational fault, emissions from flare and diesel engines



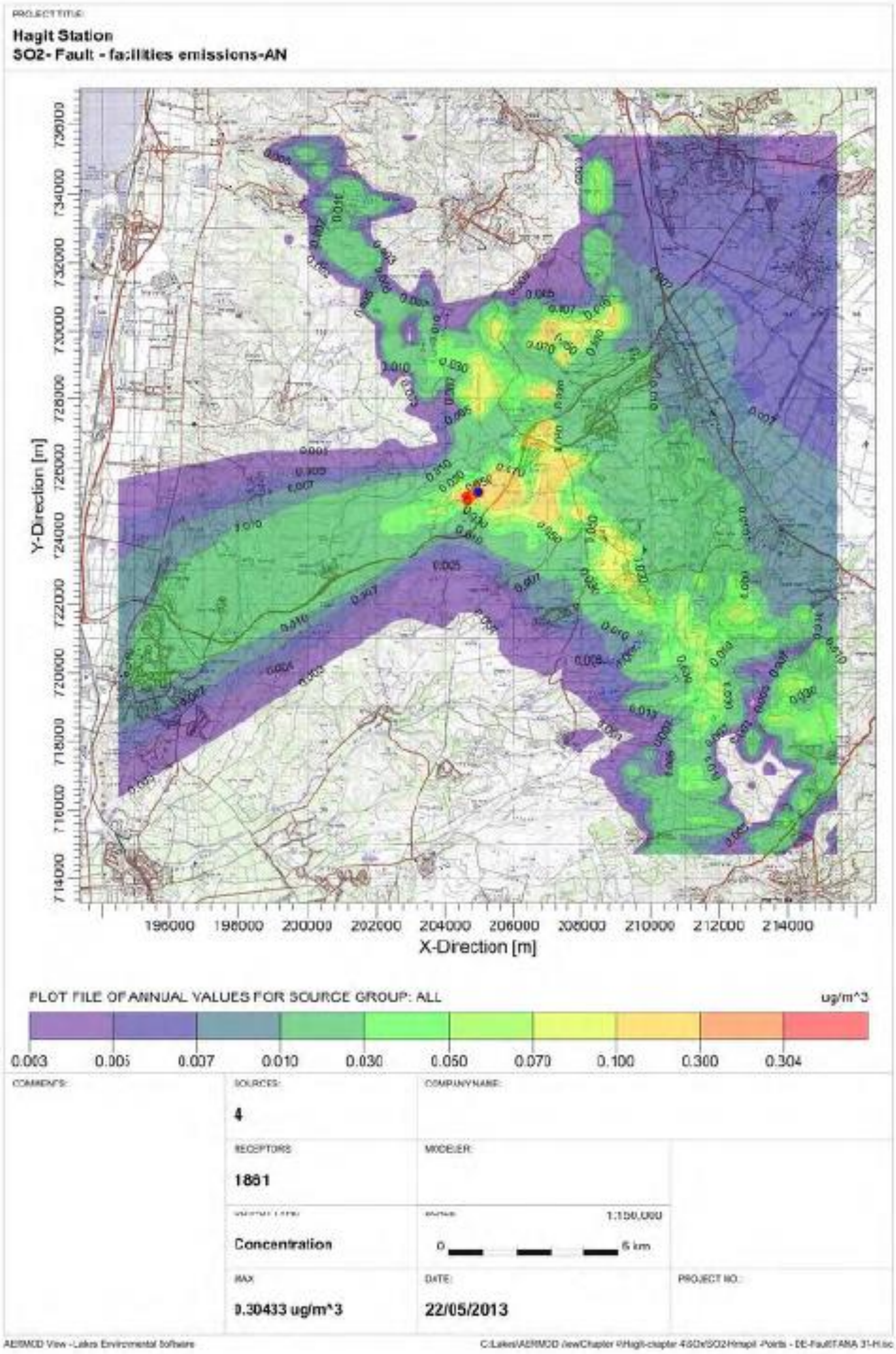
Isopleth map of sulfur dioxide (SO_2) emissions,24-hour average for operational fault, emissions from flare and diesel engines



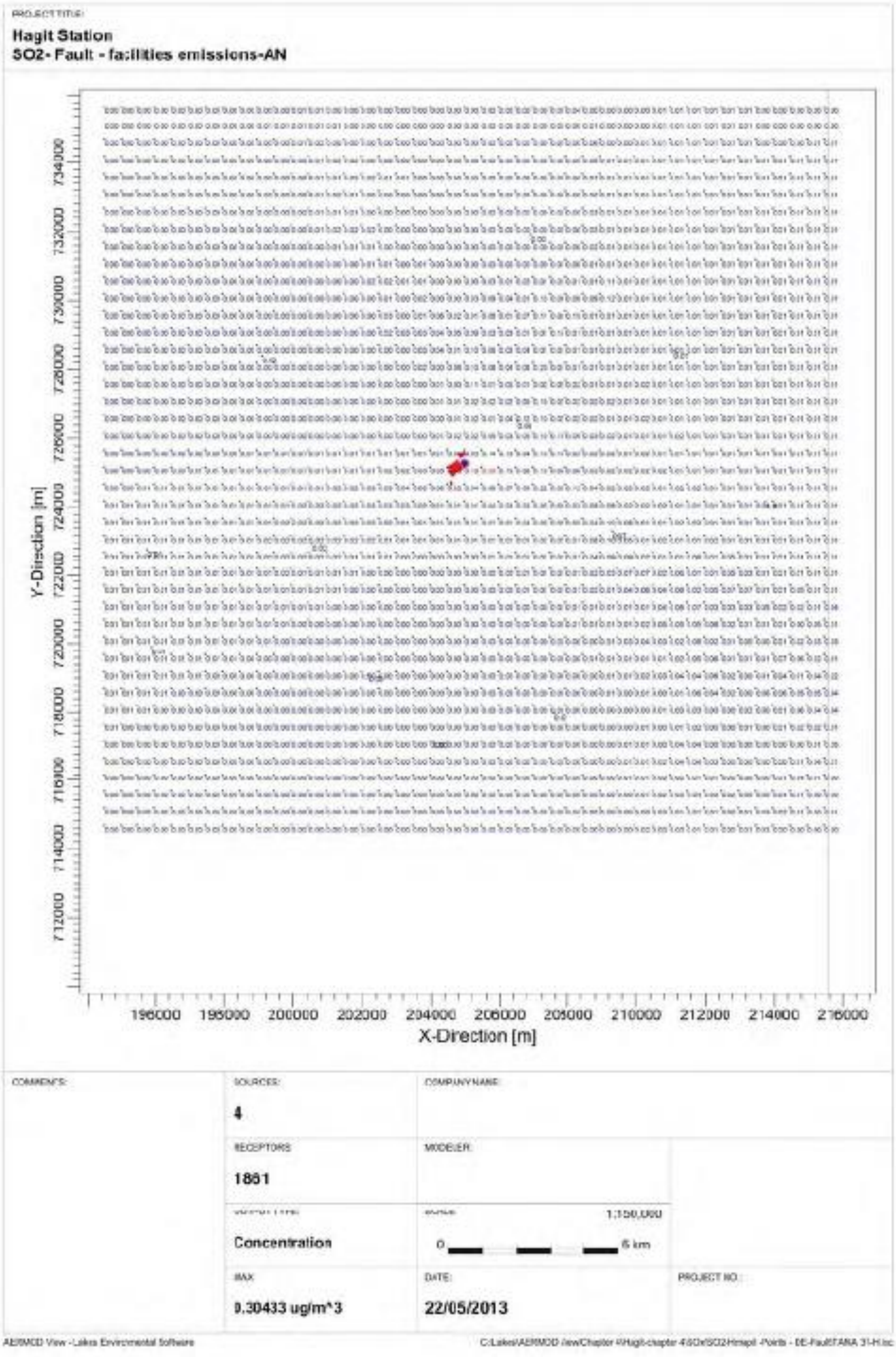
Lattice map of sulfur dioxide (SO_2) emissions,24-hour average for operational fault, emissions from flare and diesel engines



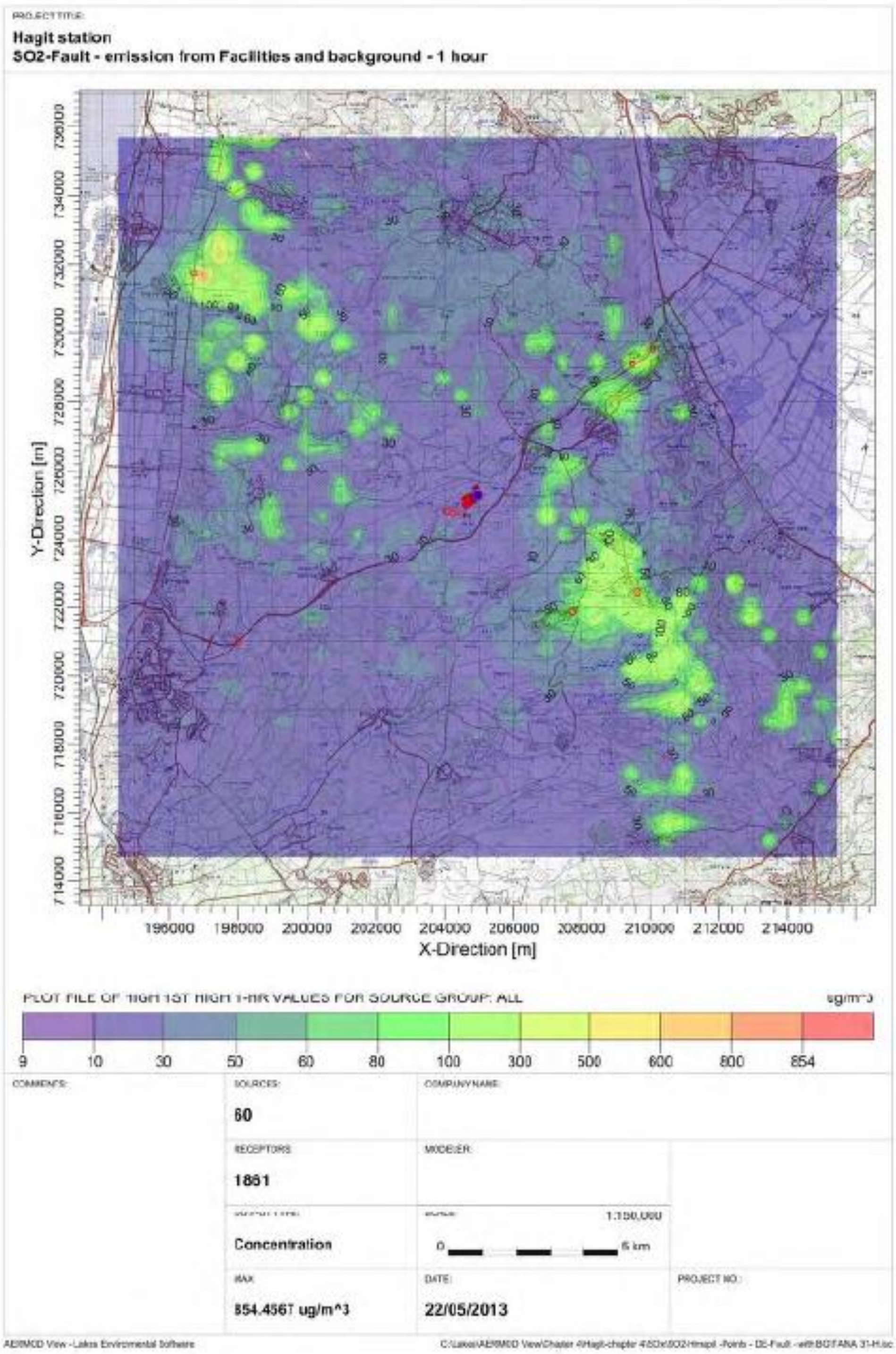
Isopleth sulfur dioxide (SO_2) emissions, annual average for operational fault, emissions from flare and diesel engines



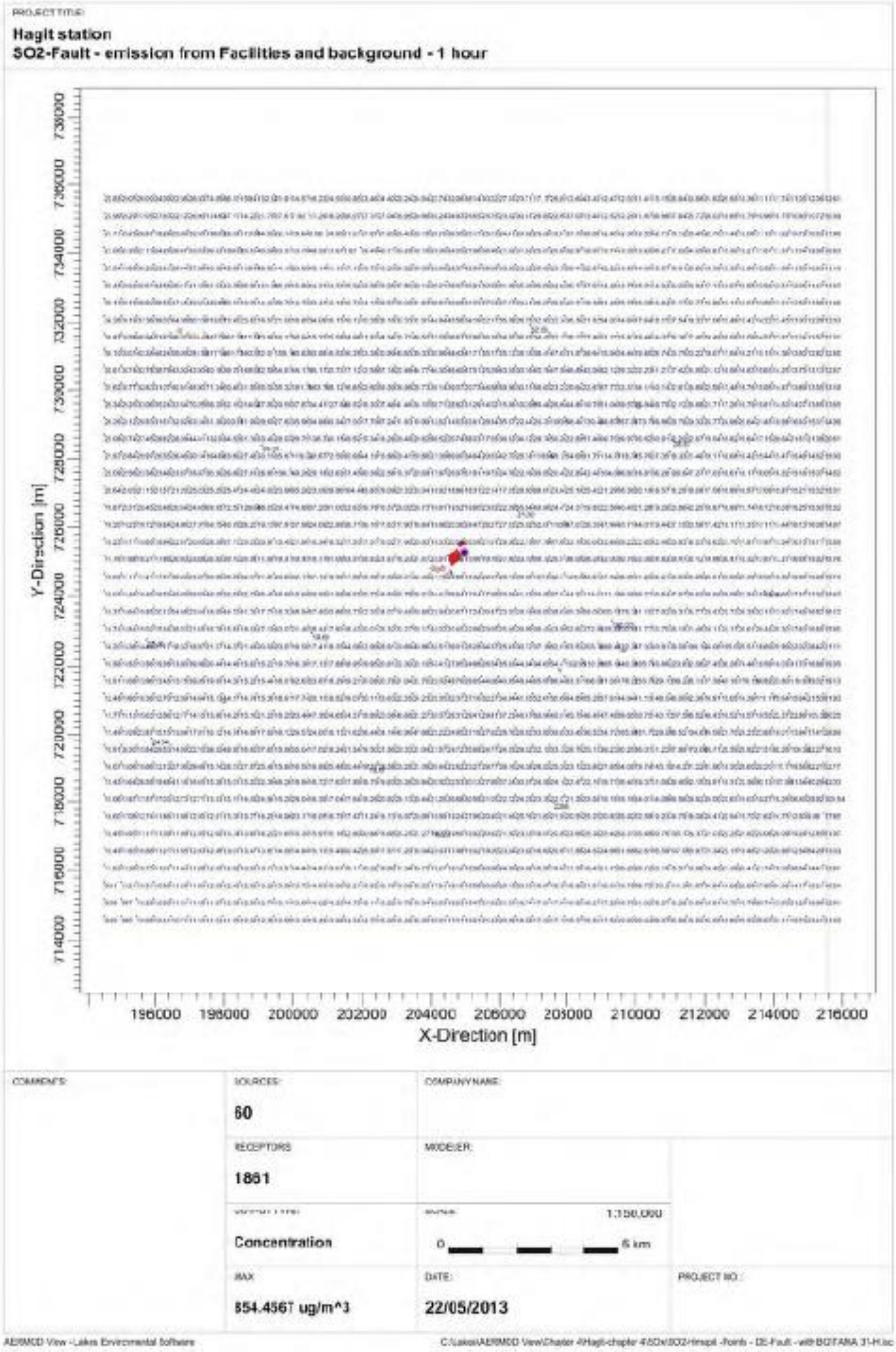
Lattice map of sulfur dioxide (SO_2) emissions, annual average for operational fault, emissions from flare and diesel engines



