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Table of Contents

List of Tables

List of Figures

Abbreviations

Abbreviation	Description
LF	Landfall
EREL	Environmental Research Laboratory
ECMWF	European Centre for Medium Range Weather Forecasts
CWT	Characteristic Weather Types
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model

External cooperation

This document was drafted with the cooperation of:

- National Center for Scientific Research ''Demokritos''

ANNEX 9F.2 AIR DISPERSSION MODEL FOR PRE-COMMISSIOINING ACTIVITIES AT LF5

9F.2.1 SUMMARY

The Environmental Research Laboratory (EREL) of the National Centre for Scientific Research "Demokritos" performed the modelling study of the atmospheric dispersion of NOx, COand PM10 concentrations ,from the, the pre-commissioining activities of the EastMed Pipeline Project, in Patraikos Gulf.

The study was carried out for ASPROFOS Engineering S.A. by the following EREL personnel:

- Vlachogianni Diamando, M.Sc., Ph.D
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- Gounaris Nikolaos., M.Sc.
- Emmanouil George, PhD.
- Karozis Stelios, M.Sc., Ph.D

9F.2.2 AIM OF THE REPORT

The scope of this study is to investigate the impact of the dispersion of Nitrogen Oxides (NO_x) Carbon Monoxide (CO) and Particulate Matter (PM10) , on the atmospheric quality from the , pre-commissioining activities of the EastMed pipeline, at landfall location LF5, at Patraikos gulf

In the current modelling study, the 3-dimensional computer modelling tools were used with appropriate methodology[1] developed by the Environmental Research Laboratory (EREL) of the NCSR "Demokritos". The position and geometry data about the stacks, emission rates of NO_x COand PM10 were provided to EREL by Asprofos S.A. based on construction information.

The meteorological data for the area of interest were retrieved by EREL. The data related to the topography of the area were extracted from the Geographic Information System (ARC GIS) available at EREL. The basic computational and analysis steps followed are listed below:

[1] D. Vlachogiannis, A. Sfetsos, N. Gounaris and A. Papadopoulos," Investigation of atmospheric dispersion of gas compounds from an industrial installation over a realistic topography", 17th International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, 9-12 May 2016, Budapest.

- Processing of the available data, preparation of the input files for the dispersion model regarding the topography (ARC.GIS) and the meteorology of the area.
- Meteorological computational calculations to obtain the characteristic weather types of the area of interest and the respective 3-Dimensional meteorological fields (WRF model).
- Modelling calculations of the atmospheric dispersion of the emissions of NO_x , COand PM10 from the pre-commissioning activities (HYSPLIT model).
- Analysis and evaluation of the model results on the near ground distribution of the NO_x , CO and PM10 concentrations.
- Modelled near ground concentrations of the pollutants were compared against European air quality standards (2008/50/EC), adopted by Greek legislation, considering ambient background levels and potential receivers (populated places).

9F.2.3 PREPARATION OF THE INPUT DATA

This part involves the preparation of the input data files for the atmospheric dispersion model. For the specific study, the necessary data include the topography and meteorological fields of the area of interest.

9F.2.3.1 TOPOGRAPHY AND MODELLING DOMAIN

The geographical coordinates of the emission sources of the equipment used near the landfall location LF5 at Patraikos Gulf (on Greek Geodetic Reference System GGRS87 (X,Y) and latitude /longitude are shown on Table F2- 1.

Table F2- 1 Geographic coordinates of the Landfall LF5.

STATION_NAME	POINT_X	POINT_Y
LF5 Galatas - West Greece (Patraikos Gulf)	286649.249	4244178.987

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The computational domain extent was set to 50 × 50 km^2 to include as many as possible neighbouring urban areas of the area (see Figure F2- 1). The topography of the area around the LF5 location is smooth with low elevation and plain areas .

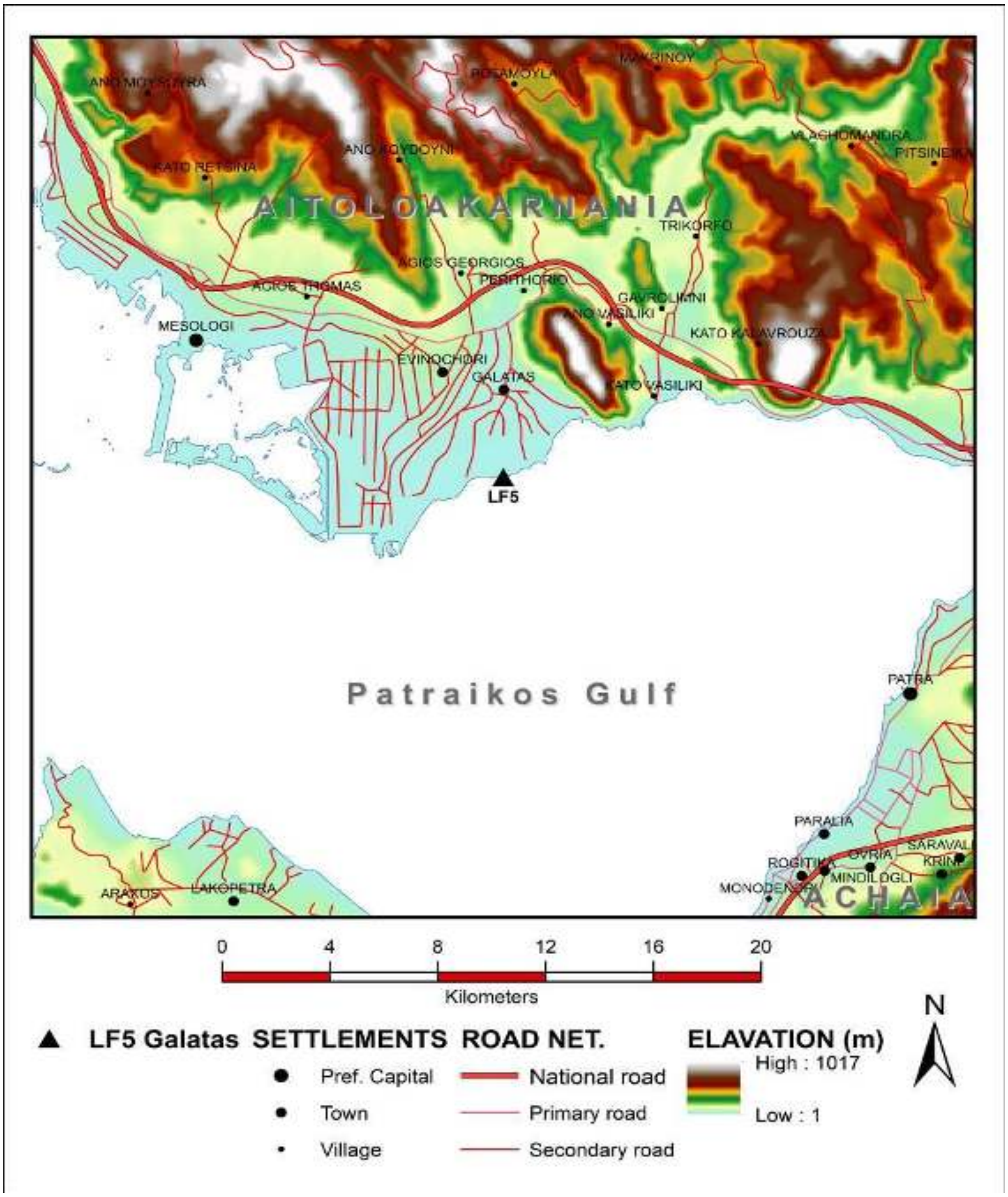

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Figure F2- 1 Topography map of the computational domain and locations of residential areas.

9F.2.3.2 METEOROLOGY AND CHARACTERISTIC WEATHER TYPES

The atmospheric dispersion models use as input data meteorological variables such as wind speed and wind direction, temperature, category of atmospheric stability, mixing layer height etc. The more complex models (like the one used in this study named HYSPLIT) use 3-dimensional meteorological fields as input. The discretised meteorological fields are calculated by prognostic and/or diagnostic models.

