Meijer Milieuadvies

DFW
De heer Jacobs
Dulleweg 53
1721 PM Broek op Lange Dijk
Email: info@dfweurope.com

Burg, Jhr v.d. Boschstr 123a
3958CC Amerongen telefoon
06-55835390
meijermilieuadvies@gmail.com

Amerongen, 6 july 2020

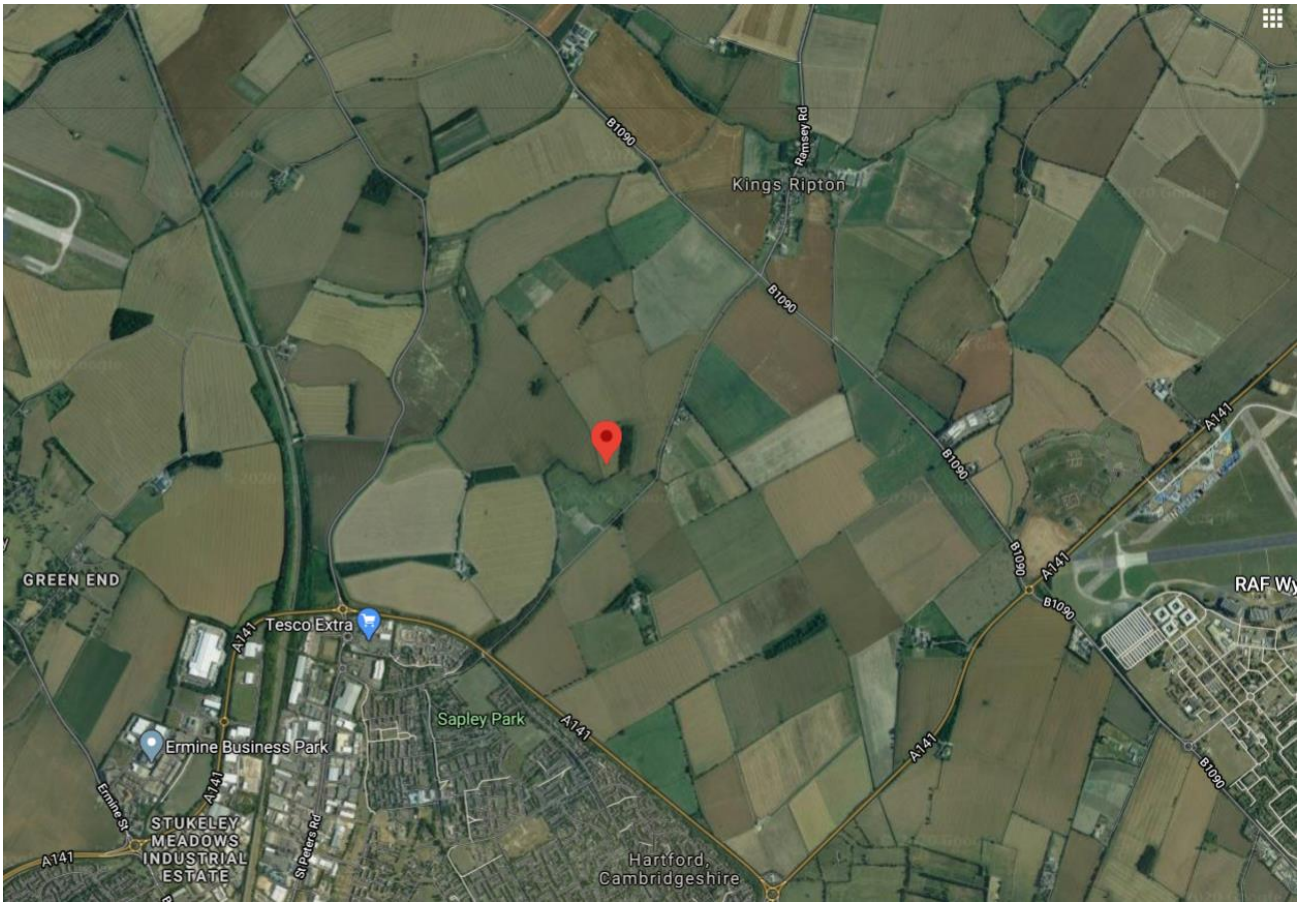
Betreft: Crematorium Huntingdonx
Referentie: MMA-R050
Annex: 3

Dear mr Jacobs,

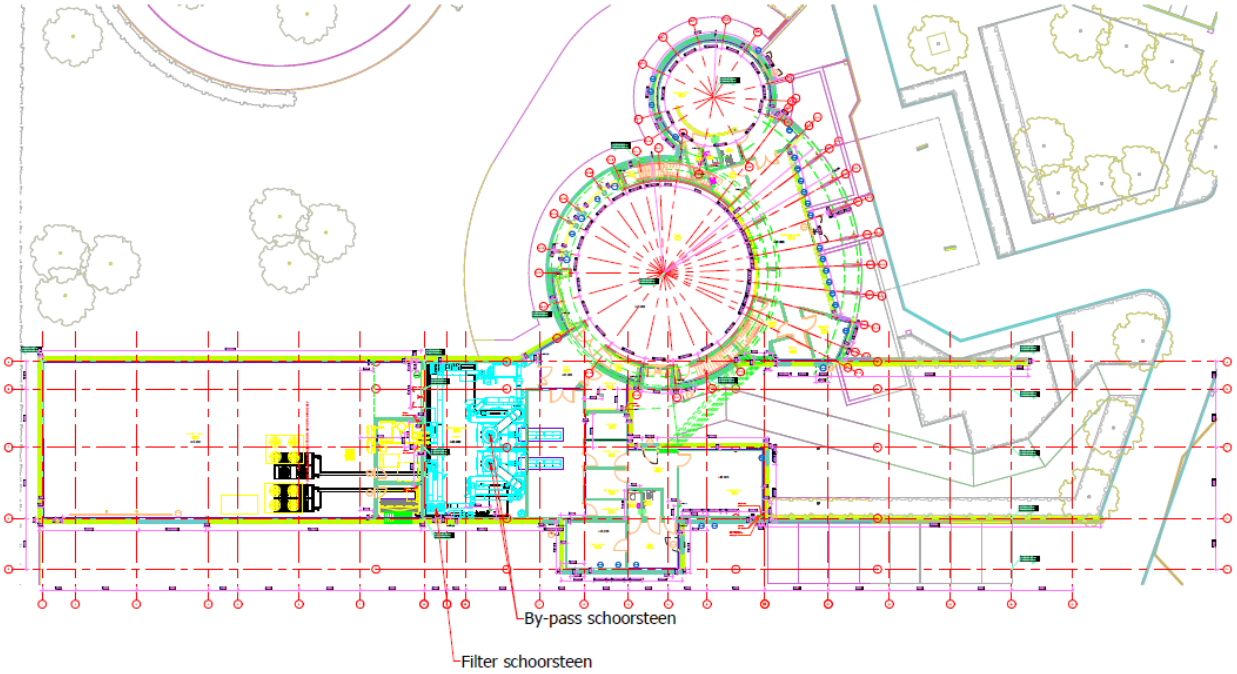
DFW Europe has commissioned Meijer Milieuadvies to carry out a dispersion study for a crematorium which is planned in Huntingdon (Sapley Road, Kingsripton (UK)). In this crematorium two ovens of DFW will be installed.