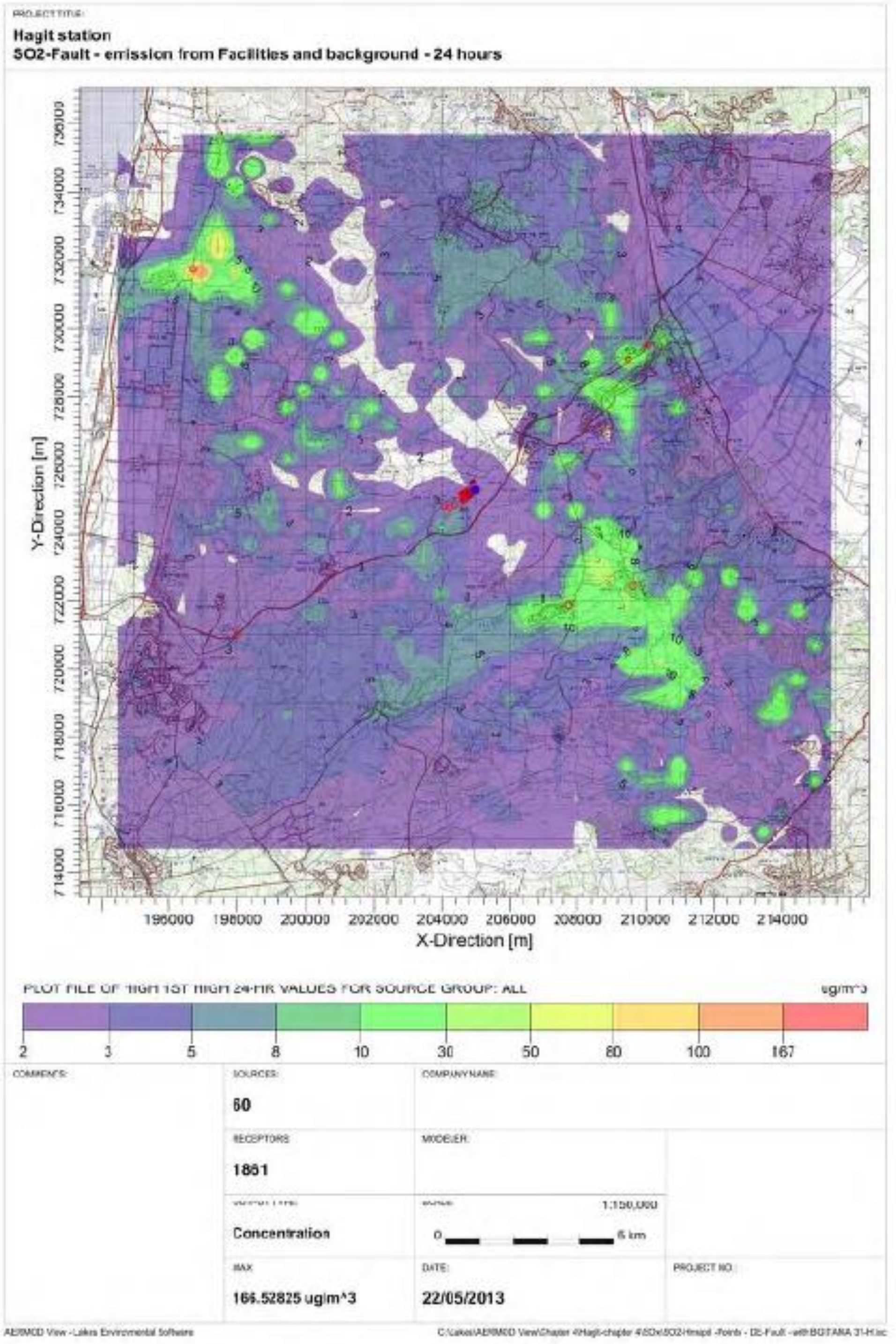
Isopleth map of sulfur dioxide (SO_2) emissions,1-hour average for operational fault, background emissions (points) and emissions from flare and diesel engines



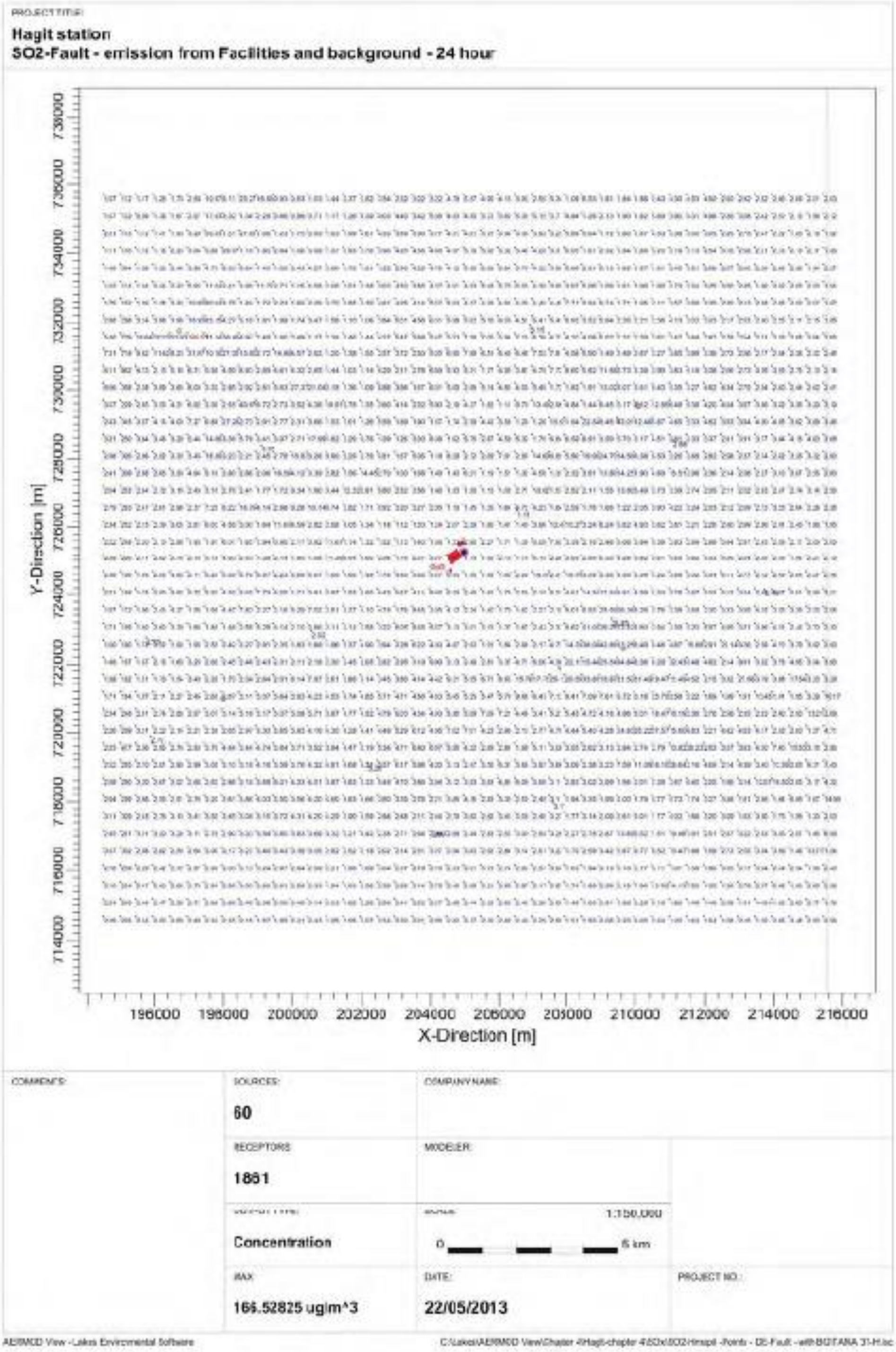
Lattice map of sulfur dioxide (SO_2) emissions,1-hour average for operational fault, background emissions (points) and emissions from flare and diesel engines



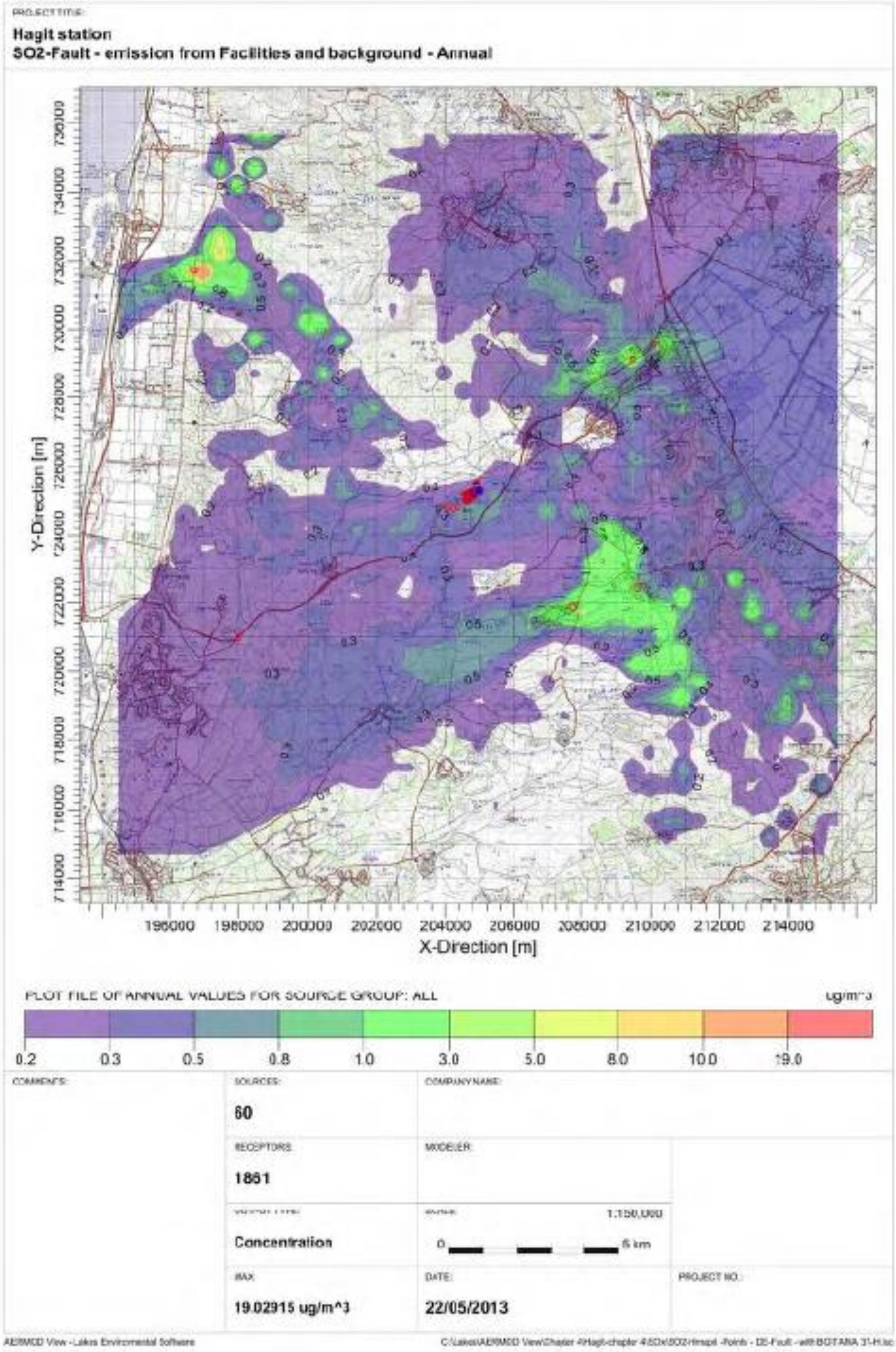
Isopleth map of sulfur dioxide (SO_2) emissions,24-hour average for operational fault, background emissions (points) and emissions from flare and diesel engines



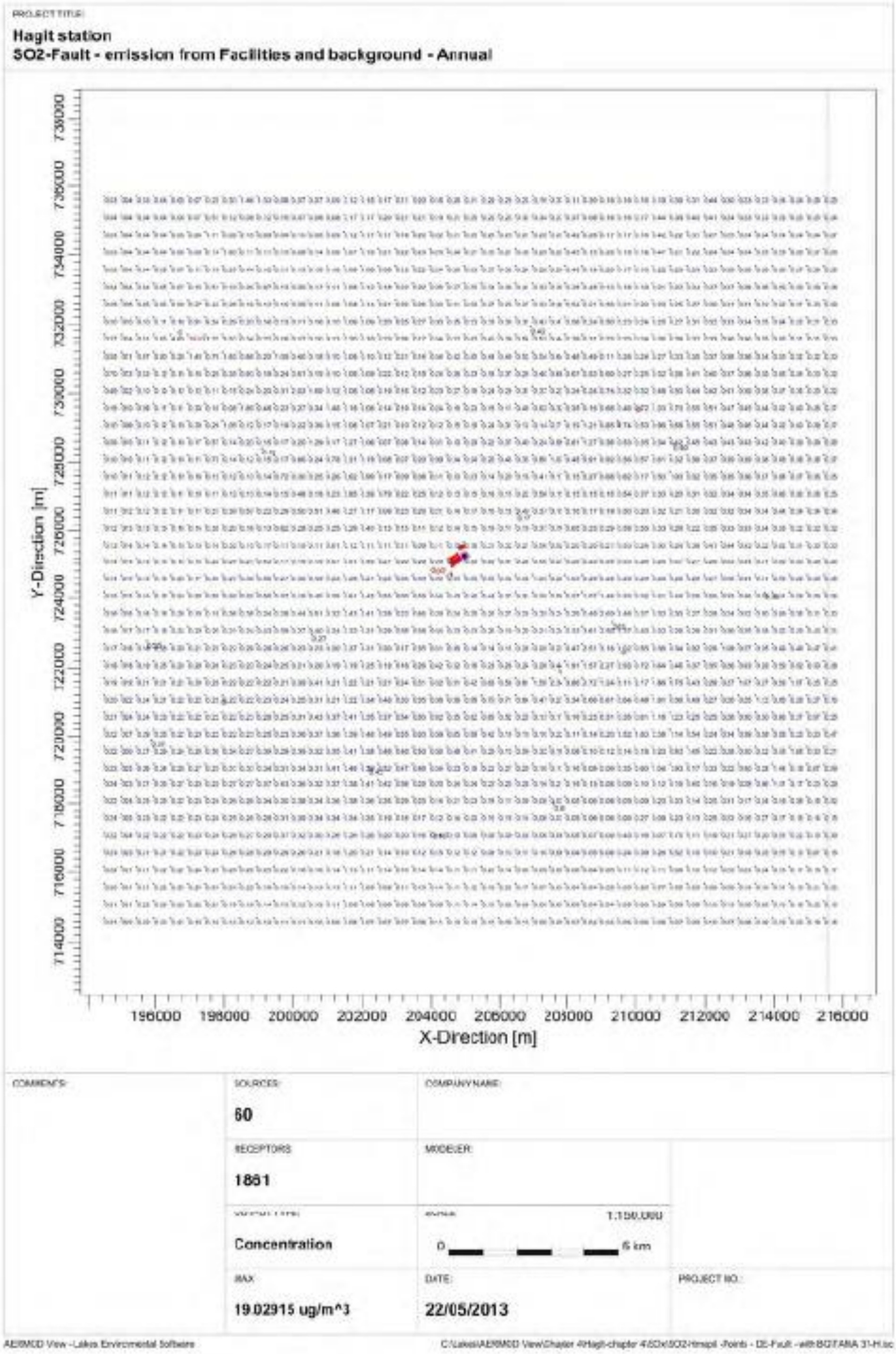
Lattice map of sulfur dioxide (SO_2) emissions,24-hour average for operational fault, background emissions (points) and emissions from flare and diesel engines