For the current study, meteorological data (vertical distribution of wind speed and direction, temperature, mixing layer height, humidity, precipitation, cloud cover etc) were extracted from the European Centre for Medium-Range Weather Forecasts (ECMWF) ERA-5 climate re-analysis dataset, (https://confluence.ecmwf.int/display/CKB/ERA5%3A+data+documentation), available at 3-hourly intervals.

9F.2.3.2.1 Characteristic Weather Types over the study area

To calculate the average levels and the maximum values of the pollutant concentrations from a future installation in the atmosphere on an annual, daily and hourly basis, the procedure of identifying the typical meteorological conditions or else characteristic weather types (CWT) of the area of interest was followed. The prevailing meteorological conditions or in other words characteristic weather types were obtained using the methodology of Sfetsos et al. (2005)[2]. The specific methodology was applied on ERA5 reanalysis data of large scale, as referenced above, covering a period of eleven years (2010-2020). The analysis revealed the prevailing weather conditions in the defined computational domain and the corresponding frequency of occurrence (in percentage) per year. Each weather condition was assigned a characteristic or else typical day (24-hour).

The results showed that the area of study is characterised by eleven (11) in total weather types (see Table F2- 2, Table F2- 3), .The meteorological conditions from the global reanalysis model, characterise each typical weather day of the region.

[2] A. Sfetsos, D. Vlachogiannis, N. Gounaris, and A. K. Stubos, (2005). On the identification of representative samples from large data sets with application to synoptic climatology, Theor. Appl. Climatol. 82, 177–182.

Table F2- 2 Characteristic weather types (CWT) and percentage of their frequency of occurrence within a typical year in the area of LF5.

CS3	
Typical weather type	Frequency Percentage of occurrence in a year (%)
1	13.06
2	5.56
3	6.31
4	9.80
5	15.40
6	8.60
7	3.50
8	7.54
9	5.57
10	8.68
11	15.98

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Table F2- 3 Prevailing meteorological conditions during the 11 characteristic weather types (CWT) in the domain of Achaia: horizontal component of wind speed, u (m/s), vertical component of wind speed v (m/s), (at 850 mb and 10 meters above mean sea level, a.m.s.l.

CWT	u10 (0 h)	u10 (12 h)	v10 (0 h)	v10 (12h)	T (0 h)	BLH (12 h)	
1	-0.712	2.551	-0.627	-0.297	286.35	918.05	-
2	-1.490	0.335	0.180	1.922	287.15	759.76	-
3	-0.742	1.283	-0.502	-0.705	291.96	1544.43	-
	u10 (0 h)	u10 (12 h)	v10 (0 h)	v10 (12h)	T (0 h)	T (12 h)	BLH (12 h)
4	-0.951	2.256	-0.058	-0.238	284.53	298.49	1311.20
5	-0.768	2.416	0.020	0.631	281.72	291.00	1053.22
	u10 (0 h)	u10 (12 h)	v10 (0 h)	v10 (12h)	T (0 h)	BLH (12 h)	-
6	-0.106	2.948	-0.354	-1.218	-0.819	-0.618	-
7	-1.653	-0.631	-0.430	-1.270	-0.656	-0.956	-
8	-0.233	3.104	-0.483	-1.013	-0.955	-0.172	-
9	-1.066	1.385	-0.512	-0.415	-1.316	-0.672	-

CWT	u10 (0 h)	u10 (12 h)	v10 (0 h)	v10 (12h)	T (0 h)	BLH (12 h)	
	u10 (0 h)	u10 (12 h)	v10 (0 h)	v10 (12h)	T (0 h)	T (12 h)	BLH (12 h)
10	-1.450	0.432	1.077	1.955	282.63	286.14	861.30
11	-1.133	1.976	0.076	-0.899	279.05	285.18	858.95
CWT	RH (0 h)	RH (12 h)	u850 (0 h)	-	-	-	-
1	84.70	56.52	0.723	-	-	-	-
2	83.20	73.38	4.994	-	-	-	-
3	72.70	37.70	1.591	-	-	-	-
	RH (0 h)	RH (12 h)	u850 (0 h)	v850 (0 h)	-	-	-
4	81.31	41.80	-1.119	-1.595	-	-	-
5	93.94	60.94	5.354	-2.536	-	-	-
	RH (0 h)	u850 (0 h)	v850 (0 h)	-	-	-	-
6	84.71	0.955	-3.722	-	-	-	-
7	51.31	-7.226	-6.193	-	-	-	-
8	92.31	2.454	-5.499	-	-	-	-
9	72.75	-2.402	-2.566	-	-	-	-
	RH (0 h)	RH (12 h)	u850 (0 h)	v850 (0 h)	-	-	-
10	88.51	67.52	0.847	8.792	-	-	-
11	83.16	62.03	1.818	-0.990	-	-	-

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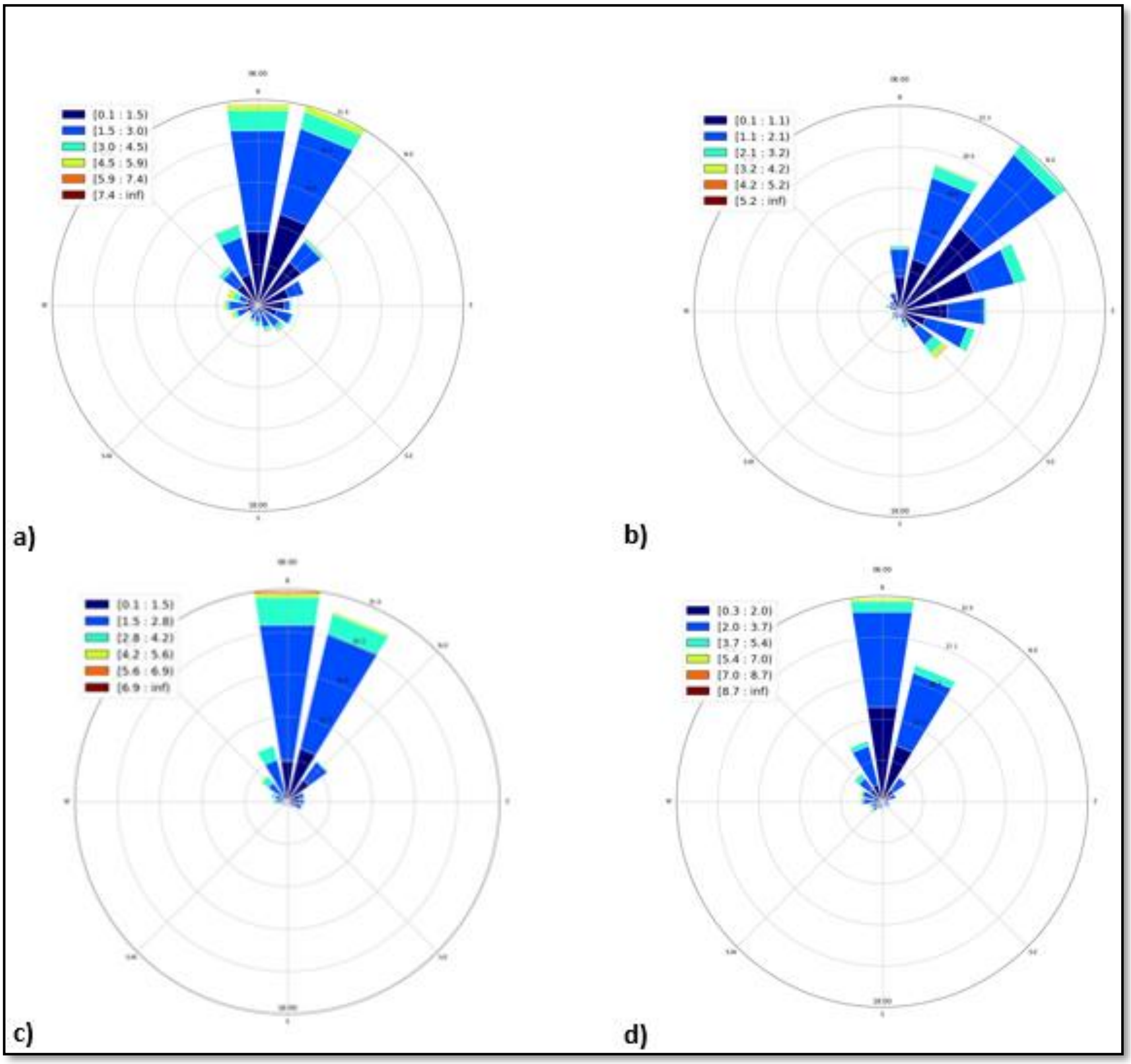


Prepared by Demokritos on behalf of ASPROFOS, 2022.