The impact of the planned crematorium regarding the air quality of NO_x, CO, SO_2 and PM2,5 and PM10 on the nearby residential area has to be investigated. Know emissions of a comparable furnace of DFW has been used for the investigation. This concerns the furnace of crematorium Geleen in the Netherlands.

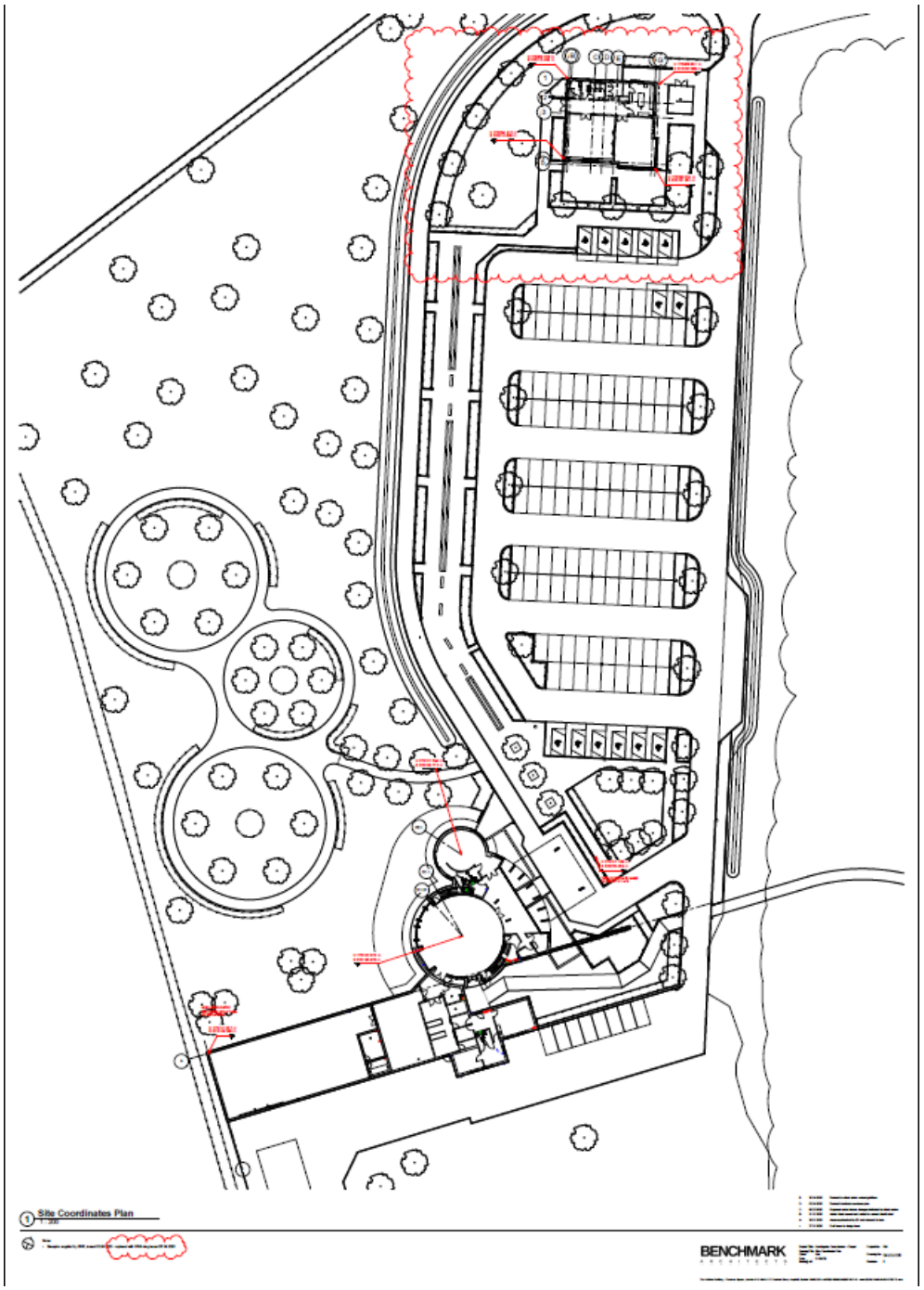
Investigation
Figures 1,2 and 3 indicates the location of the Huntingdon crematorium.