Isopleth sulfur dioxide (SO_2) emissions, annual average for operational fault, background emissions (points) and emissions from flare and diesel engines

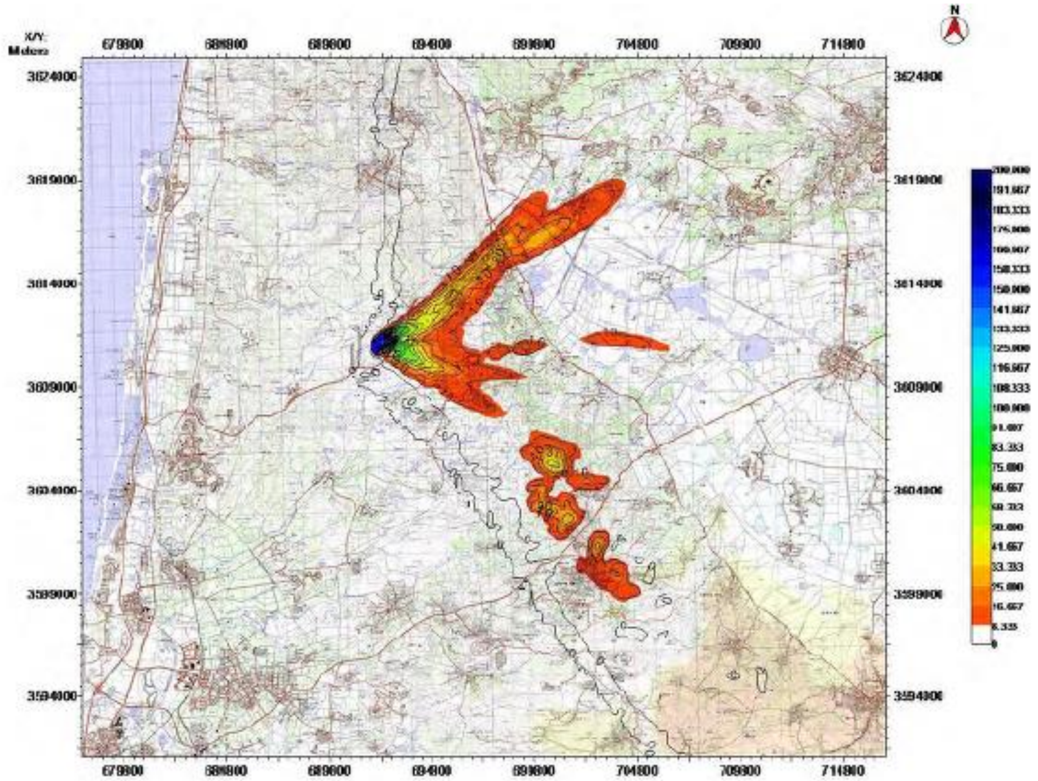


Lattice map of sulfur dioxide (SO_2) emissions, annual average for operational fault, background emissions (points) and emissions from flare and diesel engines



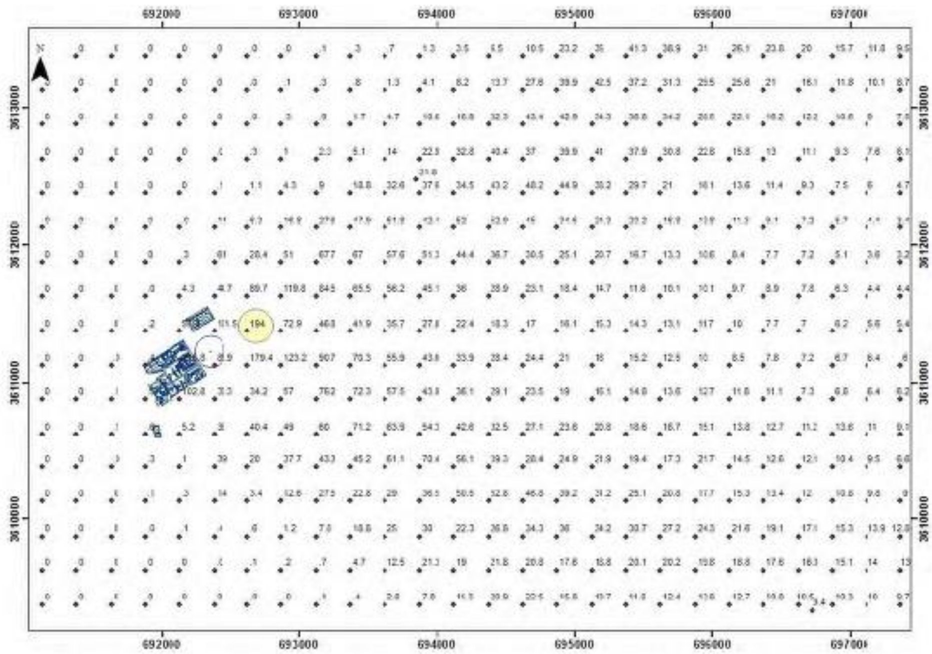
Results of running a CALPUFF model on an operational fault

Isopleth map of nitrogen oxide (NOx) emissions, half-hour average for operational fault, emissions from flare and diesel engines

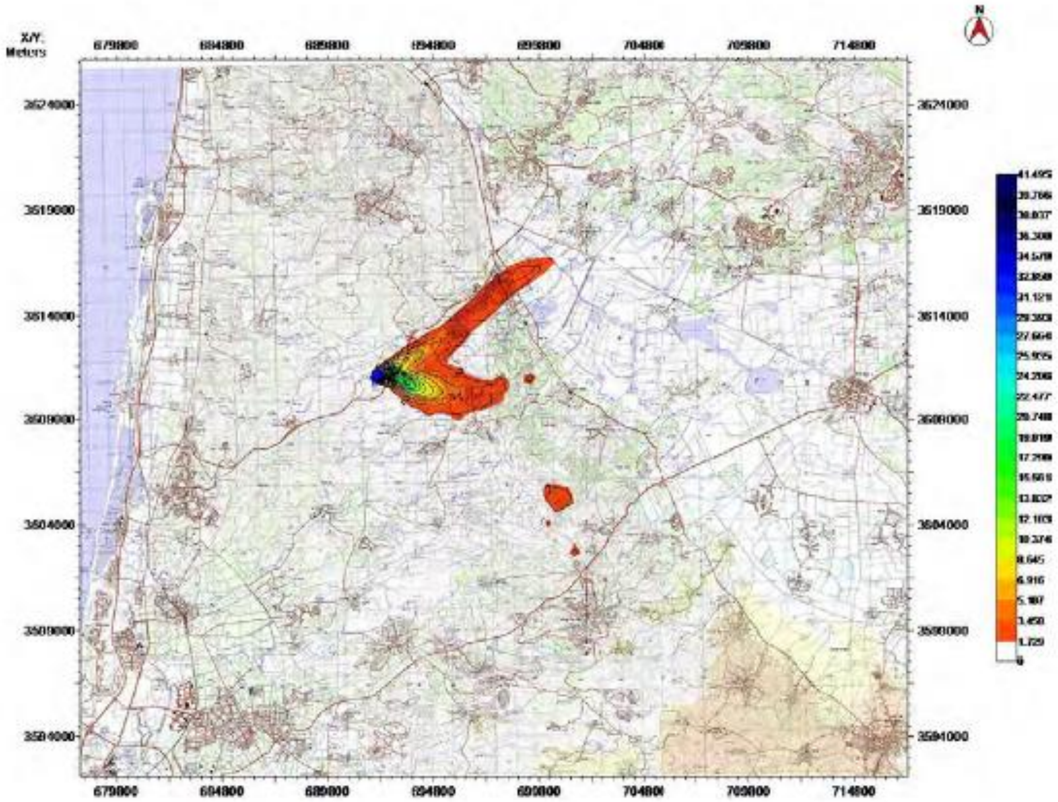


Lattice map of nitrogen oxide (NOx) emissions, half-hour average for operational fault, emissions from flare and diesel engines

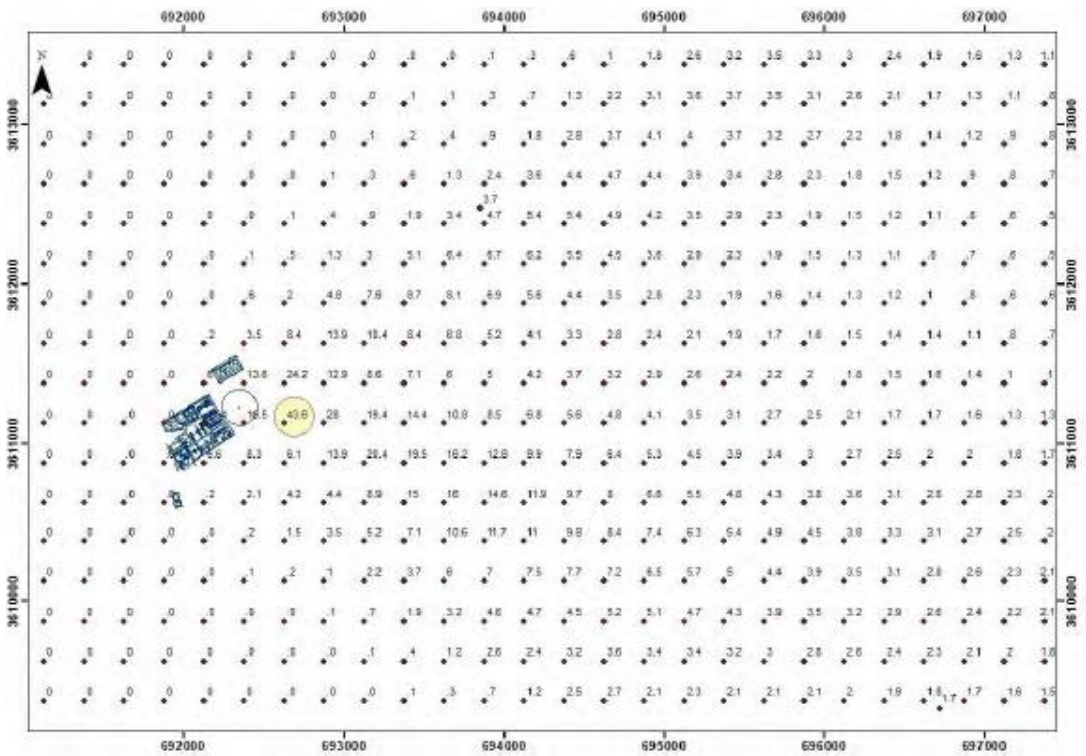
(Maximum concentration is circled in yellow)



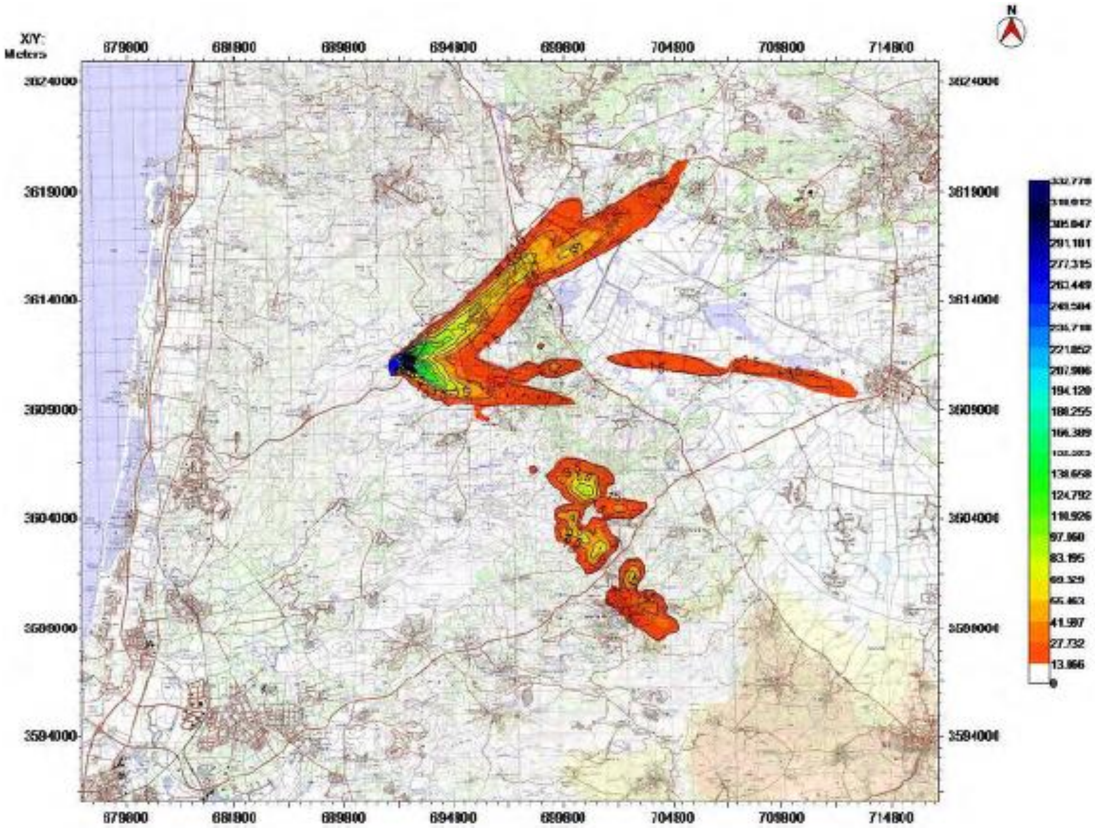
Isopleth map of nitrogen oxide (NOx) emissions, 24-hour average for operational fault, emissions from flare and diesel engines