Figure F2- 2 Wind rose diagrams in the area of LF5, at 10 m a.s.l. and 12:00, for a) spring, b) summer, c) autumn and d) winter.

Figure F2- 2 presents the calculated wind rose diagrams at the location of theLF5, at 10 meters height for a typical year, calculated using ERA5 data. The concentric circles correspond to the relative frequency of each wind direction and the colour gradation is related to the percentage (%) of the wind speed per direction.

9F.2.3.2.2 Weather conditions description

The description of the weather conditions prevailing during each characteristic weather type of Table F2- 2 (CWT) is provided below.

- CWT1
  Relative high pressures are covering the area of study, resulting to good weather during this autumn day, low to moderate northerly wind speeds and temperature up to 23-25 degrees Celsius during noon.
- CWT2
  Low pressure system affects the Greek area with rainy weather accompanied with temporary thunderstorms in the area of interest during this typical autumn day. The winds are light to moderate from variable directions, veering in the afternoon to moderate westerlies, while temperature rises to 21-23 degrees Celsius.
- CWT3
  A shallow low-pressure system is passing south of Greece causing rainy weather locally at the area of interest during this autumn day. North-westerly moderate winds are prevailing over the area and temperature is up to 27-29 degrees Celsius during early afternoon.
- CWT4
  In this spring day, high pressures are covering the area with fair weather, light variable winds and maximum temperature reaching 26-28 degrees Celsius.
- CWT5
  Smooth barometric field is affecting the weather of the country with local clouds over the study area during this spring typical day. The winds are variable and temporarily westerlies of light to moderate intensity and the temperature up to 14-16 degrees Celsius during noon.
- CWT6
  High pressures associated with fine weather are affecting the area during this typical summer day, resulting to increased temperature 31-33 degrees Celsius during early afternoon and light winds, which temporarily, the hot period of the day, veer to westerlies up to moderate.
- CWT7
  High pressures field is covering the country, with fine weather in the Achaia region during this typical summer day. The winds blow from northeast directions light to moderate, and the temperature is climbing to 33-35 degrees Celsius at noon.
- CWT8
  High pressures prevail during this typical summer day resulting to fair weather at the area of study. The winds are of low intensity from variable directions, when during the hot part of the

day they are north-westerlies up to moderate and the temperature reaches 31-33 degrees Celsius.

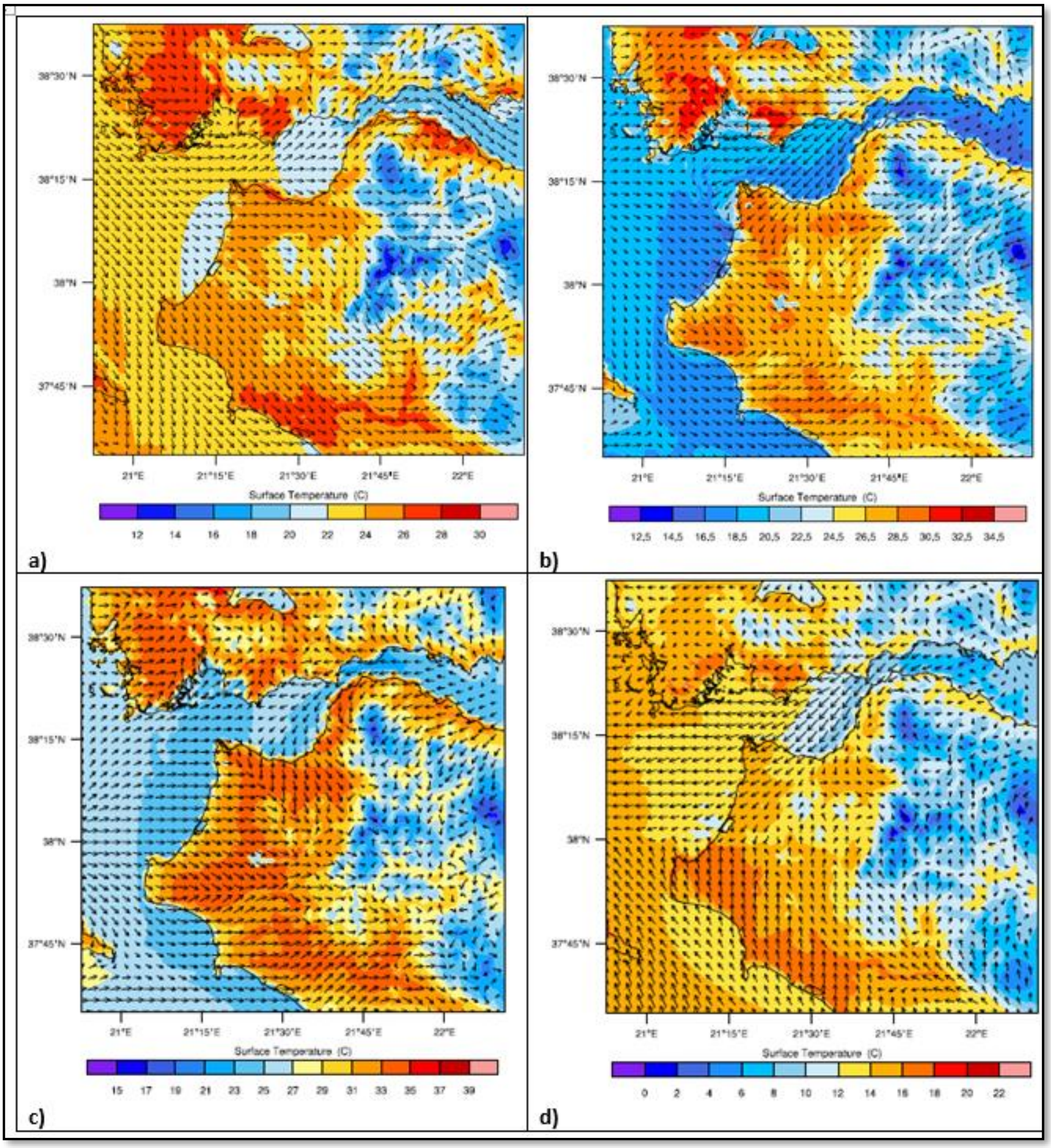
- CWT9
  High pressures field and fine weather over the area of interest during this typical summer day. The winds blow from north directions light to moderate, while the temperature is high reaching 34-36 degrees Celsius at mid-day.
- CWT10
  A low barometric atmospheric system is moving eastwards, causing rains and thunderstorms the area of interest on this winter day. The winds are blowing from south-eastern directions light to moderate and temperature rises to 14-16 degrees Celsius during noon.
- CWT11
  Smooth barometric system is moving south of Greece, affecting with light rain the Achaia region during this typical winter day. The winds are light variable and gradually north-westerlies moderate, while the temperature reaches 12-14 degrees Celsius.

9F.2.3.2.3 Atmospheric model WRF

The prognostic meteorological model Weather Research Forecasting (WRF-ARW) version 3.6.1 (Skamarock et al., 2008)[3] was set-up and used for the calculation of the 3-dimensional meteorological fields. The WRF model calculated the 3-dimensional meteorological fields of the region of interest with horizontal and temporal resolution of 1×1 km^2 and 1-hour, respectively. The ERA-5 data for the determined characteristic weather days were used as initial and boundary conditions to the meteorological model (WRF). The model simulations were performed for the 11 characteristic weather days (CWT).