Figures 1. Location of the planned crematorium in Huntingdon



Figures 2 Planned crematorium in Huntingdon: detail 1



Figures 3 Planned crematorium in Huntingdon: detail 2

The following input data for the dispersion calculation are used for each oven and stack:

Building	: see annex A
Stack height	: 12,7 m
Stack diameter	: 0,25 m
Exhaust temperature	: 362 K
Flow	: 0,27 Nm^3/s
Emission NO_X	: $3,48*10^{-5}$ kg/s
emission CO	: $2,63*10^{-6}$ kg/s
Emission SO_2	: $1,14*10^{-6}$ kg/s
Emission dust	: $1,67*10^{-7}$ kg/s
Duration of emission	: 5 days a week, 250 days a year; 500 cremations per oven in a year

The dispersion was calculated with the US-EPA AERMOD-model: AERMOD View1 , version 19.191 from Lakes Environmental Software Inc..

Three year local meteorological data (period 2017, 2018 and 2019) was purchased from Lakes Environmental Software Inc.
A special sub-program (AERMET view) is used to transform the raw meteorological data in such a format, that they can be used in the dispersion model AERMOD View.

After the source and the receptor grid have been defined, the local topography was downloaded.

The effect of building downwash was incorporated in the calculation.
Annex A shows a layout of the crematorium hall.
Each calculation results in dispersion charts:
-Dispersion chart showing the annual impact values (NOx, SO2, PM10 and PM2,5)
-Dispersion chart showing the maximum 8 hours averages of CO.

The results are presented on topographical maps in Annex B; Annex C gives a copy of a part of the AERMOD summary files.

Table 1 provides a summary of the results of the modelling calculations.

Table 1: Results of the dispersion calculations for the new crematorium in Huntingdon (UK).

max. contribution at groundlevel concentration in residential area				
NO_x as NO_2	SO_2	CO	PM10	PM2,5
annual	annual	8 hours	annual	annual
concentration in [µg/m^3]unless otherwise mentioned				
air quality limits human health*				
40	125	10 mg/m^3	40	25
air quality limits human vegetation*				
30	20	-	-	-
23,4 (outside site < 10)	0,77 (outside site < 0,2)	8,4 (outside site < 8)	0,113 (outside site < 0,1)	0,113 (outside site < 0,1)
background concentrations (baseline level)				
9,8***	2,5**	0,21 mg/m^3**	15,7***	9,3***
predicted environmental concentrations (maximum)				
33 (< 20 outside site)	3,3 (< 2,7 outside site	0,21 mg/m^3	16 (< 16 outside site	9,4 (< 9,4 outside site

*National air quality objectives
** Defra 2001 estimate
*** Defra 2020 estimate

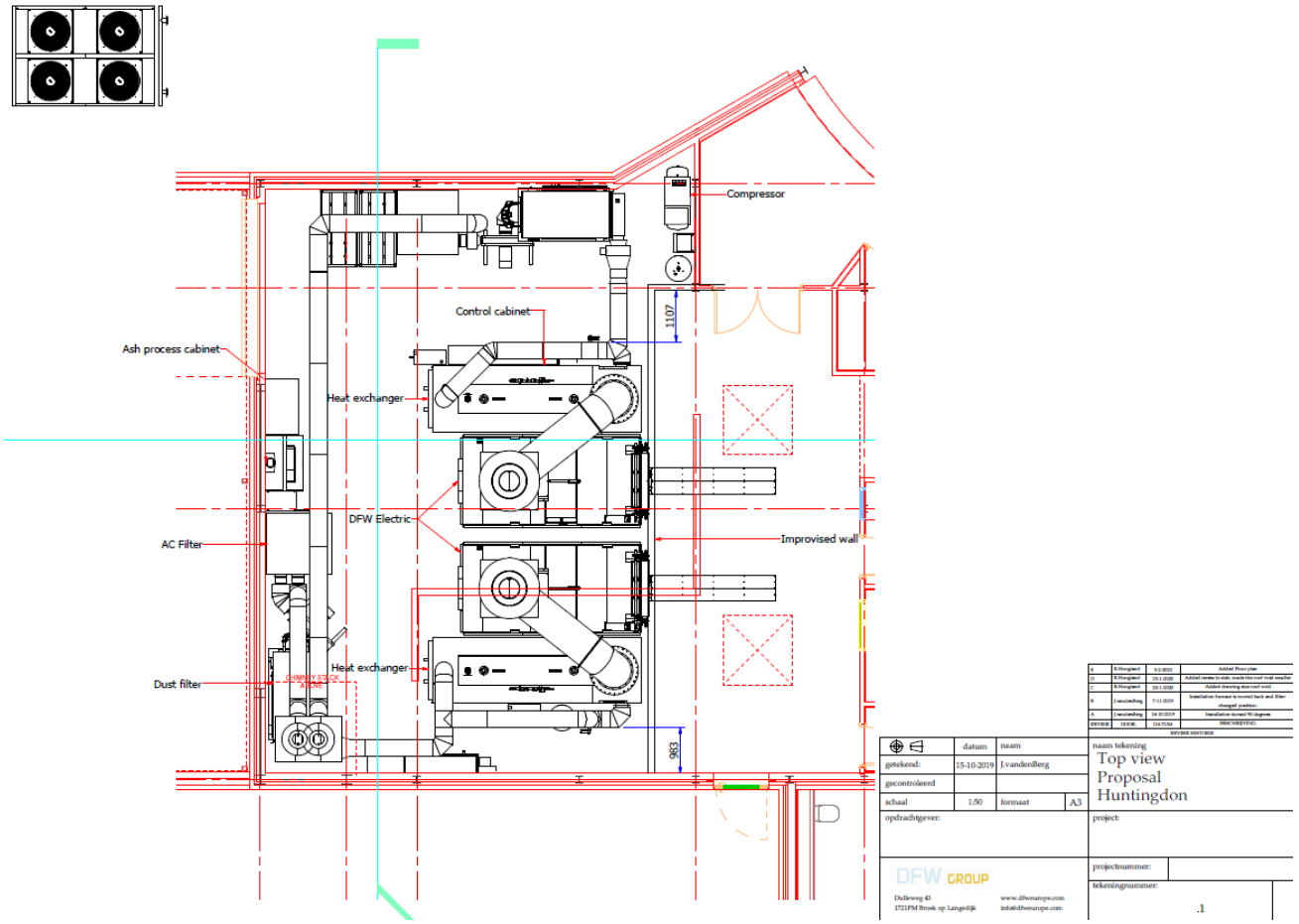
The maximum contribution of the crematorium stacks to the ambient air are found at the crematorium site itself.