Lattice map of nitrogen oxide (NOx) emissions, 24-hour average for operational fault, emissions from flare and diesel engines

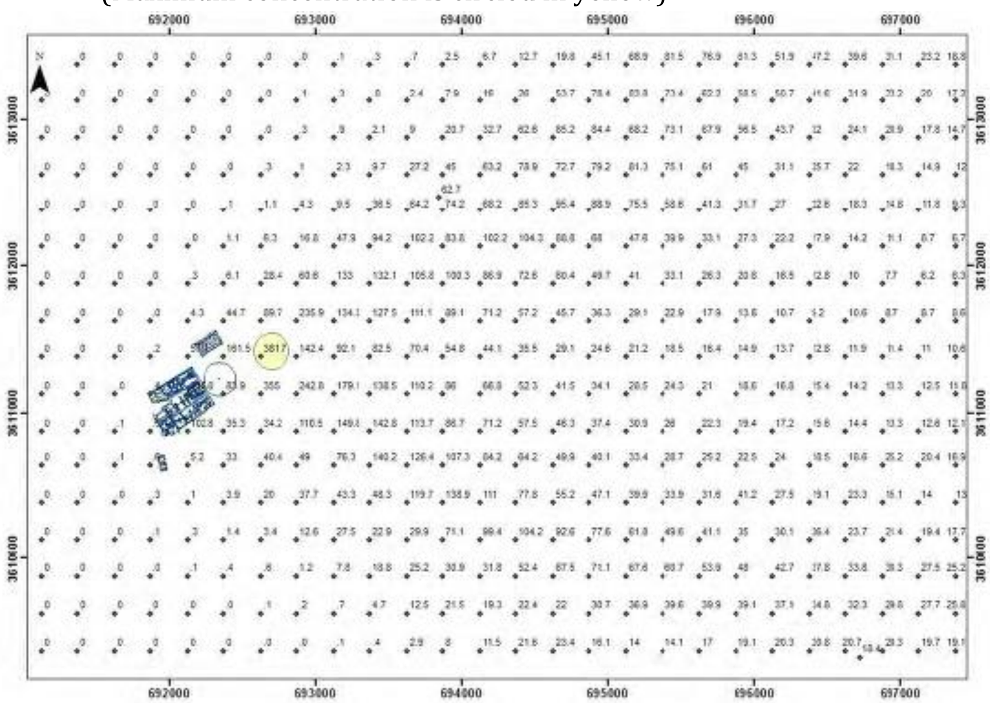


Isopleth map of nitrogen oxide (NOx) emissions, half-hour average for operational fault, background emissions (points) and emissions from flare and diesel engines

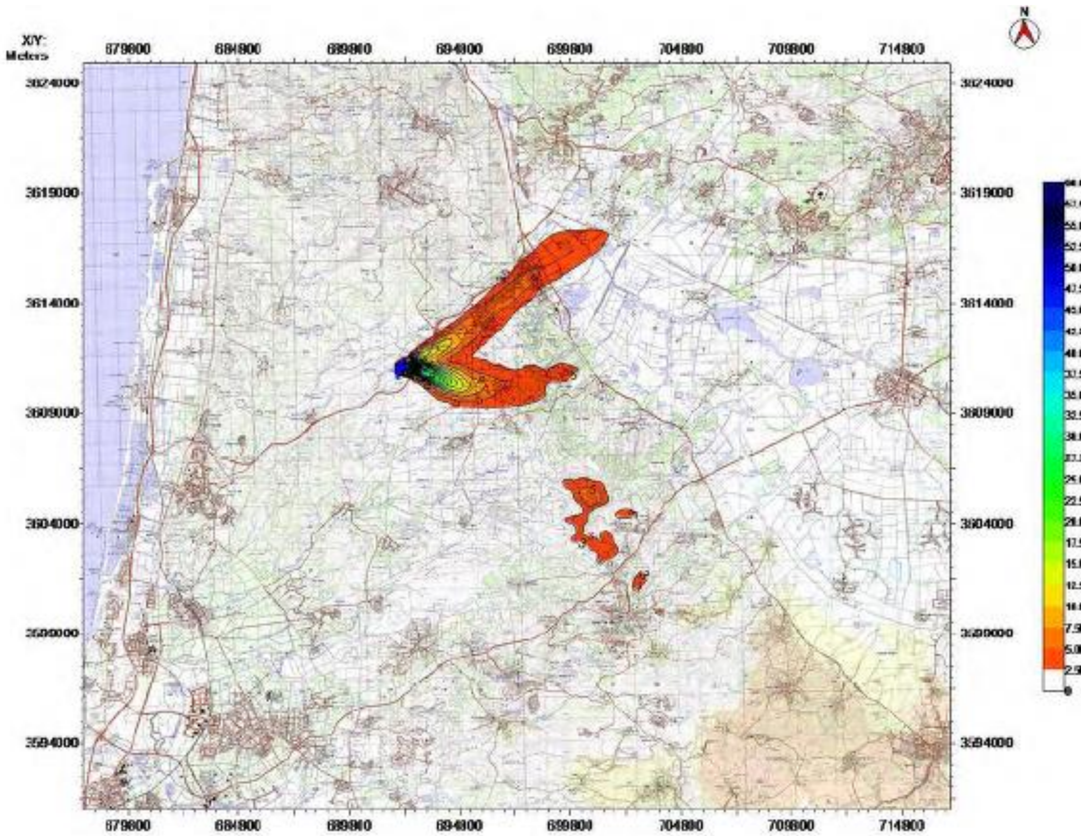


Lattice map of nitrogen oxide (NOx) emissions, half-hour average for operational fault, background emissions (points) and emissions from flare and diesel engines

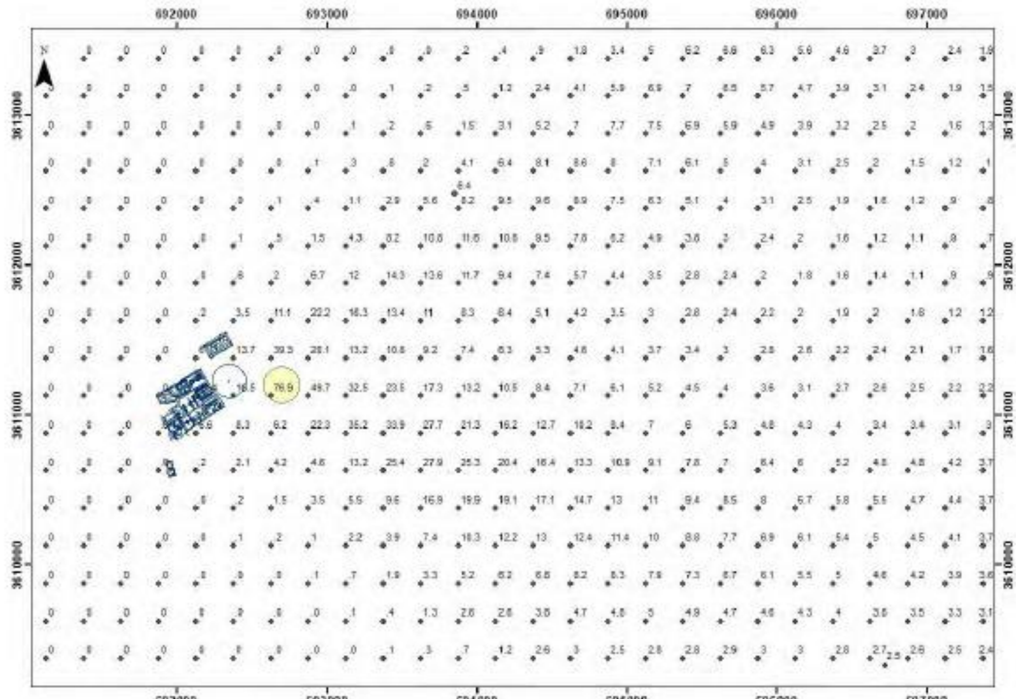
(Maximum concentration is circled in yellow)



Isopleth map of nitrogen oxide (NOx) emissions, 24-hour average for operational fault, background emissions (points) and emissions from flare and diesel engines

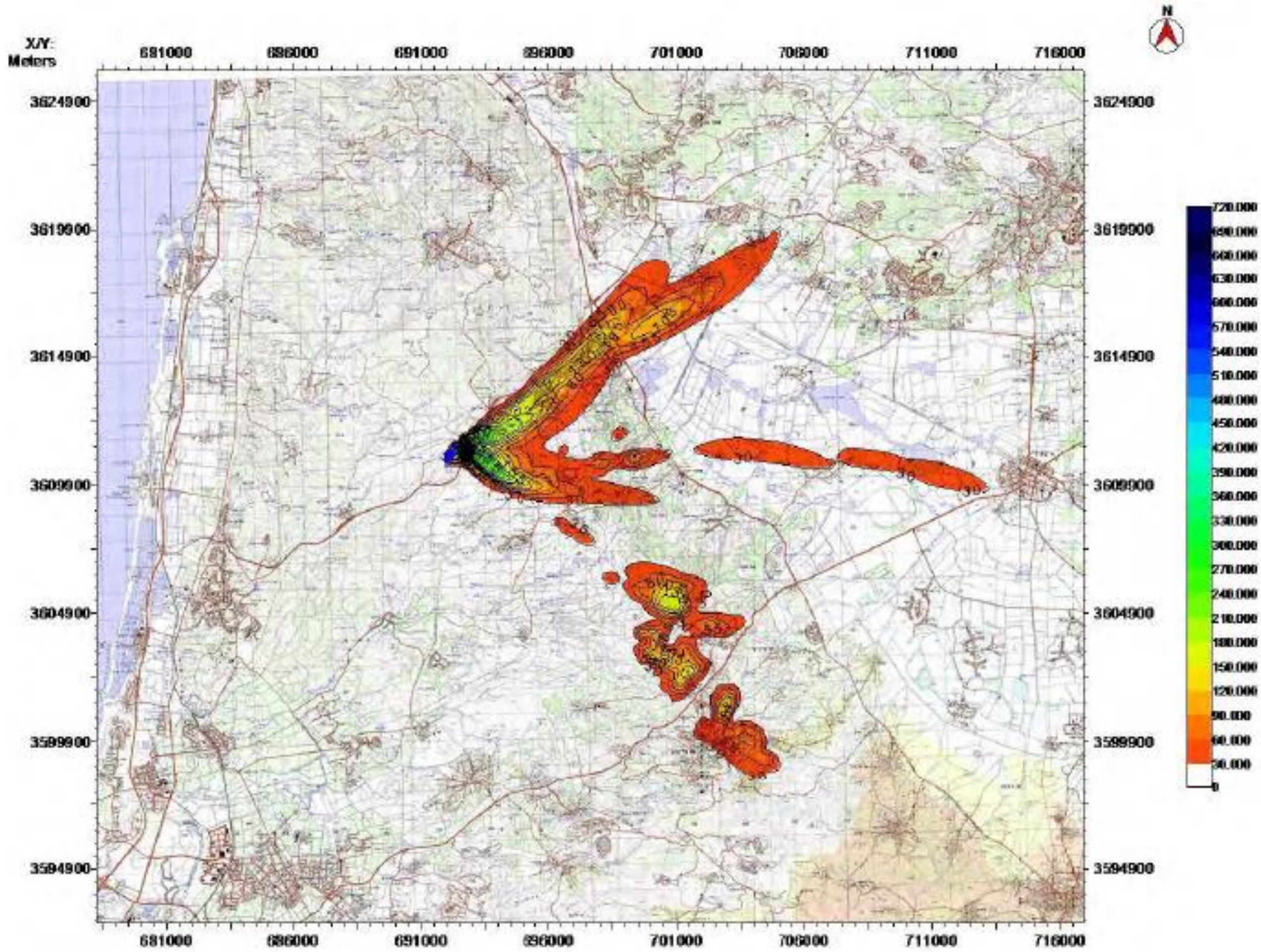


Lattice map of nitrogen oxide (NOx) emissions, 24-hour average for operational fault, background emissions (points) and emissions from flare and diesel engines
(Maximum concentration is circled in yellow)



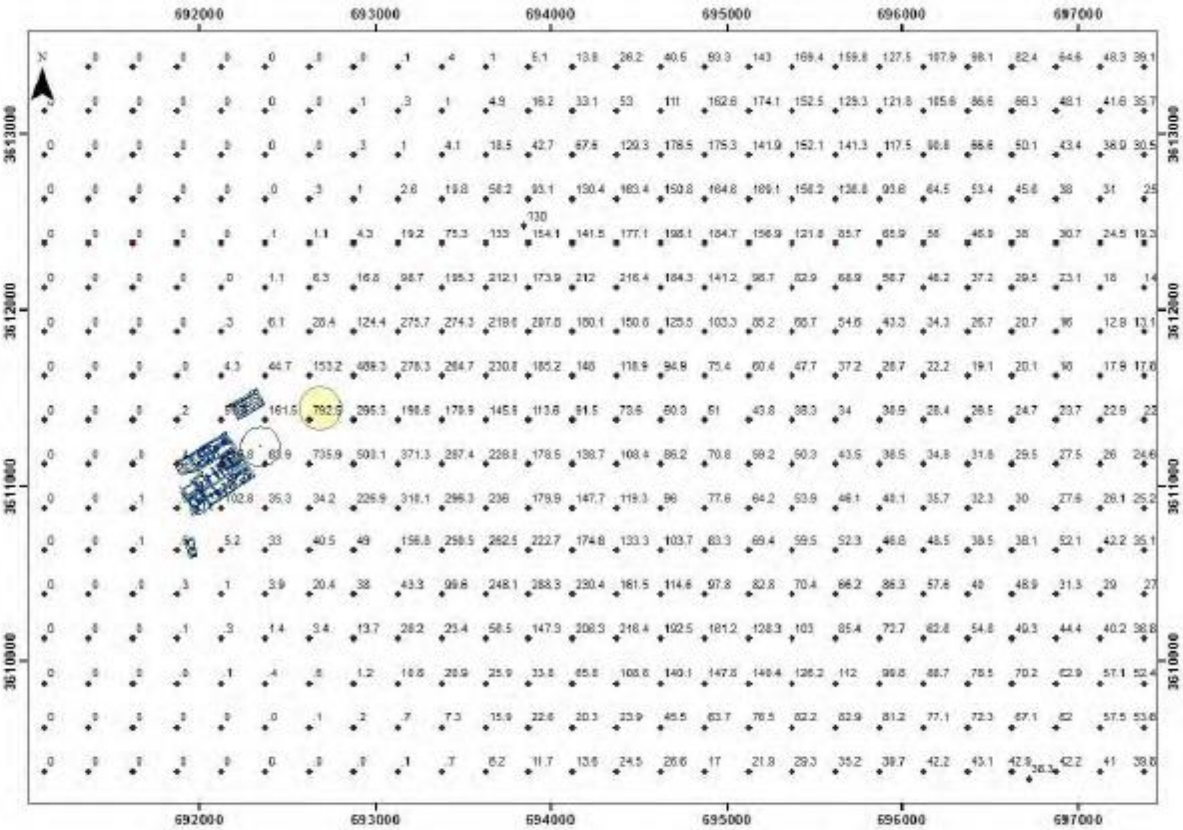
Results of running a CALPUFF model on a fault when venting gas to release pressure through high pressure (HP) flare and low pressure (LP) flare