As an example of the WRF results, Figure F2- 3-and Figure F2- 4 display examples of the WRF calculated 3-dimensional temperature and wind fields for CWT1 (autumn), CWT4 (spring), CWT6(summer) and CWT10 (winter) at 12:00 hr and 24:00 hr. The calculated meteorological fields were consequently used as input to the dispersion model.

3 Skamarock, W. C., J. B. Klemp, J. Dudhia, D. O. Gill, D. M. Barker, M. G. Duda, X.-Y. Huang, W. Wang, and J. G. Powers, 2008: A description of the Advanced Research WRF version 3. NCAR Technical Note 475, http://www.mmm.ucar.edu/wrf/users/docs/arw_v3.pdf.



Prepared by Demokritos on behalf of ASPROFOS, 20222.

Figure F2- 3 WRF calculated near surface temperature and wind fields in the area of LF5, at 12:00hr for: a) CWT1(autumn), b) CWT4 (spring), c) CWT6 (summer) and d) CWT10 (winter).

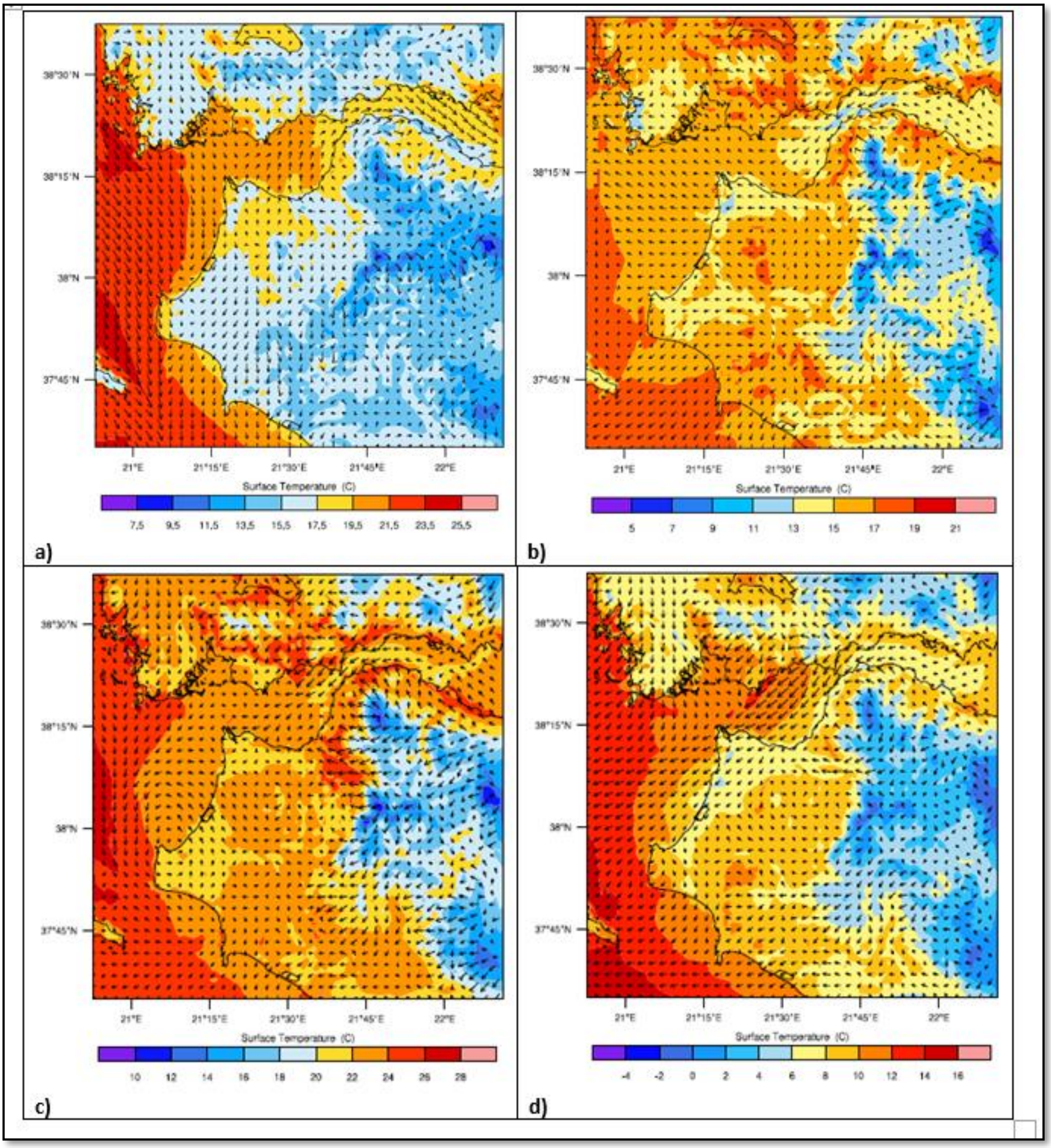


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Figure F2- 4 WRF calculated near surface temperature and wind fields in the area of LF5, (at 24:00hr for: a) CWT1(autumn), b) CWT4 (spring), c) CWT6 (summer) and d) CWT10 (winter).

9F.2.3.3 SIMULATION OF THE DISPERSION OF THE POLLUTANTS

This chapter presents the preparation of the input data for the atmospheric dispersion model HYSPLIT (Hybrid Single Particle Lagrangian Integrated Trajectory Model) used in the present study.

9F.2.3.3.1 The Dispersion Model

The HYSPLIT model is the newest version of a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. As a result of a joint effort between NOAA and Australia's Bureau of Meteorology, the model has been used for several applications (https://ready.arl.noaa.gov/HYSPLIT.php). The Air Resources Laboratory's HYbrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model is a complete system for computing both simple air parcel trajectories and complex dispersion and deposition simulations. The model calculation method is a hybrid between the Lagrangian approach, which uses a moving frame of reference as the air parcels move from their initial location, and the Eulerian approach, which uses a fixed three-dimensional grid as a frame of reference. In the model, advection and diffusion calculations are made in a Lagrangian framework following the transport of the air parcel, while pollutant concentrations are calculated on a fixed grid. The model is designed to support a wide range of simulations related to the atmospheric transport and dispersion of pollutants and hazardous materials, as well as the deposition of these materials onto the Earth's surface.

9F.2.3.3.1.1 Data of the pollutant emissions from pre-commissionig test at location LF5

In order to test the integrity of the pipelines a pre-commissioning test is performed after the pipelines installation. Specifically in Landfall 5(LF5) a pre-commissioning test will be performed for the OSS4 pipeline.. The duration of the pre-commissioning test estimated at 15 days .For the pre-commissioning test the equipment to be used and the emitted pollutants NOx, CO, PM10 described in

Table F2- 4. The developed model uses the emissions of the aforementioned equipment.

Table F2- 4 Technical data on emission sources from the equipment to be used in the pre-commissionning test and data for emitted pollutants NOx, CO, PM10

Type of data	unit	Compressors @ 2,000 scfm	Boosters @ 3,000 scfm	MEG injection pumps	Air dryer	Power generators
Equipment Number	#	12	9	2	5	2

Type of data	unit	Compressors @ 2,000 scfm	Boosters @ 3,000 scfm	MEG injection pumps	Air dryer	Power generators
Engine Size	kW	500	500	200	300	500
Total power	MW		13.4			
Area	m2	0.049	0.049	0.049	0.049	0.049
Diameter [m]	m	0.25	0.25	0.25	0.25	0.25
Height [m]	m	3	3	3	3	3
Flue Gas Temp. [°C]	°C	550	550	550	550	550
Flue Gas Temp. [K]	K	823	823	823	823	823
Flue Gas Velocity [m/s]	m/s	40	40	40	40	40
NOX EF	g/kWh	4	4	4	4	4
CO EF	g/kWh	3.5	3.5	3.5	3.5	3.5
PM EF	g/kWh	0.2	0.2	0.2	0.2	0.2
NO_x Emission rate	g/s	0.56	0.56	0.22	0.33	0.56
CO Emission rate	g/s	0.49	0.49	0.19	0.29	0.49
PM10 Emission rate	g/s	0.03	0.03	0.01	0.02	0.03

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9F.2.4 ATMOSPHERIC DISPERSION CALCULATIONS

This section focuses on the analysis of the HYSPLIT model results of the concentration values of NO_x, COand PM10 from the equipment to be used in the pre-commissioning test.