The impact in the nearby residential area will be low: the maximum predicted concentrations of CO, SO_2, PM10 and PM2,5 at ground level do not exceed the limit values For NO_x the maximum value is exceeding the limit, but this concentration exits within the site area. Outside the crematorium site; the immission concentration is < 20 µm^3 (below the limits for human health and vegetation).

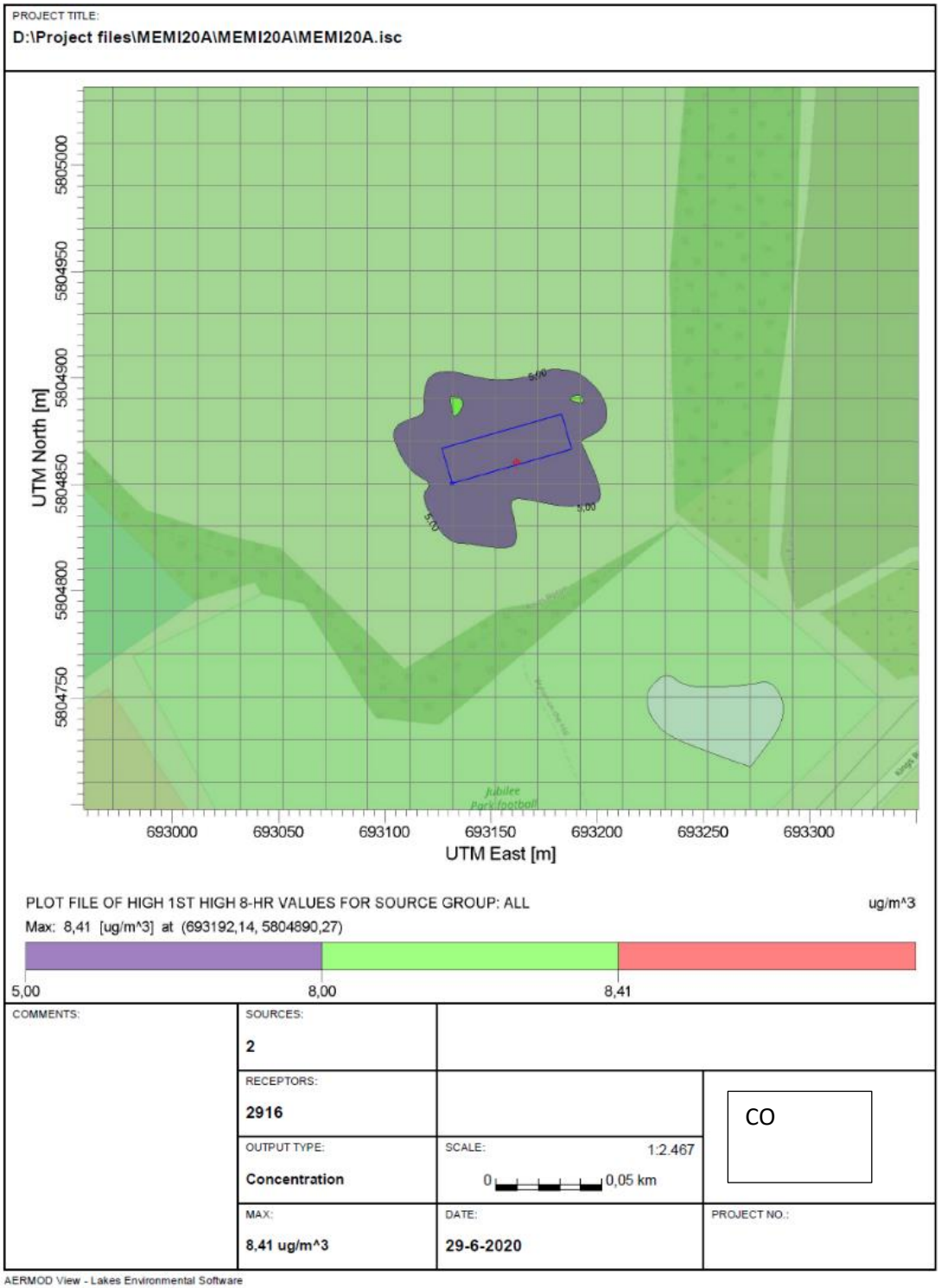
Kind regards,

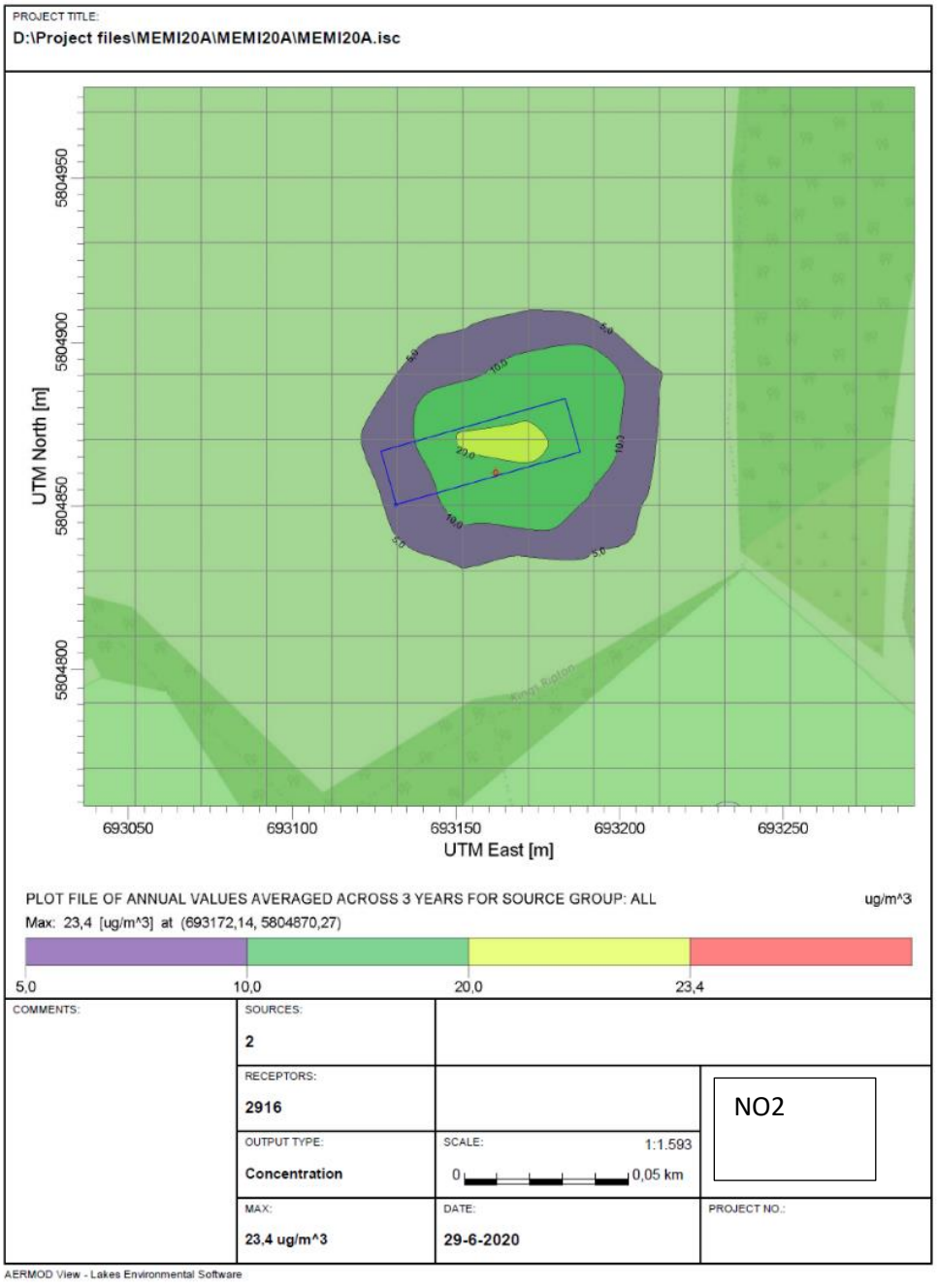
W. Meijer

Annex A. Layout



Annex B Dispersion figures