Isopleth map of nitrogen oxide (NOx) emissions, half-hour average, for a fault when venting gas to release pressure through the HP and LP flares, emissions from flares and diesel engines

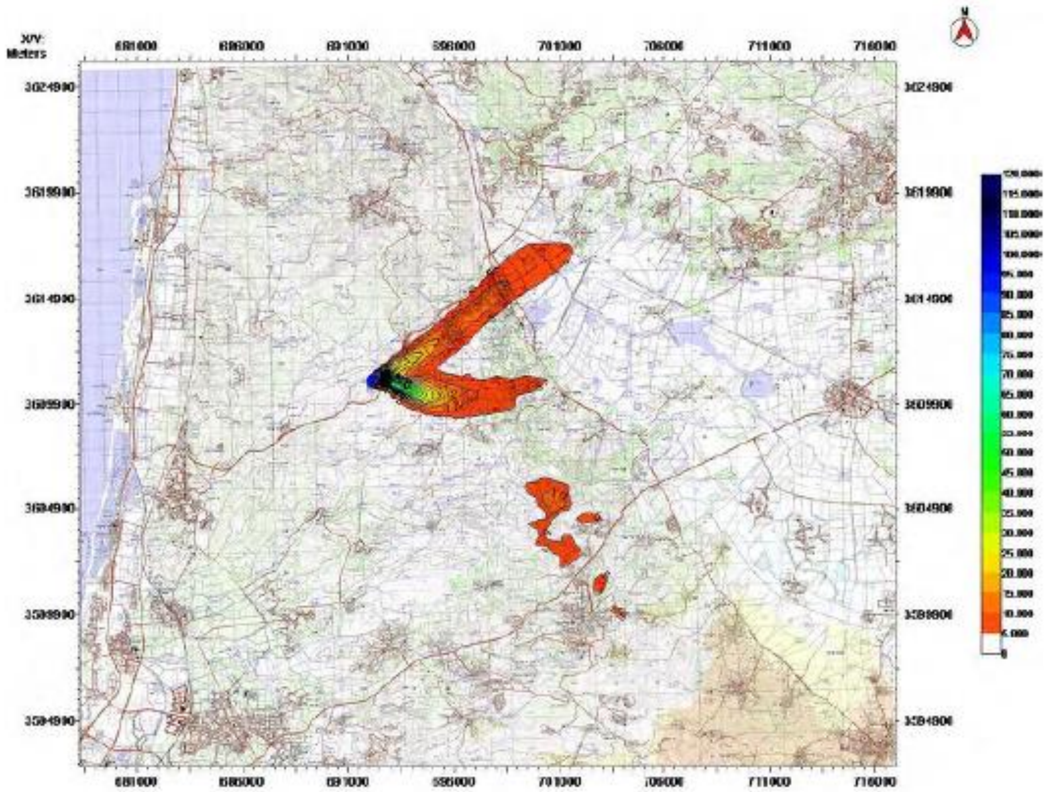

N
X/Y:
Meters
681000
686000
691000
696000
701000
706000
711000
716000
3624900
3619900
3614900
3609900
3604900
3599900
3594900
720.000
690.000
660.000
630.000
600.000
570.000
540.000
510.000
480.000
450.000
420.000
390.000
360.000
330.000
300.000
270.000
240.000
210.000
180.000
150.000
120.000
90.000
60.000
30.000
0

Isopleth map of nitrogen oxide (NOx) emissions, half-hour average, for a fault when venting gas to release pressure through the HP and LP flares, emissions from flares and diesel engines

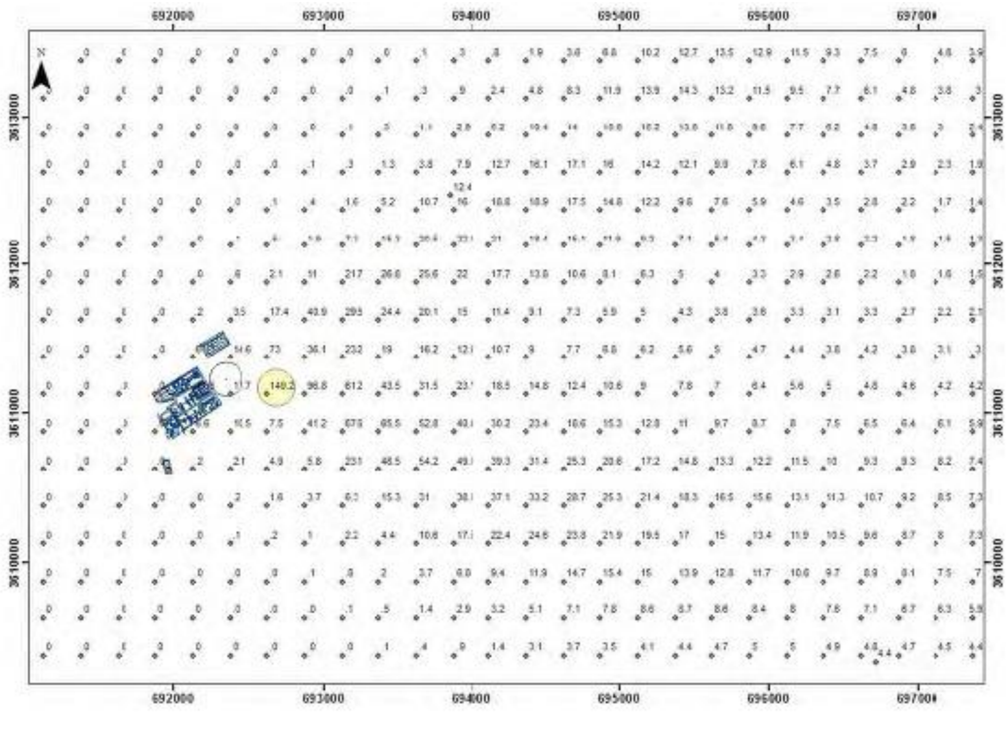
(Maximum concentration is circled in yellow)



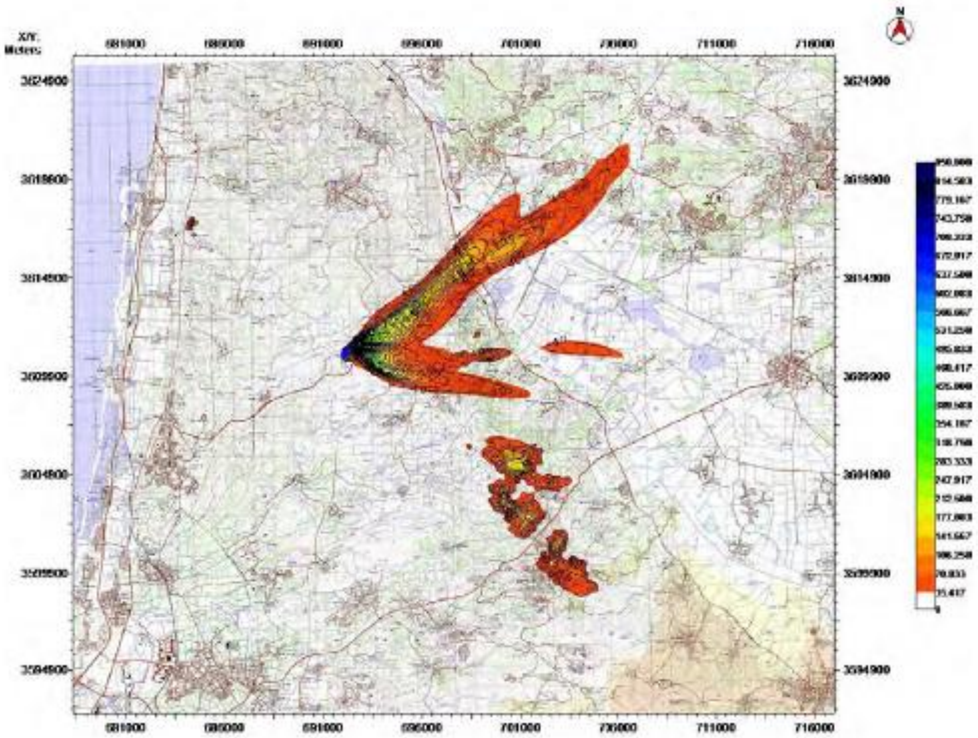
Isopleth map of nitrogen oxide (NOx) emissions, 24-hour average, for a fault when venting gas to release pressure through the HP and LP flares, emissions from flares and diesel engines



Isopleth map of nitrogen oxide (NOx) emissions, 24-hour average, for a fault when venting gas to release pressure through the HP and LP flares, emissions from flares and diesel engines
(Maximum concentration is circled in yellow)

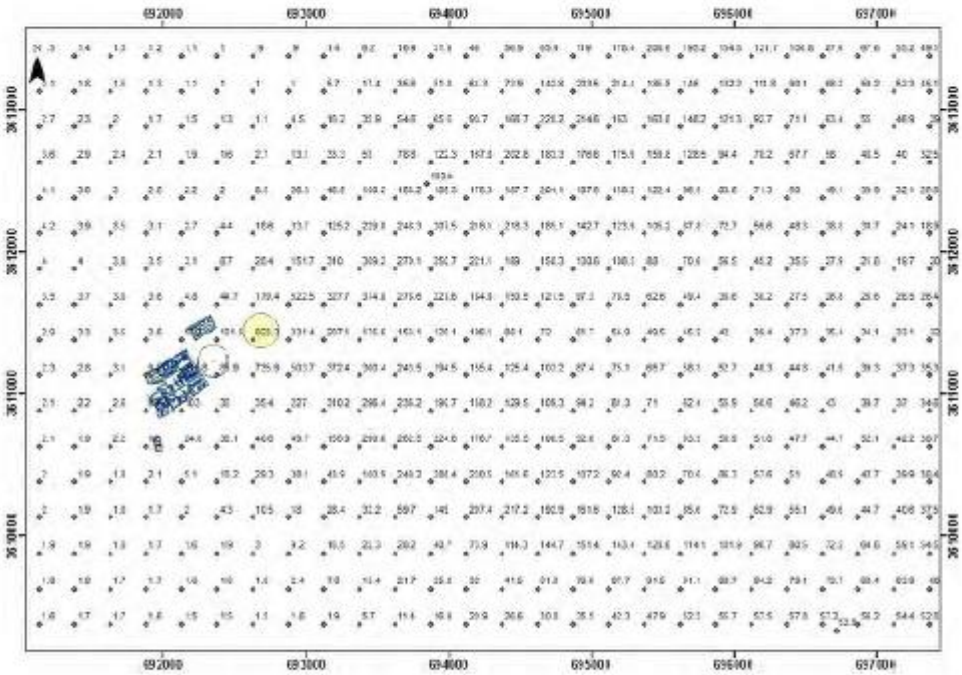


Isopleth map of nitrogen oxide (NOx) emissions, half-hour average, for a fault when venting gas to release pressure through the HP and LP flares, background emissions (points) and emissions from flares and diesel engines

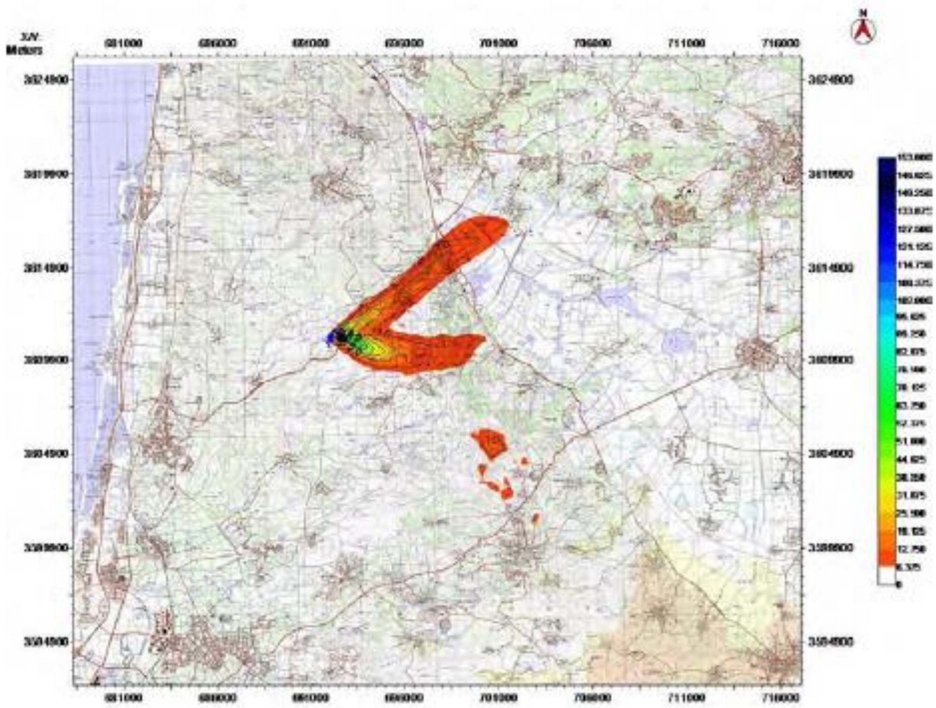


Lattice map of nitrogen oxide (NOx) emissions, half-hour average, for a fault when venting gas to release pressure through the HP and LP flares, background emissions (points) and emissions from flares and diesel engines

(Maximum concentration is circled in yellow)

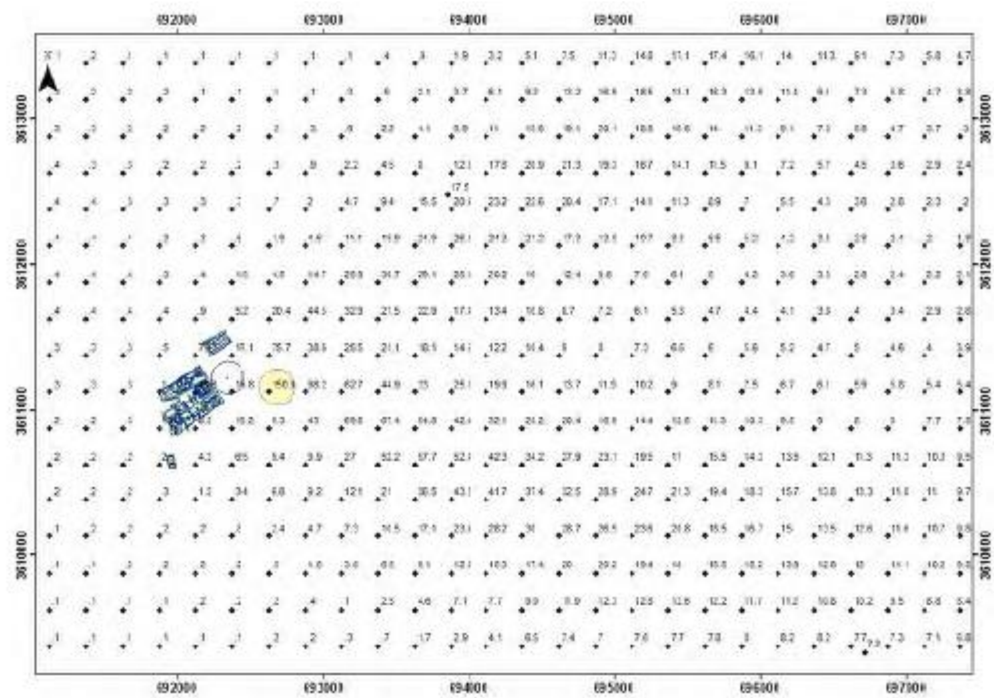


Isopleth map of nitrogen oxide (NOx) emissions, 24-hour average, for a fault when venting gas to release pressure through the HP and LP flares, background emissions (points) and emissions from flares and diesel engines