Considering that pre-commissioning activities will last for a limited number of days, the study has considered short term concentrations .The concentrations of NO_x were calculated on an hourly and annual basis to compare the modelled calculated results with the respective air quality limits as set by the legislation in force (MD 14122/549/E.103/2011 "Measures to improve air quality in compliance with the provisions of Directive 2008/50/EC "on the air quality and cleaner air for Europe" the European Parliament and Council of the European Union of 21 May 2008"). According to the current directive, the air quality limit for NO_2 for averaging period of 1 hour is set at 200 μg/m^3, not to be exceeded more than 18 times a calendar. . The CO values were calculated as maximum daily 8 hour running mean concentrations for comparison with the respective air quality limit of 10 mg/m^3 (Directive 2008/50/EC). The air quality limit for PM10 for averaging period of 1 day is set at 50 μg/m^3, not to be exceeded more than 35 times a calendar.

The modelling approach was performed without the inclusion of the photochemical reactions which could reduce the concentrations of NO_x and CO in the atmosphere for the reason of obtaining the maximum possible values in the domain. Moreover, detailed data on the compounds from high resolution inventories would be needed for a photochemical model, which were not available. Special attention was given to the populated areas around the location of the LF5.

9F.2.4.1 Pollutant concentrations from precommissioning test at LF5

The atmospheric dispersion calculations for the hydraulic experiments were performed for 2 characteristic weather types CWT5 and CWT6 that had resulted in the maximum concentration values of NOx and CO in the domain during the simulations of emissions from the Gas Compressor Station (CS3).

To simulate worst-case scenarios in the case of the pre-commissioning test , the meteorology calculations were based on synthetic data. The procedure assumed that the 24-hour CWT prolonged for 15 consecutive days i.e. for the total duration of the pre-commissioning test.

The modelling results and analysis showed that concentration values for the three pollutants remained well below the air quality limits of the legislation (2008/50/EC).

Table F2- 5 shows the maximum hourly and annual average concentrations of NO_x as well as the maximum 8-hour running mean value of CO and the maximum daily (mean) PM10 concentrations, calculated in the domain, for direct comparison with the legislative limits. It can be deduced that these maximum pollutant values are very low compared to the air quality limits (2008/50/EC).

Table F2- 5 Maximum calculated average concentration values of NOx, CO, and PM10 of 15 days of CTW5 and CTW6 in the domain and air quality limits (2008/50/EC).

LF5			
Characteristic Weather types (CWT)	Maximum hourly (mean) NOX concentration (μg/m3)	Maximum 8-h mean CO concentration (μg/m3)	Maximum daily (mean) PM10 concentration (μg/m3)
	(Limit 200 μg/m3)	(Limit 10000 μg/m3)	(Limit 50 μg/m3)
5	60.3	61.1	0.40

LF5			
Characteristic Weather types (CWT)	Maximum hourly (mean) NOX concentration (µg/m3)	Maximum 8-h mean CO concentration (µg/m3)	Maximum daily (mean) PM10 concentration (µg/m3)
6	44.0	37.9	0.50

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Table F2- 6 summarizes the maximum hourly average and annual NO_x concentrations as well as the CO maximum 8-hour running mean values and maximum daily (mean) PM10 concentration , calculated by the dispersion model over all the residential areas of the domain at a radius of ~20 km from the centroid of the LF5. The concentrations of the pollutants are negligible above the residential areas compared to the corresponding air-quality limits.

Table F2- 6 Maximum calculated concentration values of NOx, CO and PM10, over the residential areas, resulted from 15-days simulations of CWT5 and CTW6.

LF5					
Nu	Place of residence	Distance from LF5 (km)	Maximum hourly (mean) NOX concentration (µg/m3) (limit200 µg/m3)	Maximum 8-h mean CO concentration (µg/m3) (limit 10000 µg/m3)	Maximum daily (mean) PM10 concentration (µg/m3) (limit 50 µg/m3)
1	GALATAS	3.48	---	---	0.000001
2	GAVROLIMNI	8.92	0.289	0.150	0.000006
3	KATO KALAVROUZA	10.83	2.464	2.617	0.000018
4	KATO VASILIKI	6.45	5.177	3.975	0.000227
5	MONODENDRI	19.43	0.064	0.038	---
6	PITSINEIKA	20.28	0.074	0.197	0.000004
7	ROGITIKA	19.33	---	0.005	---
8	VLACHOMANDRA	18.43	0.079	0.089	---

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From the tables (Table F2- 5 and Table F2- 6) , it **can be deduced, that no exceedances of the NO_x CO and PM10 respective air quality limits occur over the populated areas within an approximate distance of 20 km from LF5.** In fact, the maximum hourly) and annual NO_x maximum 8-h mean CO and Maximum daily (mean) PM10,concentrations are found to be very low compared to the legislative limits (2008/50/EC).

It can be concluded that the modelled NO_x CO ,PM10 concentrations from the pre-commissioning test s, in the location of LF5, emitted from 12 Compressors with capacity 500 KW each,9 Boosters with capacity 500 KW each,2 Meg pumps with capacity 200 KW each,5 air dryers ,with capacity 300 KW each,2 Power Genarators with capacity 500 KW each are very low and insignificant compared to the air quality limits of the legislation in force.