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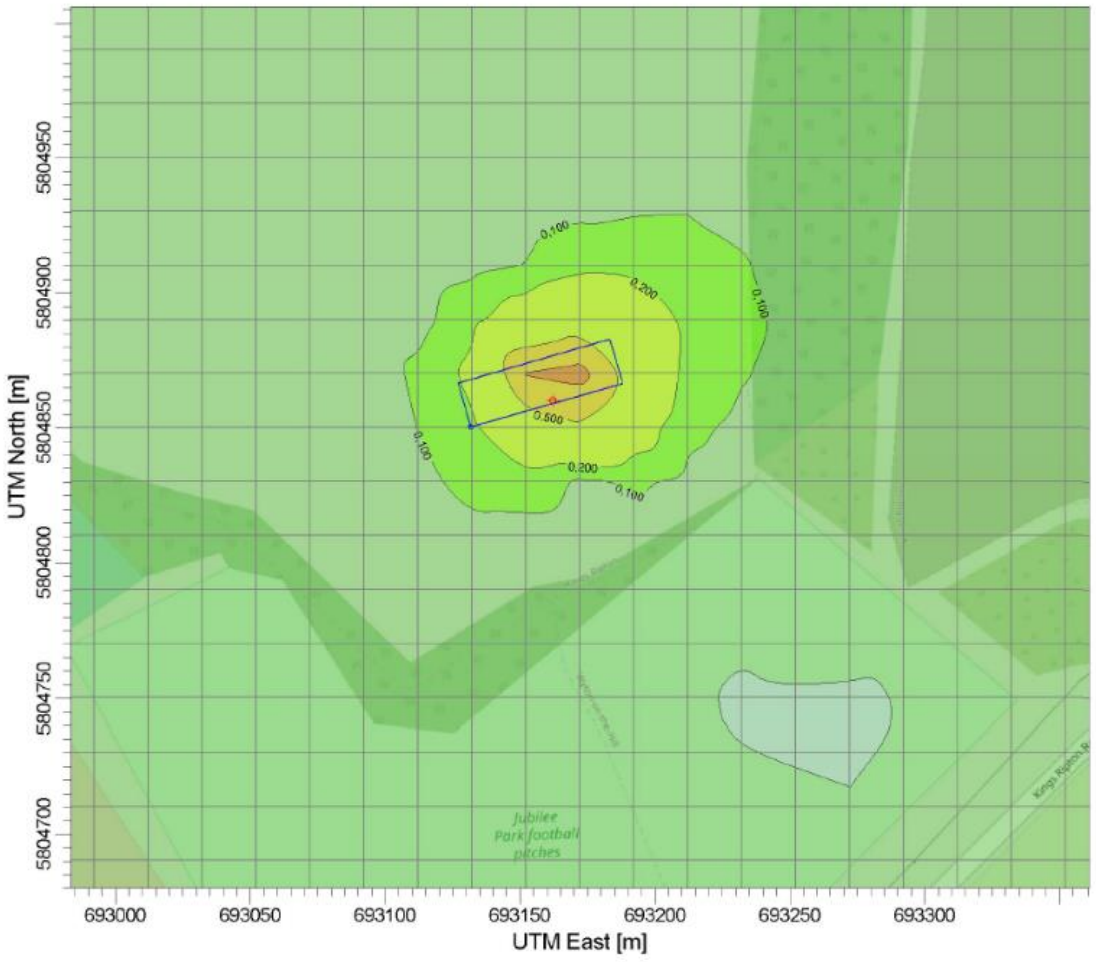
UTM North [m]
5804950
5804900
5804850
5804800
693050
693100
693150
693200
693250
UTM East [m]
PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 3 YEARS FOR SOURCE GROUP: ALL
ug/m^3
Max: 23,4 [ug/m^3] at (693172,14, 5804870,27)
5,0
10,0
20,0
23,4
COMMENTS:
SOURCES:
2
RECEPTORS:
2916
OUTPUT TYPE:
Concentration
SCALE:
1:1.593
0
0,05 km
NO2
MAX:
23,4 ug/m^3
DATE:
29-6-2020
PROJECT NO.:
AERMOD View - Lakes Environmental Software