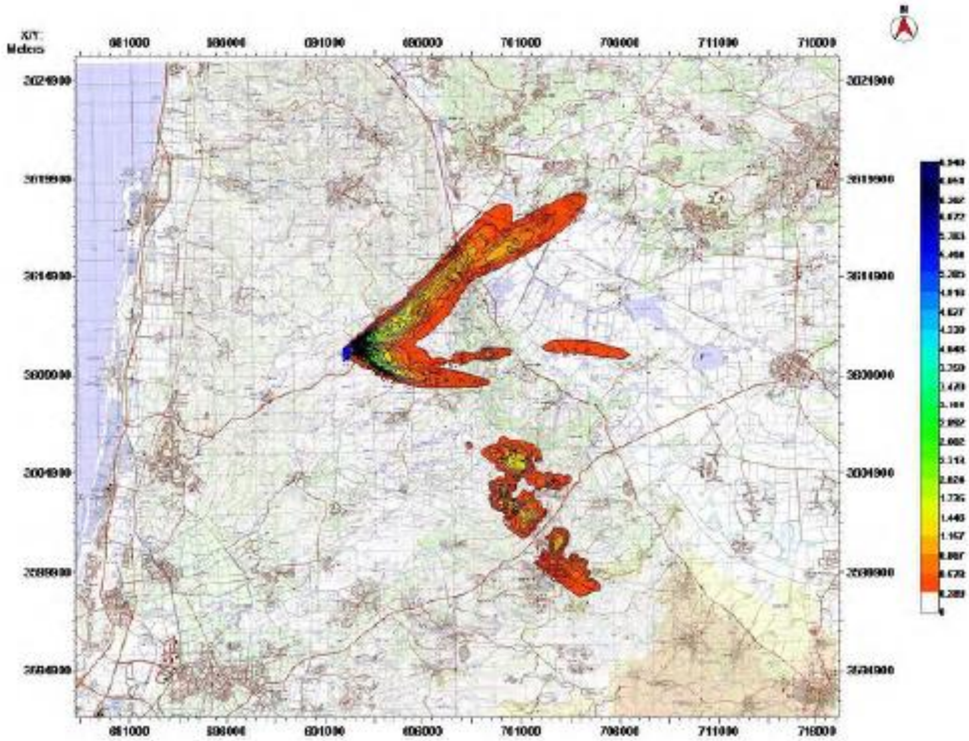


Lattice map of nitrogen oxide (NOx) emissions, 24-hour average, for a fault when venting gas to release pressure through the HP and LP flares, background emissions (points) and emissions from flares and diesel engines

(Maximum concentration is circled in yellow)

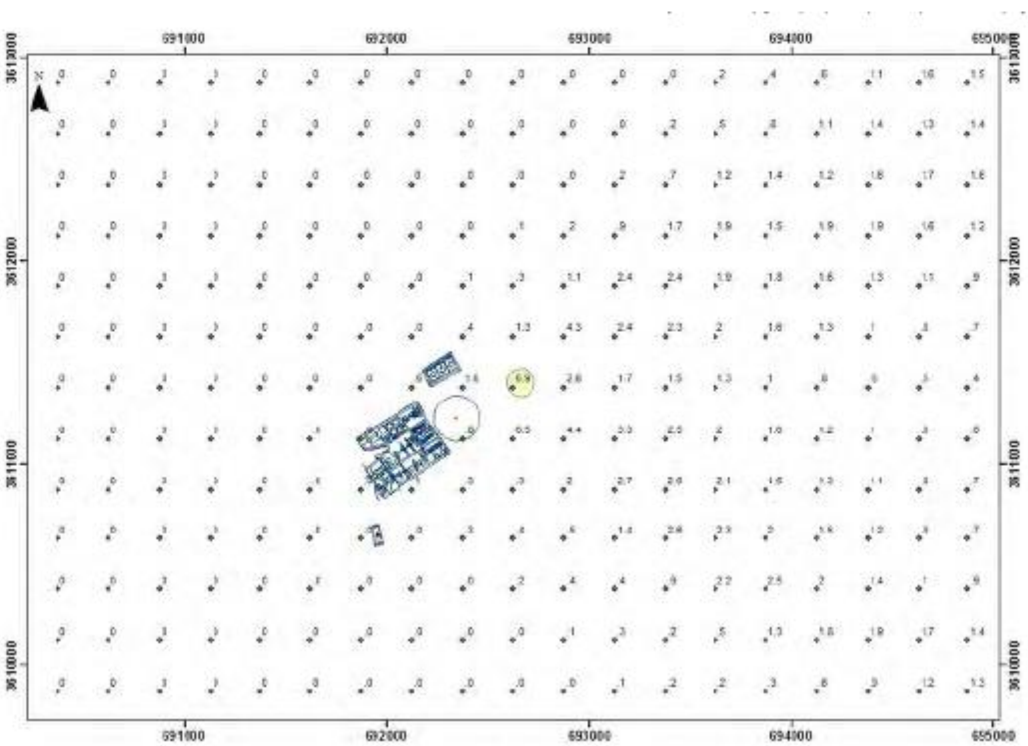


Isopleth map of sulfur dioxide (SO_2) emissions, 1-hour average, for a fault when venting gas to release pressure through the HP and LP flares, emissions from flares and diesel engines

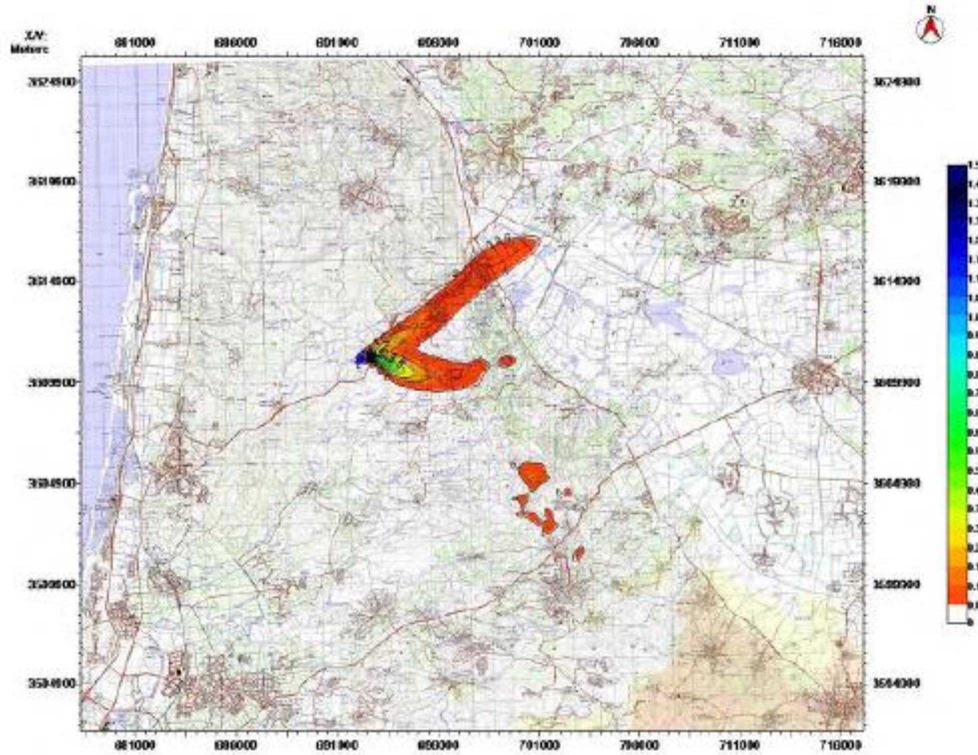


Lattice map of sulfur dioxide (SO_2) emissions, 1-hour average, for a fault when venting gas to release pressure through the HP and LP flares, emissions from flares and diesel engines

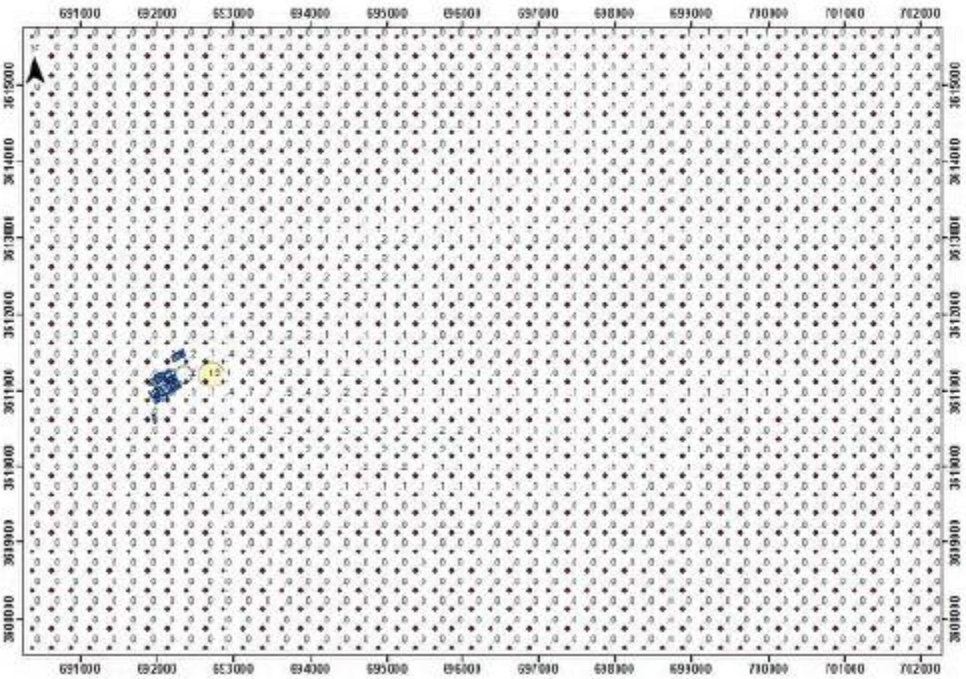
(Maximum concentration is circled in yellow)



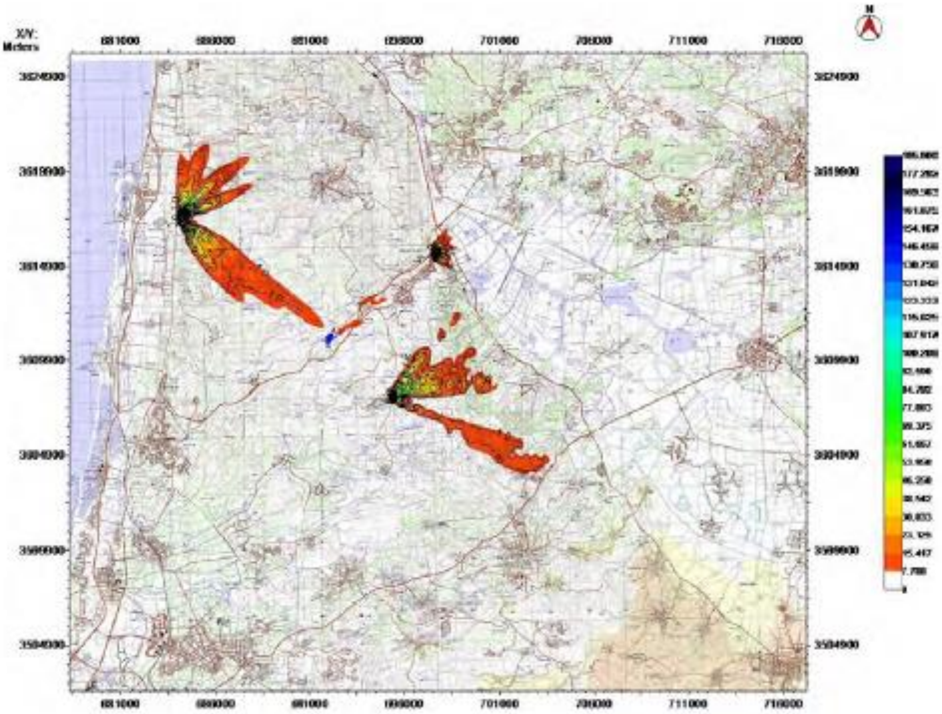
Isopleth map of sulfur dioxide (SO_2) emissions, 24-hour average, for a fault when venting gas to release pressure through the HP and LP flares, emissions from flares and diesel engines



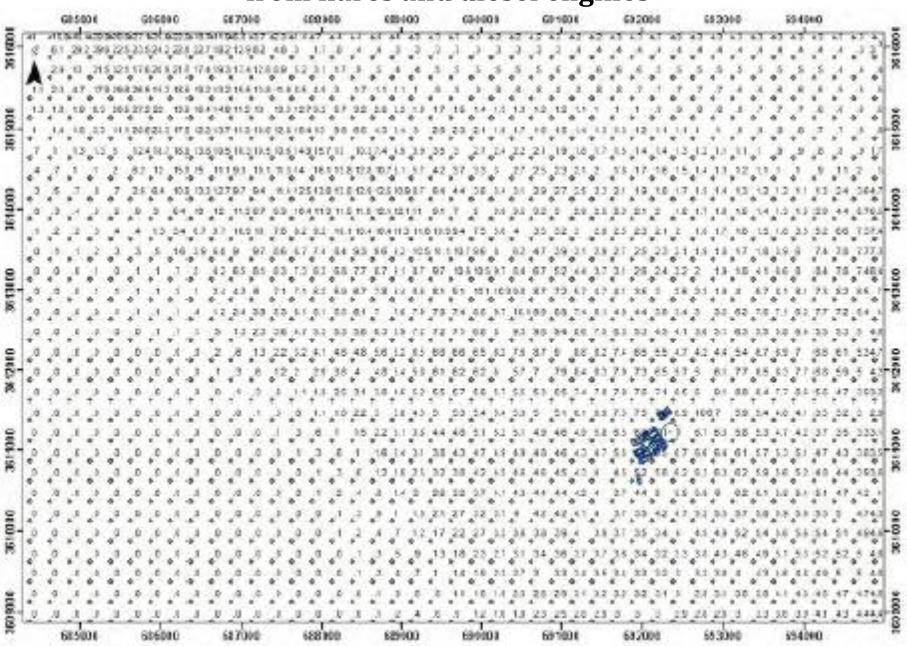
Lattice map of sulfur dioxide (SO_2) emissions, 24-hour average, for a fault when venting gas to release pressure through the HP and LP flares, emissions from flares and diesel engines