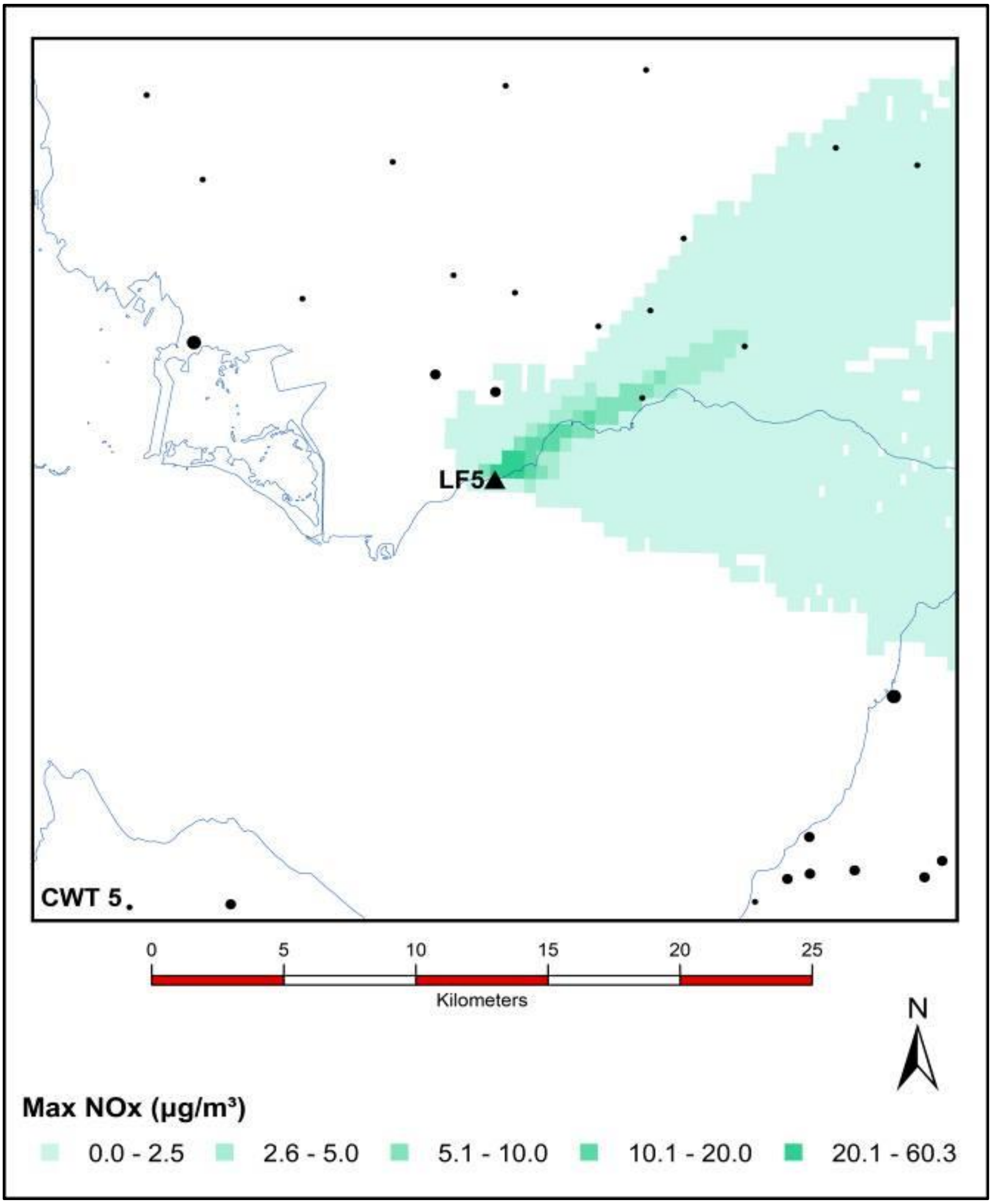

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Figure F2- 5 Modelled near surface maximum hourly average concentrations of NOx resulted from 15-days simulation of CWT5. Air quality limit for hourly NO2: 200 (μg/m3).

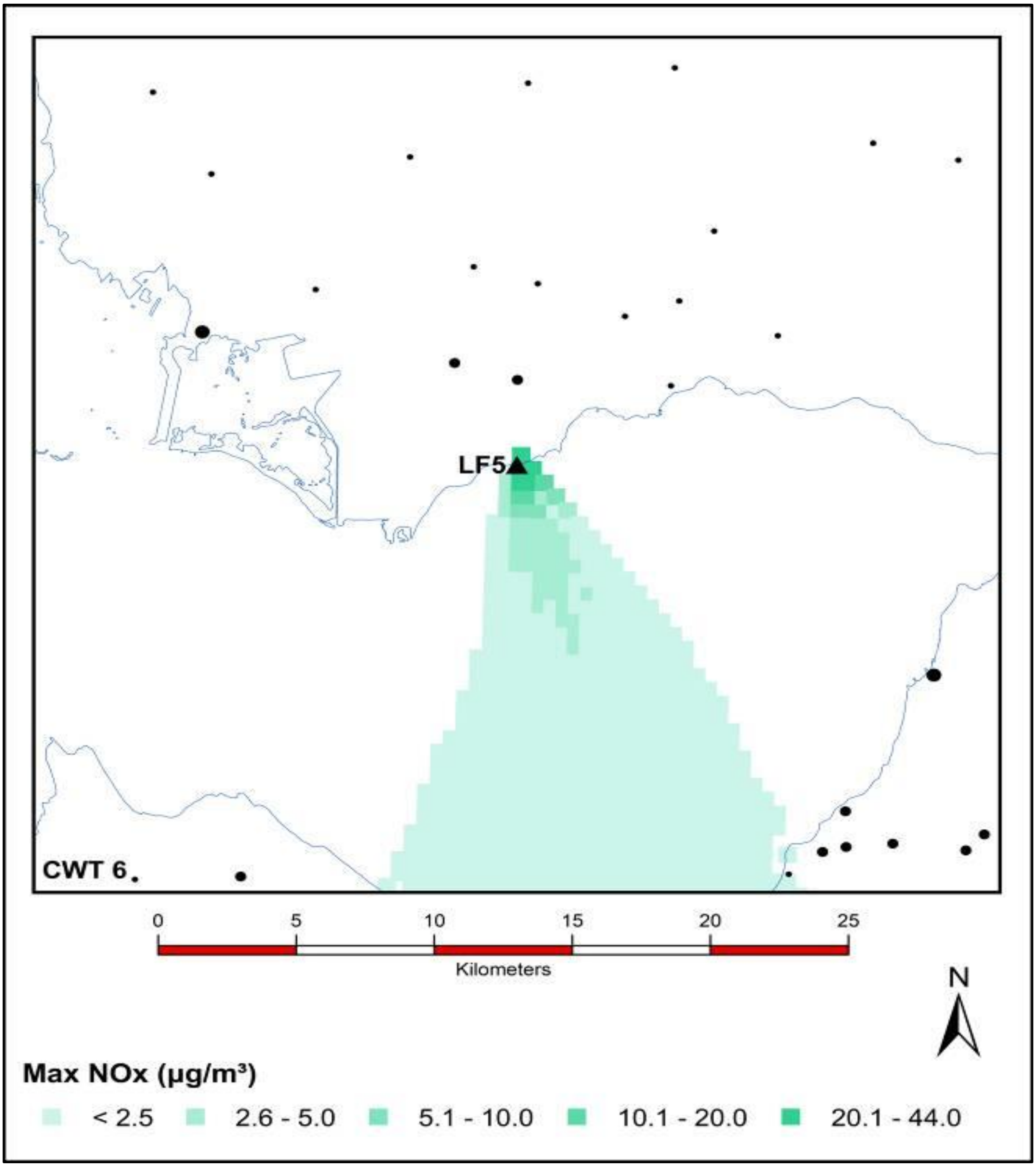

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Figure F2- 6 Modelled near surface maximum hourly average concentrations of NOx resulted from 15-days simulation of CWT6. Air quality limit for hourly NO2: 200 (μg/m3).