PROJECT TITLE:
D:\Project files\MEMI20A\MEMI20A\MEMI20A.isc

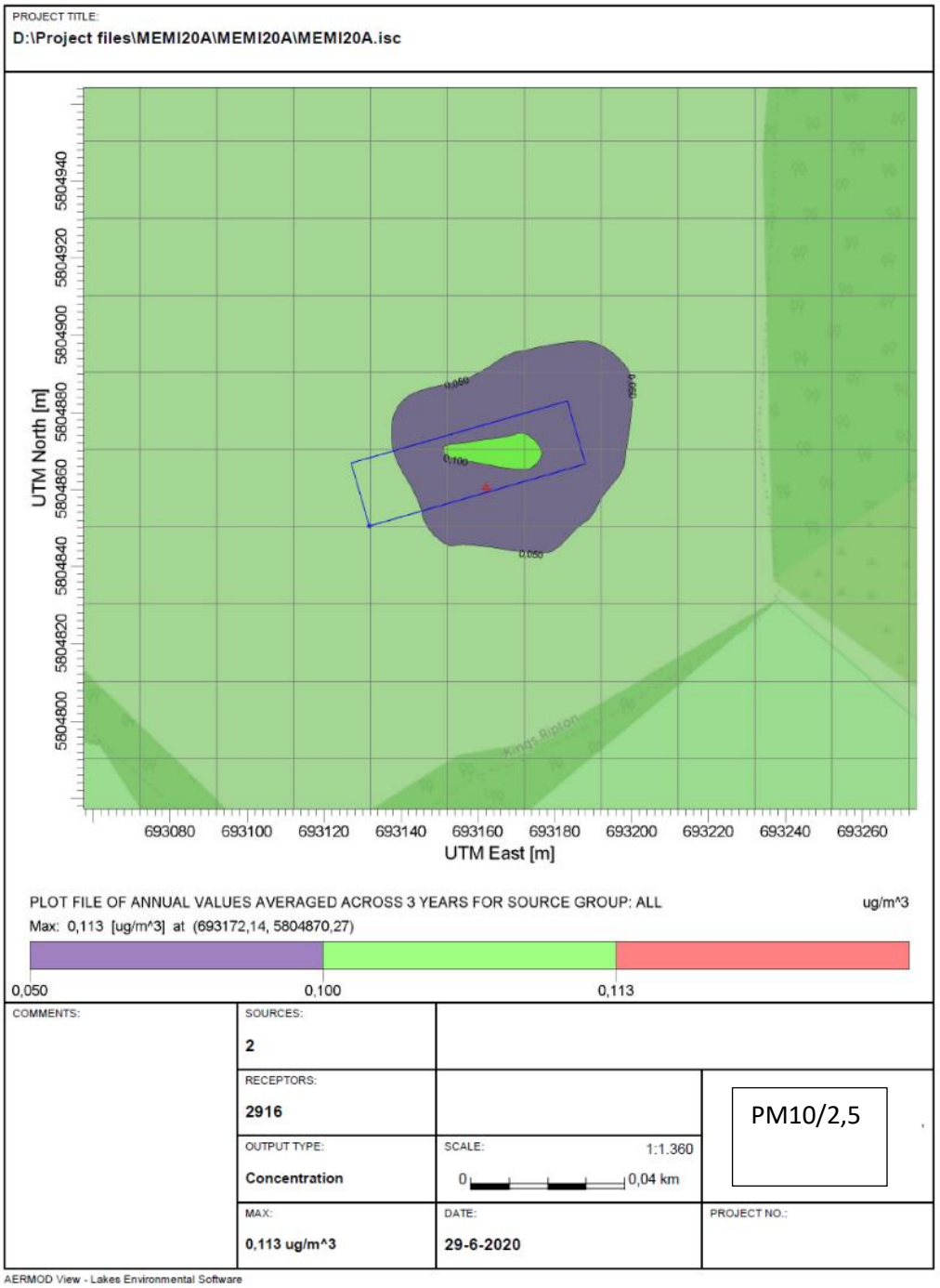


PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 3 YEARS FOR SOURCE GROUP: ALL ug/m^3
Max: 0,768 [ug/m^3] at (693172,14, 5804870,27)

0,100 | 0,200 | 0,500 | 0,700 | 0,768

COMMENTS: SO2 annual mean	SOURCES: 2		
	RECEPTORS: 2916		SO2
	OUTPUT TYPE: Concentration	SCALE: 1:2.370 0 0,05 km	
	MAX: 0,768 ug/m^3	DATE: 26-6-2020	PROJECT NO.:

AERMOD View - Lakes Environmental Software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UTM North [m]
5804940
5804920
5804900
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5804860
5804840
5804820
5804800
693080
693100
693120
693140
693160
693180
693200
693220
693240
693260
UTM East [m]
0,050
0,100
PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 3 YEARS FOR SOURCE GROUP: ALL
ug/m^3
Max: 0,113 [ug/m^3] at (693172,14, 5804870,27)
0,050
0,100
0,113
COMMENTS:
SOURCES:
2
RECEPTORS:
2916
OUTPUT TYPE:
Concentration
SCALE:
1:1.360
0
0,04 km
PM10/2,5
MAX:
0,113 ug/m^3
DATE:
29-6-2020
PROJECT NO.:
AERMOD View - Lakes Environmental Software