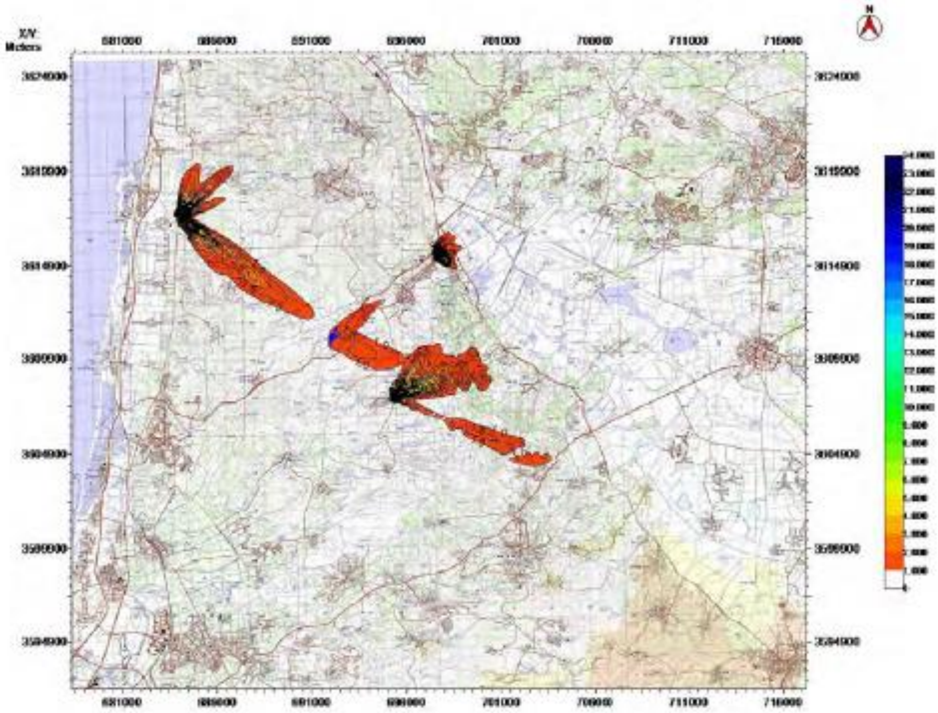
Isopleth map of sulfur dioxide (SO_2) emissions, 1-hour average, for a fault when venting gas to release pressure through the HP and LP flares, background emissions (points) and emissions from flares and diesel engines



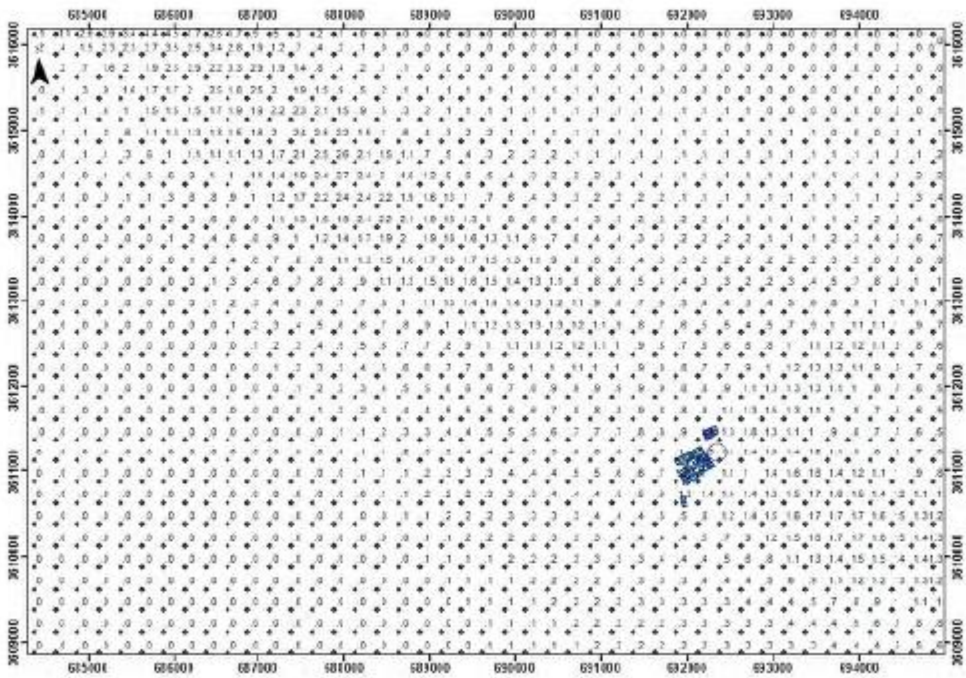
Lattice map of sulfur dioxide (SO_2) emissions, 1-hour average, for a fault when venting gas to release pressure through the HP and LP flares, background emissions (points) and emissions from flares and diesel engines



Isopleth map of sulfur dioxide (SO_2) emissions, 24-hour average, for a fault when venting gas to release pressure through the HP and LP flares, background emissions (points) and emissions from flares and diesel engines



Lattice map of sulfur dioxide (SO_2) emissions, 24-hour average, for a fault when venting gas to release pressure through the HP and LP flares, background emissions (points) and emissions from flares and diesel engines



Appendix G – ENVID

[ORIGINAL TEXT IS IN ENGLISH – SEE PDF FILE תמא_37-ח_תסקיר_השפעה_על_הסביבה-_חגית-פרקים_ג-ה_+_נספחים_איכות_פחותה_6.2013]

Appendix H – Response from Keren Kayemeth LeIsrael - JNF

Jewish National Fund
JNF – KKL

Northern District
Planning Division

March 7, 2013
NOP 37 / H

To: Ms. Orly Levy
Lerman Architects and Urban Planning, Ltd.
120 Yigal Alon Street
Tel Aviv 67443

Dear Ms. Levy,

Re: **N.O.P. 37 / H – Coordinating Infrastructures**

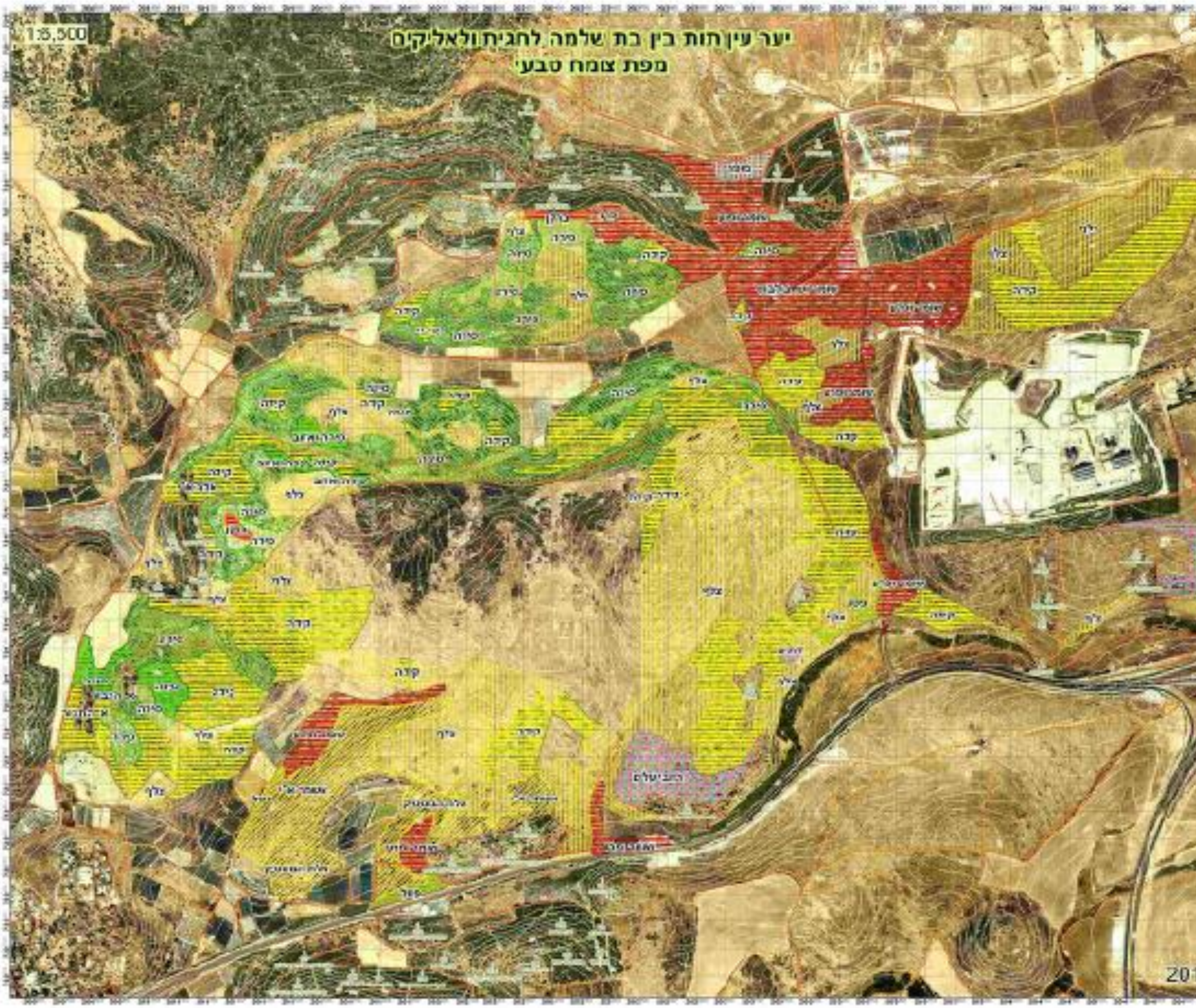
In the framework of our examination of the alternatives for pipeline strips between the offshore facilities and the East Hagit site, two alternatives were examined: A – the northern alternative; B – the southern alternative.
Below is the JNF's response regarding these two alternatives:
Both of the alternatives damage areas of planted forest and natural woodlands.
Alternative A to the north is adjacent to existing infrastructures and its development will prevent damage to and the "opening" of additional open space.
According to the ecological survey prepared by Dr. Nir Har, continuation of the alignment in Alternative A uses existing routes to pass through an area characterized by woodlands with grasses and shrubs. Attached are diagrams that include the flora that can be found in the area.
Accordingly, we recommend Alternative A from the offshore facilities to Hagit East. We ask to participate in deciding the exact alignment of the gas line being planned in accordance with the survey findings.

Sincerely yours,

Ilana Friedman
Statutory Coordinator
JNF – Northern District

Cc: Mr. Yiftach Harchul – Director, Northern District
Mr. Pinchas Kahane – Planning Division Jerusalem
Ms. Shimona Sabagh – Director of the Planning Division
Dr. Nir Har – Forest Engineer, Northern District
Mr. Michael Weinberger – Director, Western Galilee Division

Ein Tut Forest, between Bat Shlomo and Hagit and Elyakim – Map of natural growth



Appendix I – Guidelines for Preparing an EMMP Document

[ORIGINAL TEXT IS IN ENGLISH – SEE PDF FILE -37_תמא
ח_תסקיר_השפעה_על_הסביבה-_חגית-פרקים_ג-
ה_+_נספחים_איכות_פחותה_6.2013]

Appendix J – Team's Response to Remarks Regarding Chapters A-B

Planning team's Response to Remarks of the Ministry of Environmental Protection Regarding Chapters A-B

National Outline Plan 37/H – Treatment facilities for Natural Gas Discoveries – Onshore Environment Component

In the opinion rendered by the Ministry of Environmental Protection regarding Chapters A-B of the Environmental Impact Survey of National Outline Plan (hereinafter: **"NOP"**) 37/H – 'Treatment Facilities for Natural Gas Discoveries – Onshore Component' dated Nov. 26, 2012 it is written: *"In general, it can be said that the survey has been prepared professionally, however it is incomplete"* and that there are deficiencies in it and that "*…these deficiencies do not prevent arriving at a well-founded decision concerning the survey, for it is possible to send assorted matters that have not received a full response for examination in Sections C-E".*

The National Board in its decision of Nov. 27, 2012 decided on continued examination and planning of two onshore sites at the Hagit East site and the Meretz Wastewater Facility for gas treatment facilities and the pipeline leading to them.

Some of the remarks concerning the survey dealt with alternatives that are no longer relevant to the Plan. Accordingly, please find attached the Planning Team's response to NOP 37/H, to remarks that are relevant to the selected sites, and to the Plan's continuation in the following table:

Section	**Subject**	**Team's response**
	Landscape	
	Include 'authentic' simulations by inserting an intake facility within land photos of the relevant alternatives. The information attached in the review is solely of a technical nature and does not permit the general public or decision-makers to precisely understand the landscape implications of the facilities under each alternative.	A response was in Chapters C-E, see Section 4.3
	Hydrology, water and streams	

Section	Subject	Team's response
1	Page 242 mentions a number of factors that affect the calculation of the maximum seasonal flow. Absent is the important factor of soil erosion and land preservation.	Calculation of flow in the model takes into account soil parameters ('soil classification'). Calculations of erosion, stream undermining, and expected drift quantities will be performed during the course of planning for the construction permit.
2	1. The matter of crossing streams must be addressed in further detail; it is insufficiently emphasized and there are some unclear points. For example: regarding the Hagit alternative, Section 7.3.2.1 A1 ('soil and drainage') on page 251 states that: "The pipeline's path does not pass by stream and flooding areas." 2. On the subsequent page it is written: "At the Hagit site there are two drainage basins…Area A1 is situated at the site's northern side, and turns into the watershed. The basin drains into a local *wadi* (Nahal Tut) that flows in a southwest direction." 3. Does the pipeline indeed not cross it? 4. This contradicts the above determination that there are no stream and flooding areas.	1. Further detail is provided; see supplementary details in Appendix 1 to this document. 2. The local wadi is not Nahal Tut but rather its secondary stream. Updated in Section 1.7.3.3-A 3. The pipeline's path crosses with the wadi; updated in Section 1.7.3.2.1. 4. There is no connection between the details. The drainage basins belong to the Hagit alternative and drain into Nahal Tut while the streams that pass the pipeline's path do not in fact connect with it (secondary channels that drain into Nahal Dalia). The pipeline does not cross Nahal Tut but rather crosses north of it.
3	On page 254 (Michmoret – soil and drainage) it is written: "The site is situated on the shore and there are no streams in its vicinity" while it is known that Nahal Alexander flows nearby.	Nahal Alexander does not flow adjacent to the coastal entry array at Michmoret.