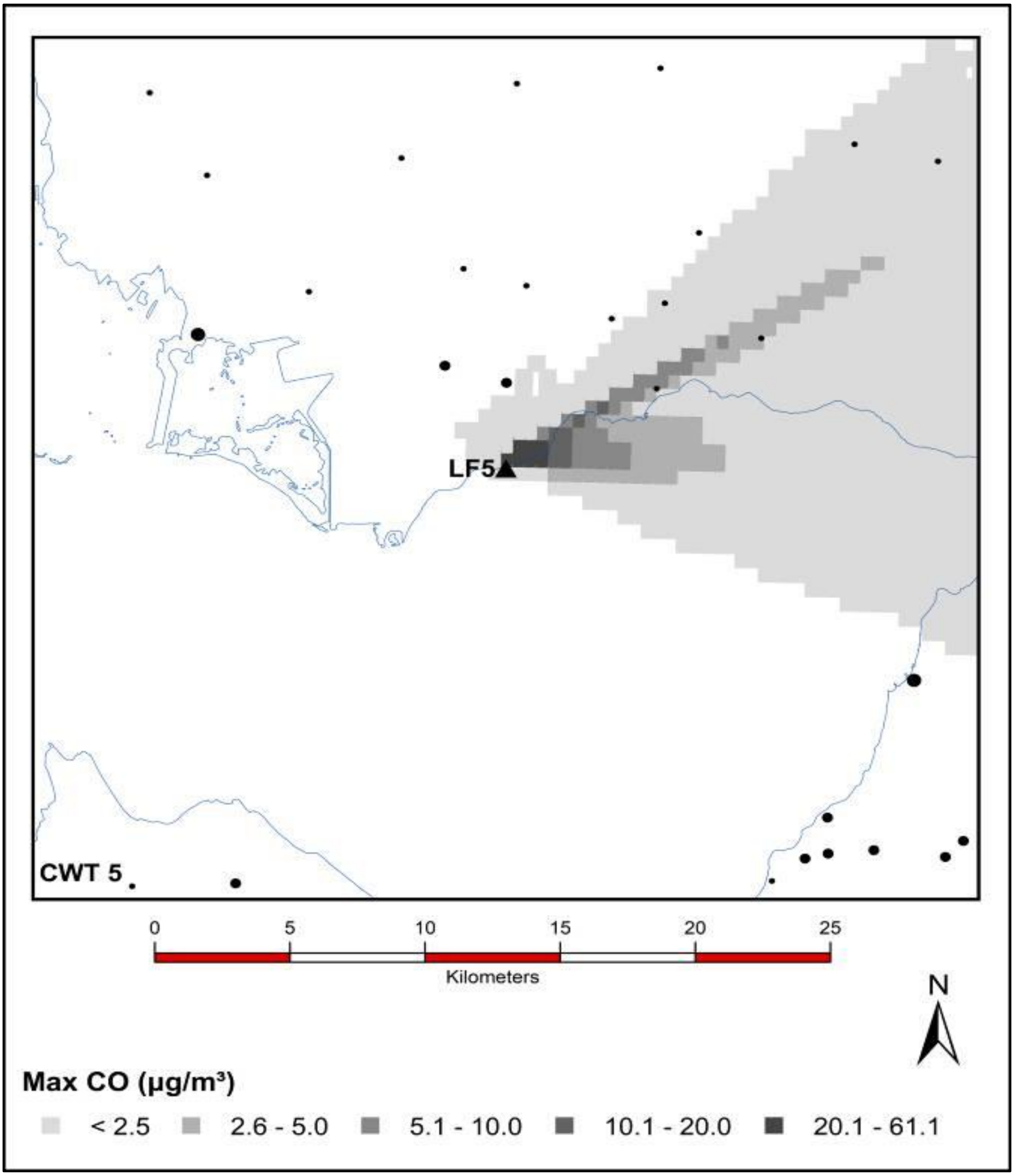

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Figure F2- 7 Modelled near surface 8-hour running mean concentration values of CO (μg/m3), resulted from 15-days simulation of CWT5. Limit for 8-hour CO: 10000(μg/m3).