Annex C Aermod summary file

CO

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                                        *** POINT SOURCE DATA ***

                NUMBER EMISSION RATE                    BASE     STACK   STACK    STACK     STACK    BLDG   URBAN  CAP/  EMIS RATE
   SOURCE        PART.  (GRAMS/SEC)     X         Y     ELEV.    HEIGHT  TEMP.   EXIT VEL. DIAMETER  EXISTS SOURCE HOR   SCALAR
     ID          CATS.                (METERS) (METERS) (METERS) (METERS) (DEG.K)  (M/SEC)  (METERS)                       VARY BY
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 CHIMNEY1         0   0.26300E-02  693162.1 5804860.3    43.4    11.75   362.15     5.50     0.25    YES     NO    NO
 CHIMNEY2         0   0.26300E-02  693162.1 5804860.3    43.4    11.75   362.15     5.50     0.25    YES     NO    NO
*** AERMOD - VERSION  19191 ***   *** D:\Project files\MEMI20A\MEMI20A\MEMI20A.isc                          ***         06/26/20

                                        *** THE SUMMARY OF HIGHEST  1-HR RESULTS ***


                                    ** CONC OF CO       IN MICROGRAMS/M**3                      **

                                                    DATE                                                                NETWORK
GROUP ID                          AVERAGE CONC     (YYMMDDHH)            RECEPTOR  (XR, YR, ZELEV, ZHILL, ZFLAG)    OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ALL      HIGH   1ST HIGH VALUE IS      12.25575  ON 19082707: AT (  693152.14,  5804890.27,    42.70,    42.70,    0.00)  GC  UCART1


File  Edit  Format  View  Help
                                    *** THE   1ST HIGHEST  8-HR AVERAGE CONCENTRATION   VALUES FOR SOURCE GROUP:  ALL
                                        INCLUDING SOURCE(S):     CHIMNEY1    , CHIMNEY2    ,