Section	Subject	Team's response
4	Relation between the pipeline and streams: No reference is made to the significance of the pipeline's passage in the proximity of the stream, for example: In Section 1.7.4.4.2, which addresses the pipeline's southern alternative (page 262), only the alignment is described, which is all right ("The pipeline intersects with Nahal Hadera in three places until connecting with the Hagit-Gezer national gas supply pipeline. Under NOP 34 B3, the pipeline's alignment passes by Nahal Hadera in a flooding zone"). What does all this mean? Are any engineering related difficulties expected? How will this passage affect the flow of Nahal Hadera? Staging areas? Working time?	See supplementary details in Appendix 1 to this document.
Nature, landscape and heritage sites		
1	The survey specifies in a satisfactory manner the sensitivity of the different land sections along the pipeline's transmission path.	
2	Because field tours were conducted in summer 2012, it was not possible to locate and observe a large variety of organisms such as annual vegetation or winter fowl in moist habitats such as the seashore and fishponds. For this reason, the quantity of species indicated in the different species tables of this section was low.	Chapters C-E specify additional species.
3	Insufficient data was gathered from various information sources	Completed in Chapters C-E.

Section	Subject	Team's response
	such as the Nature and Parks Authority and BIGIS.	
4	It is necessary to conduct additional tours so as to complete the data on the abundant species associated with the different alternatives. Such tours must be conducted during the upcoming winter and spring.	The survey was conducted as per the survey requirements. Additional tours were conducted locally in accordance with changes in the planned paths. Relevant conclusions have been inserted in Chapters C-E.
6	The value of areas in the Dor north and Ein Ayala alternatives, as presented in illustrations of the field survey conducted by the Society for the Protection of Nature, is clearly spelled out as is the relative sensitivity of the region's different land sections. The survey includes reference to the diversity of wildlife. Under the other alternatives, for which no surveys were conducted by the Society for the Protection of Nature, there is no broad perspective of natural habitats in the proximity of each alternative.	Addressed in Chapters C-E.
7	Figure 1.9 presents natural habitats within the different alternatives; however the lack of field data concerning the different species in each site affects the figure's ability to present the full picture of natural habitats.	Addressed in Chapters C-E.
Professional remarks		
	General specification of the facility in Chapter B: The general specification is very unclear, certainly when targeting a public that is unfamiliar with the	The description of engineering aspects in Chapter B is general in nature; a more specific description is presented in Chapter C and in Appendix B of the EIS.

Section	Subject	Team's response
	subject. Several examples are given below:	
1	There is no description of the gas treatment process – what the main stages are and the method in each stage.	A more specific description is presented in Chapters C-E of the EIS.
2	There are no details concerning condensates: quantitative nature (scope), storage, removal & disposal, the need for refining and so forth. The general specification makes no reference to stacks for burning and releasing the gas. In the simulation on page 16, we need to guess where the stacks are.	A more specific description is presented in Chapters C-E of the EIS.
3	The description concerning the pipeline alignment on page 22 is unclear. There is no indication of its depth/distance from the shore with respect to shallow waters.	A more specific description is presented in Chapters C-E of EIS.
4	In the description of the onshore valve station the manner of releasing the gas is not explained. Will a stack be needed?	The description of engineering aspects that appears in Chapter B is general in nature. Details on the valve station and gas release are presented in Chapters C-E.
	The distance between the pipelines (page 28): It is unclear why it is not possible to switch between the required distances for the INGL pipeline and the natural gas pipelines and thus reduce the required strip width.	Pursuant to the professional team's decision, there shall be no additional INGL line from the existing Dor station to the Hagit station. Thus the width of the additional pipeline strip is 40 meters (20 meters for each of the suppliers). Running between the shore and existing Dor station (approximately 1.5 km) shall be a strip for an additional INGL line. Therefore a pipeline strip width of

Section	Subject	Team's response
		60 meters is needed (20 meters for each of the suppliers plus 20 meters for INGL). A pipeline strip for a new INGL line, not yet in existence, will also serve the Meretz facility. Therefore a pipeline strip width of 60 meters is needed (20 meters for each of the suppliers plus 20 meters for INGL).
	<u>Placement of Infrastructures</u> It is unclear why the entry route of the pipeline at Hof Dor was not placed closer to the existing gas pipeline. Additionally, it appears that for the Hadera complex, it is possible to execute planning such that it integrates the entry array and the pipeline array with existing infrastructures in a better manner.	On the shore it is necessary to assign approximately 50 meters between HDD entries, this in order to make certain there is sufficient space between pipelines for safe execution. Immediately after that, the distance between the lines decreases to the accepted strip width.

Appendix 1 – Supplementary details to Chapters A-B – hydrogeology

1.7 Hydrogeology and soil

A. Soil and drainage

This section presents the status of the work area by investigating four hydrogeologic parameters: the drainage basin, sediment data, soil type, and the soil's permeability capacity based on maps of NOP 34 B/3. After assessing the parameters, the design flow for runoff is calculated. There are a number of methods and formulae for calculating maximum volumetric flow rate under storm conditions.

Each one of these methods has its advantages and disadvantages. In a given case, opting for a suitable calculation method depends on different factors such as:

- Quantity of data needed for the calculation
- Precision and reliability of data in the engineer's possession
- Type (zoning) of the drainage basin area
- Size of the drainage basin area
- Ground cover of the drainage basin area

After consideration of these factors as well as the size of the drainage basins (very small basins up to 1-2 sq kilometers), it was decided to calculate the maximum volumetric flow rate for the above report via the rational method and according to the statistical hydrological model developed by K. Getker and S. Polk.

- During the advanced planning stages, calculations will be performed to assess erosion, undermining, and expected drift quantities.

1.7.3 Hagit East

The Hagit East alternative is situated adjacent to Israel Electric's Hagit power station, north of Nahal Tut, which separates between the northern Carmel and the Menashe syncline – in the Nahal Dalia drainage basin under the jurisdiction of the Carmel Drainage Authority. This alternative is situated approximately 11 kilometers from the Mediterranean shore; the height of the terrain relative to sea level ranges between 130 and 200 meters. The alternative is surrounded by open spaces that serve for pastures among other purposes. The nearest hydrometric station is Dalia Bat Shlomo (no. 12130).

1.7.3.1 Coastal entry array

A. Soil and drainage

Situated in the area of the site are fishponds, which are adjacent to the coastal road. At the southeastern side flows Nahal Dalia, at its intersection with Zichron Yaakov interchange, situated southeast of the existing Gesher site. See Figure 1.7.3.1-1.

1.7.3.2 Pipeline alignment to the treatment facility

<u>1.7.3.2.1 Northern alternative</u>

A. Soil and drainage

After exiting the Dor system, the pipeline alignment continues in a northeasterly direction for approximately 11 km. On the way it intersects four local drainage ditches followed by Nahal Tlimon, continuing along its length for approximately four km. until connecting with the treatment facility adjacent the Hagit power station. It is important to point out that the pipeline alignment exceeds the boundaries of NOP 34 B/3 when crossing Nahal Tlimon and the drainage ditches. This necessitates building flooding areas and coordinating with the local drainage authority during planning stages. Furthermore, special attention from an engineering aspect is needed to address the stream's erosion as well as the depth for laying the pipeline. At the treatment facility the path crosses a local wadi (a secondary channel of Nahal Tut), which also necessitates attention from an engineering aspect to determine the depth for laying the pipeline.

1.7.3.2.2 <u>Southern alternative</u>

A. Soil and drainage

After approximately 3.5 km from the Dor system (the path of the 3.5 km segment from the Dor system to the east is identical to that of the northern alternative – see Section 1.7.3.2.1) and in a northeasterly direction, the pipeline alignment turns to the south (southern alternative). On the way, the route passes two streams (secondary channels of Nahal Dalia). It should be pointed out that the alignment exceeds the boundaries of NOP 34 B/3 when crossing the streams, which necessitates building flooding areas and coordinating with the local draining authority during stages of planning. Furthermore, special attention from an engineering aspect is needed in terms of the depth for laying the pipeline. After approximately 9 km from the Dor system, the pipeline alignment once again is identical to that of the northern alternative (see Section 1.7.3.2.1)

1.7.3.3 Treatment facility

A. Soil and drainage

1. Hydrological data

A. Drainage basin

There are two drainage basins at the Hagit East site:

Area A1 – situated at the site's northern side and spreads extends to the watershed. The basin drains into a local wadi (one of the secondary channels of Nahal Tut), which flows in a southwesterly direction.

Area A2 – situated at the site's southeast side and drains in the direction of Nahal Ein Tut, which flows to Road 70. There is an elevation point at the site, which causes rainwater to accumulate in the site's southern section.

The basins are situated in an abandoned and unutilized pit area.

1.7.4 Meretz Wastewater Facility

The Meretz Wastewater Facility alternative is located between Road 4 and Road 2, between Kibbutz HaMa'apil and Ein Horesh, approximately one kilometer south of Road 581. This alternative is approximately 9 km from the Mediterranean coast and its altitude ranges between 12 and 30 meters above sea level. The alternative is surrounded by agricultural fields and lies north and west of the Meretz Wastewater Facility and the Emek Hefer agricultural sludge and waste treatment facility. The alternative's southwestern sector is situated adjacent to and within flooding areas of Nahal Ometz, a secondary stream of Nahal Alexander, situated within the boundaries of NOP 34 B/3 and under the jurisdiction of the Sharon Drainage Authority. The nearest hydrometric station is the Alexander-Eliashiv station (no. 15120).

It should be pointed out that streams considered as secondary channels under NOP 34 B/3 pass through this alternative. This will necessitate building flooding areas during planning as well as coordination with the local drainage authority. Staging areas cannot be built in flooding areas.

1.7.5.1.2 <u>Michmoret</u>

A. Soil and drainage

The site is situated on the beach and there are no streams or channels in the vicinity. See Figure 1.7.5.1-1.

1.7.5.1.3 <u>Pipeline alignment to the treatment facility</u>

1.7.5.2.2 Alignment from Michmoret

1.7.5.2.2.2 Southern alternative

A. Soil and drainage

After exiting the Michmoret system, the pipeline alignment continues east for approximately 7 km and then turns south for approximately 3 km until reaching the Meretz Wastewater Treatment Facility. On the way, it crosses Nahal Zalfi and exceeds the boundaries of NOP 34 B/3. This necessitates building flooding areas and coordinating with the local drainage authority during planning. Additionally, special attention from an engineering aspect is needed to address the Nahal's erosion and the depth for laying the pipeline.

1.7.5.2 Treatment facility

A. Soil and drainage

1. Hydrological data

A. Drainage basin

The drainage basin borders the northern section of the Meretz wastewater treatment facility. Rainwater flowing from the northwest crosses Road 581 via water conduits and gathers in the drainage basin, which drains in the direction of Nahal Ometz (Figure 1.7.5.3-1).

The basin is surrounded by abundant agricultural land and fields (Figure 1.1.1.1.3)

1.7.5.3 Pipeline alignment from the treatment facility

A. Soil and drainage

The pipeline alignment passes within the northwestern section of the Meretz wastewater facility, crossing Nahal Ometz (a secondary stream to Nahal Alexander) and Nahal Alexander, within the flooding area of Nahal Alexander according to NOP 34 B/3. This necessitates building flooding areas and coordinating with the local drainage authority during planning. Furthermore, special attention is needed from an engineering aspect in terms of the Nahal's erosion and the depth at which to lay the pipeline.

Figure 1.7.5.1-1

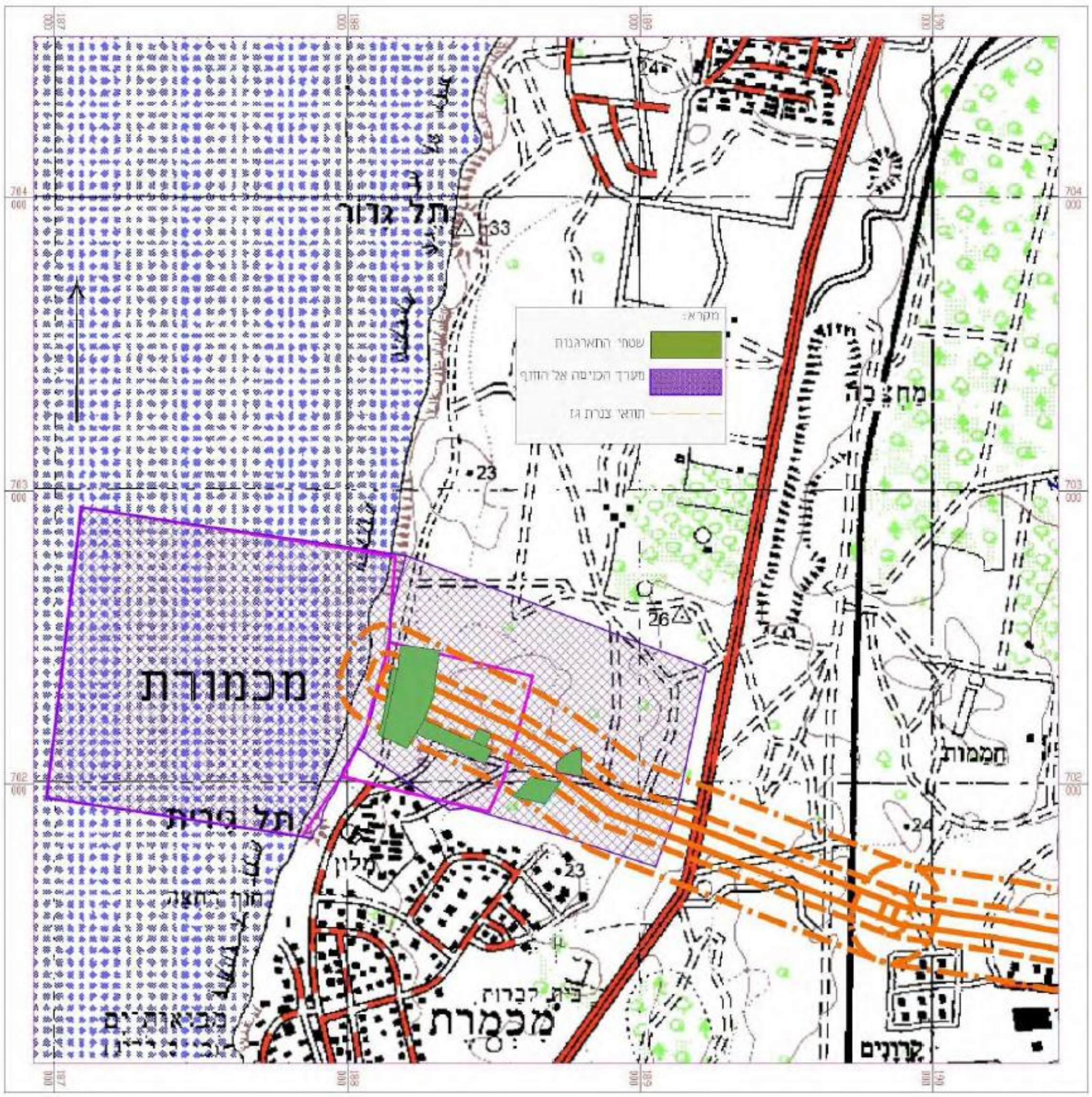


Figure 1.7.5.3-1

Bibliography