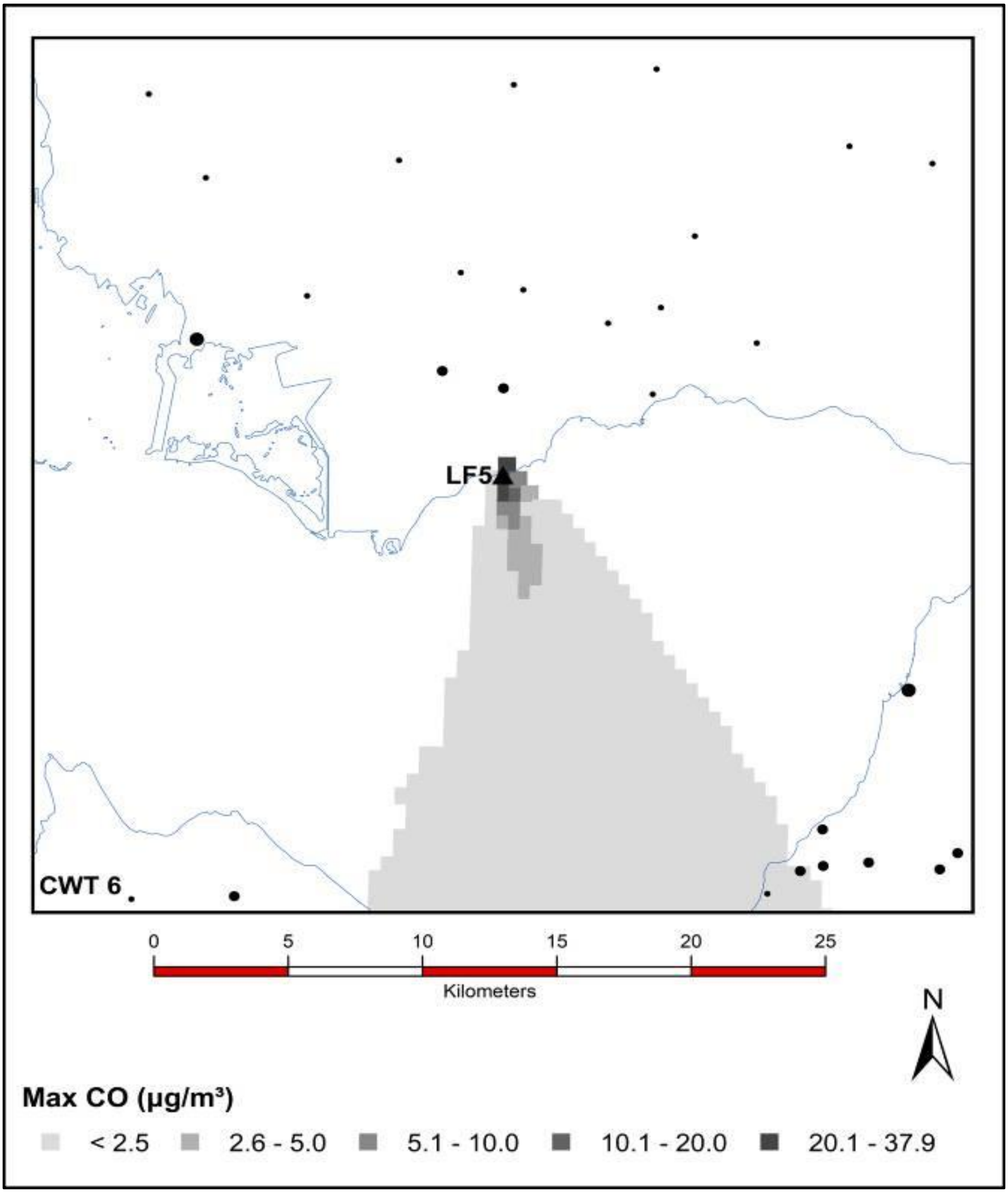

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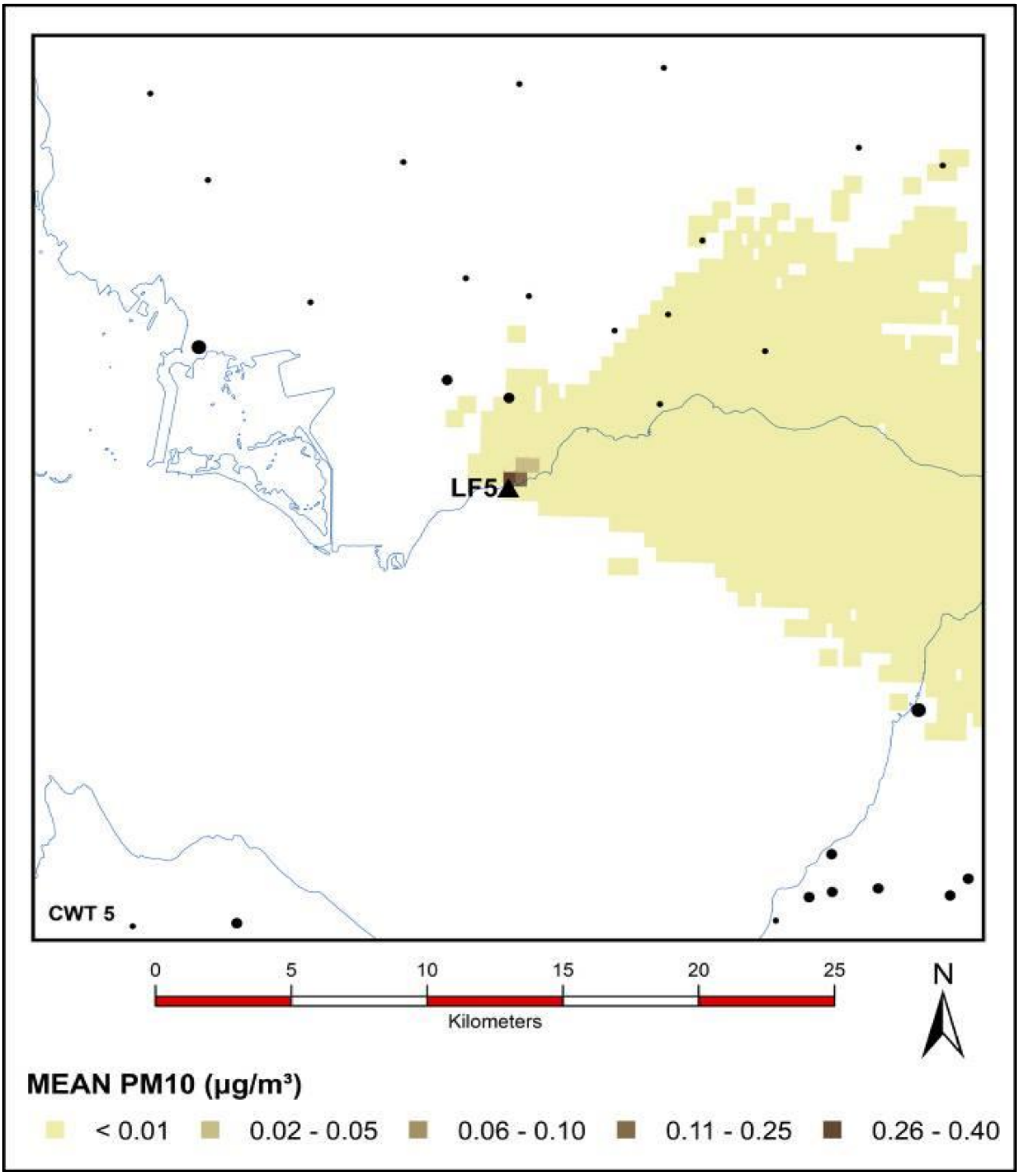
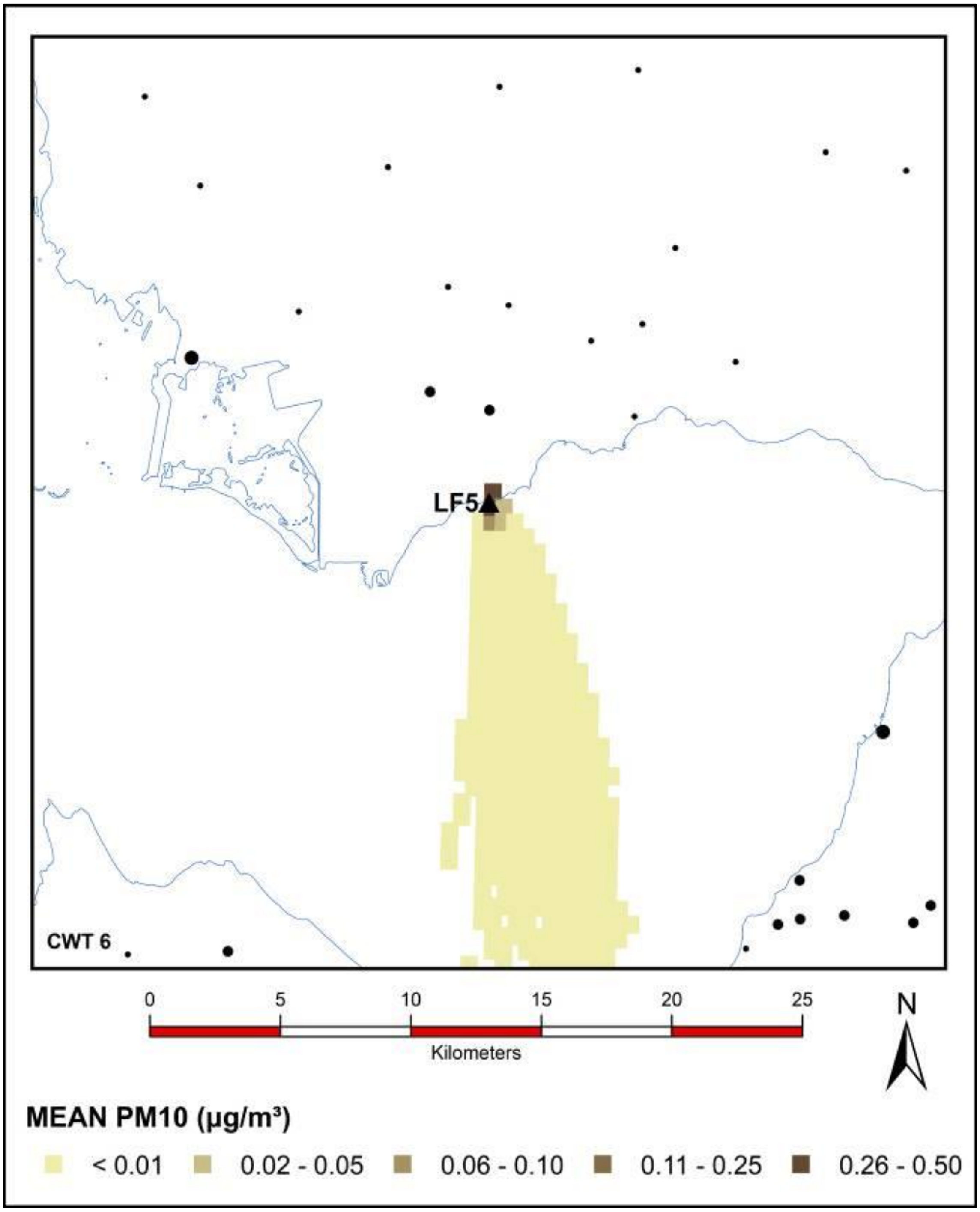
Figure F2- 8 Modelled near surface 8-hour running mean concentration values of CO (µg/m3), resulted from 15-days simulation of CWT6. Limit for 8-hour CO: 10000 (µg/m3).



Prepared by: Demokritos on behalf of ASPROFOS, 2022

Figure F2- 9 Modelled near surface maximum daily average concentrations of PM10, resulted from 15-days simulation of CWT5. Air quality limit for daily average PM10: 50 (μg/m3).



Prepared by: Demokritos on behalf of ASPROFOS, 2022

Figure F2- 10 Modelled near surface maximum daily average concentrations of PM10, resulted from 15-days simulation of CWT6.Air quality limit for daily average PM10: 50(μg/m3).

9F.2.5 SUMMARY – CONCLUSIONS

The aim of the current study was to investigate the dispersion of NO_x CO , PM10 emissions from the pre-commissioining activities of the EastMed Pipeline Project, at landfall location LF5 at Patraikos Gulf. The study was performed with the 3-dimensional computer modelling tools and appropriate methodology used and developed by the Environmental Research Laboratory (EREL) of the NCSR "Demokritos". The dimensions of the modelling domain were large enough to include sufficiently the residential areas within a reasonable distance from the LF5 location. Thus, the domain size for the modelling calculations was set to 50×50 km^2. For the modelling needs, the initial meteorological data were retrieved from the European Centre for Medium-Range Weather Forecasts (ECMWF) ERA-5 climate *high-resolution reanalysis* of 3-hours, covering in total eleven (11) years. The atmospheric dispersion calculations for the pre-commissioning test were performed for 2 characteristic weather types CWT5 and CWT6 that had resulted in the maximum concentration values of NOx and CO in the domain during the simulations of emissions from the Gas Compressor Station (CS3).

For the air dispersion calculations, the atmospheric dispersion model HYSPLIT (Hybrid Single Particle Lagrangian Integrated Trajectory Model) was employed. The modelling was based on the technical information available at the stage of the study by ASPROFOS SA. The background concentrations of NO_x and CO were not considered in the modelling study as the field measurements in the area of the compression station were estimated to be negligible for a meaningful assessment.

The near-surface hourly average and annual NO_x concentrations as well as the 8-hour running mean CO values and maximum daily (mean) PM10 concentrations were calculated in order to be comparable to the respective air quality limits as set by the legislation in force (MD 14122/549/E.103/2011 "Measures to improve air quality in compliance with the provisions of Directive 2008/50/EC "on the air quality and cleaner air for Europe" the European Parliament and Council of the European Union of 21 May 2008").

Overall, the hourly mean and annual NO_x concentrations were calculated to be lower than the air quality limits everywhere in the domain and during the worst CWTs. Similarly, the CO and PM10 concentrations were calculated to be negligible compared to the air quality legislative limit. It must also be emphasised that no exceedances of the NO2 COand PM10 respective air quality limits were found over the populated settlements within a distance of approximately 20 km due to the emissions from the precommissioning test at LF5..

Conclusively, the modelling study yielded the following results:

- The maximum mean hourly NO_x concentration was found to be equal to ~30.1% of the air quality limit of 200 μg/m^3 (during CWT5,).

- The maximum 8-hour running mean CO concentration was found to be equal to 0.61% of the air quality limit of 10000 μg/m^3 (during CWT5).
- The maximum daily average concentrations of PM10, was found to be equal to 1.0% of the air quality limit of 50 μg/m3 (during CWT6).