                                         *** NETWORK ID: UCART1   ;  NETWORK TYPE: GRIDCART ***

                                              ** CONC OF CO       IN MICROGRAMS/M**3                      **

  Y-COORD  |                                                  X-COORD (METERS)
  (METERS) |       693632.14              693652.14              693672.14              693692.14
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 5804590.3 |      0.34937 (18092624)      0.35177 (18092624)      0.33919 (18092624)      0.32107 (18092624)
 5804570.3 |      0.32954 (19070608)      0.33203 (19070608)      0.33444 (18092624)      0.32589 (18092624)
 5804550.3 |      0.28055 (19070608)      0.30152 (19070608)      0.30602 (19070608)      0.31079 (18092624)
 5804530.3 |      0.26432 (19010308)      0.25511 (18032108)      0.26555 (19070608)      0.27962 (19070608)
 5804510.3 |      0.30916 (19010308)      0.26656 (19010308)      0.23730 (18032108)      0.24201 (19070608)
 5804490.3 |      0.32955 (19010308)      0.30855 (19010308)      0.27452 (19010308)      0.23782 (19010308)
 5804470.3 |      0.31656 (19010308)      0.31914 (19010308)      0.30523 (19010308)      0.27893 (19010308)
 5804450.3 |      0.28481 (19010308)      0.30353 (19010308)      0.30920 (19010308)      0.30382 (19010308)
 5804430.3 |      0.24520 (19010308)      0.26777 (19010308)      0.28947 (19010308)      0.30674 (19010308)
 5804410.3 |      0.20620 (19010308)      0.23329 (19010308)      0.26126 (19010308)      0.28760 (19010308)
 5804390.3 |      0.21018 (19100224)      0.19654 (19010308)      0.22747 (19010308)      0.25866 (19010308)
 5804370.3 |      0.21974 (19100224)      0.19835 (19100224)      0.19254 (19010308)      0.22442 (19010308)
 5804350.3 |      0.22229 (19100224)      0.20652 (19100224)      0.19238 (19100224)      0.19277 (19010308)
 5804330.3 |      0.21815 (19100224)      0.20955 (19100224)      0.19867 (19100224)      0.18688 (19100224)
*** AERMOD - VERSION  19191 ***   *** D:\Project files\MEMI20A\MEMI20A\MEMI20A.isc                          ***
```

NO_x as NO_2

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
CHIMNEY1	0	0.34800E-01	693162.1	5804860.3	43.4	11.75	362.15	5.50	0.25	YES	NO	NO	
CHIMNEY2	0	0.34800E-01	693162.1	5804860.3	43.4	11.75	362.15	5.50	0.25	YES	NO	NO	

*** AERMOD - VERSION 19191 *** *** D:\Project files\MEMI20A\MEMI20A\MEMI20A.isc *** 06/29/20

*** THE SUMMARY OF MAXIMUM ANNUAL RESULTS AVERAGED OVER 3 YEARS ***

** CONC OF NOX IN MICROGRAMS/M**3 **

	AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG)	OF TYPE	NETWORK GRID-ID
1ST HIGHEST VALUE IS	23.44552	AT (693172.14, 5804870.27, 43.10, 43.10, 0.00)	GC	UCART1
2ND HIGHEST VALUE IS	21.65593	AT (693152.14, 5804870.27, 43.30, 43.30, 0.00)	GC	UCART1
3RD HIGHEST VALUE IS	14.42218	AT (693172.14, 5804850.27, 43.30, 43.30, 0.00)	GC	UCART1
4TH HIGHEST VALUE IS	14.38103	AT (693192.14, 5804890.27, 43.20, 43.20, 0.00)	GC	UCART1
5TH HIGHEST VALUE IS	13.19914	AT (693192.14, 5804870.27, 43.40, 43.40, 0.00)	GC	UCART1
6TH HIGHEST VALUE IS	12.70989	AT (693172.14, 5804890.27, 42.70, 42.70, 0.00)	GC	UCART1
7TH HIGHEST VALUE IS	12.46563	AT (693152.14, 5804850.27, 43.90, 43.90, 0.00)	GC	UCART1
8TH HIGHEST VALUE IS	8.68599	AT (693152.14, 5804890.27, 42.70, 42.70, 0.00)	GC	UCART1
9TH HIGHEST VALUE IS	8.60904	AT (693192.14, 5804850.27, 43.40, 43.40, 0.00)	GC	UCART1
10TH HIGHEST VALUE IS	7.08949	AT (693132.14, 5804870.27, 43.10, 43.10, 0.00)	GC	UCART1

SO_2

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
CHIMNEY1	0	0.11400E-02	693162.1	5804860.3	43.4	11.75	362.15	5.50	0.25	YES	NO	NO	
CHIMNEY2	0	0.11400E-02	693162.1	5804860.3	43.4	11.75	362.15	5.50	0.25	YES	NO	NO	

*** AERMOD - VERSION 19191 *** *** D:\Project files\MEMI20A\MEMI20A\MEMI20A.isc *** 06/26/20

** CONC OF SO2 IN MICROGRAMS/M**3 **

AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG)	OF TYPE	NETWORK GRID-ID
1ST HIGHEST VALUE IS	0.76804 AT (693172.14, 5804870.27, 43.10, 43.10, 0.00)	GC	UCART1
2ND HIGHEST VALUE IS	0.70942 AT (693152.14, 5804870.27, 43.30, 43.30, 0.00)	GC	UCART1
3RD HIGHEST VALUE IS	0.47245 AT (693172.14, 5804850.27, 43.30, 43.30, 0.00)	GC	UCART1
4TH HIGHEST VALUE IS	0.47110 AT (693192.14, 5804890.27, 43.20, 43.20, 0.00)	GC	UCART1
5TH HIGHEST VALUE IS	0.43239 AT (693192.14, 5804870.27, 43.40, 43.40, 0.00)	GC	UCART1
6TH HIGHEST VALUE IS	0.41636 AT (693172.14, 5804890.27, 42.70, 42.70, 0.00)	GC	UCART1
7TH HIGHEST VALUE IS	0.40836 AT (693152.14, 5804850.27, 43.90, 43.90, 0.00)	GC	UCART1
8TH HIGHEST VALUE IS	0.28454 AT (693152.14, 5804890.27, 42.70, 42.70, 0.00)	GC	UCART1
9TH HIGHEST VALUE IS	0.28202 AT (693192.14, 5804850.27, 43.40, 43.40, 0.00)	GC	UCART1
10TH HIGHEST VALUE IS	0.23224 AT (693132.14, 5804870.27, 43.10, 43.10, 0.00)	GC	UCART1

PM2,5

File for Summary of Results: MEMI20A.sum

*** AERMOD - VERSION 19191 *** *** D:\Project files\MEMI20A\MEMI20A\MEMI20A.isc *** 06/29/20
*** AERMET - VERSION 19191 *** *** *** 16:04:00
PAGE 2

*** MODELOPTs: RegDFAULT CONC ELEV RURAL

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BLDG EXISTS	URBAN SOURCE	CAP/ HOR	EMIS RATE SCALAR VARY BY
CHIMNEY1	0	0.16700E-03	693162.1	5804860.3	43.4	11.75	362.15	5.50	0.25	YES	NO	NO	
CHIMNEY2	0	0.16700E-03	693162.1	5804860.3	43.4	11.75	362.15	5.50	0.25	YES	NO	NO	

*** AERMOD - VERSION 19191 *** *** D:\Project files\MEMI20A\MEMI20A\MEMI20A.isc *** 06/29/20

*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***

** CONC OF PM_2.5 IN MICROGRAMS/M**3 **

		AVERAGE CONC	DATE (YYMMDDHH)		RECEPTOR (XR,	YR,	ZELEV,	ZHILL,	ZFLAG)	OF TYPE	NETWORK GRID-ID
HIGH	1ST HIGH VALUE IS	0.77822	ON 19082707:	AT (	693152.14,	5804890.27,	42.70,	42.70,	0.00)	GC	UCART1
HIGH	2ND HIGH VALUE IS	0.74138	ON 18070421:	AT (	693132.14,	5804890.27,	42.70,	42.70,	0.00)	GC	UCART1
HIGH	3RD HIGH VALUE IS	0.74063	ON 17031202:	AT (	693132.14,	5804890.27,	42.70,	42.70,	0.00)	GC	UCART1
HIGH	4TH HIGH VALUE IS	0.72628	ON 17061905:	AT (	693132.14,	5804890.27,	42.70,	42.70,	0.00)	GC	UCART1
HIGH	5TH HIGH VALUE IS	0.71945	ON 19090822:	AT (	693132.14,	5804890.27,	42.70,	42.70,	0.00)	GC	UCART1
HIGH	6TH HIGH VALUE IS	0.71884	ON 18062424:	AT (	693132.14,	5804890.27,	42.70,	42.70,	0.00)	GC	UCART1
HIGH	7TH HIGH VALUE IS	0.71829	ON 17081321:	AT (	693132.14,	5804890.27,	42.70,	42.70,	0.00)	GC	UCART1
HIGH	8TH HIGH VALUE IS	0.70341	ON 17063001:	AT (	693132.14,	5804890.27,	42.70,	42.70,	0.00)	GC	UCART1
HIGH	9TH HIGH VALUE IS	0.69224	ON 19082703:	AT (	693132.14,	5804890.27,	42.70,	42.70,	0.00)	GC	UCART1
HIGH	10TH HIGH VALUE IS	0.68656	ON 17101822:	AT (	693132.14,	5804890.27,	42.70,	42.70,	0.00)	GC	UCART1