Safe distances around fumigated containers

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Degassing fumigated containers for export

Containers for export are treated for pest control in the Netherlands

- Very high concentrations of dangerous substances
- Controlled circumstances
- Applied gases known

During degassing (airing): what are safe distances?

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Practical experiment

Three gases:

Methyl bromide (CH_3Br)

Phosphine (PH_3)

Sulfuryl fluoride (SF / vikane, SO_2F_2)

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Health standards

	Concentration at fumigation:
Methyl bromide (CH_3Br)	
10 mg/m^3 (2.5 ppm) 1-h TWA	48 g/m^3
Phosphine (PH_3)	
0.02 mg/m^3 (0.01 ppm) 24-h TWA	1 g/m^3
Sulfuryl fluoride (SF / vikane, SO_2F_2)	
12 mg/m^3 (3 ppm)	65 g/m^3

Concentrations in import containers

Substance	Concentrations in containers (mg/m3) MAX	Average	Assessment
Methyl bromide	1,100		Health effects possible (value lies between AEGL-2 and AEGL-3)
		61	Above limit value for one hour, but no health effects to be expected
Phosphine	0.3		Below effect levels, so no unacceptable health risk expected
1,2-dichloroethane	270	22	No serious health effects to be expected. Minor, acute effects can not be excluded
Chloropicrin	5.6	1.9	Irritation of eyes, nose and respiratory tracts
Benzene Toluene Xylene			No acute or long-term health risk to be expected
Chloromethane	785	73	Health effects possible

Sampling methods

Badges

Tedlar bags

Canister

Char coal tube

Analyzing method

GC-MS

Methyl bromide

Sensor

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Sampling methods

Badges

Tedlar bags

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Analyzing method

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Phosphine,

Vikane

Sensor

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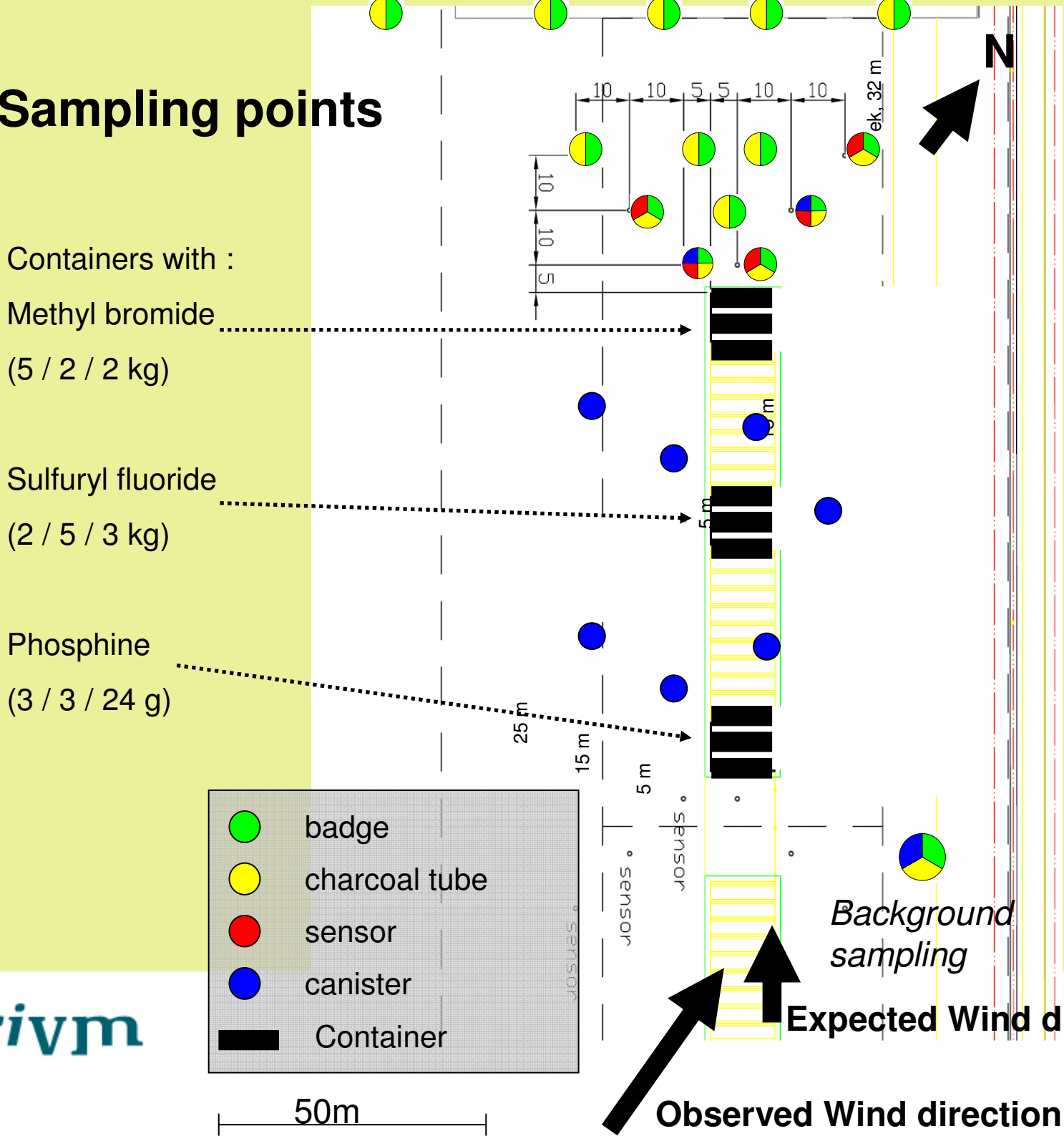
Sampling points



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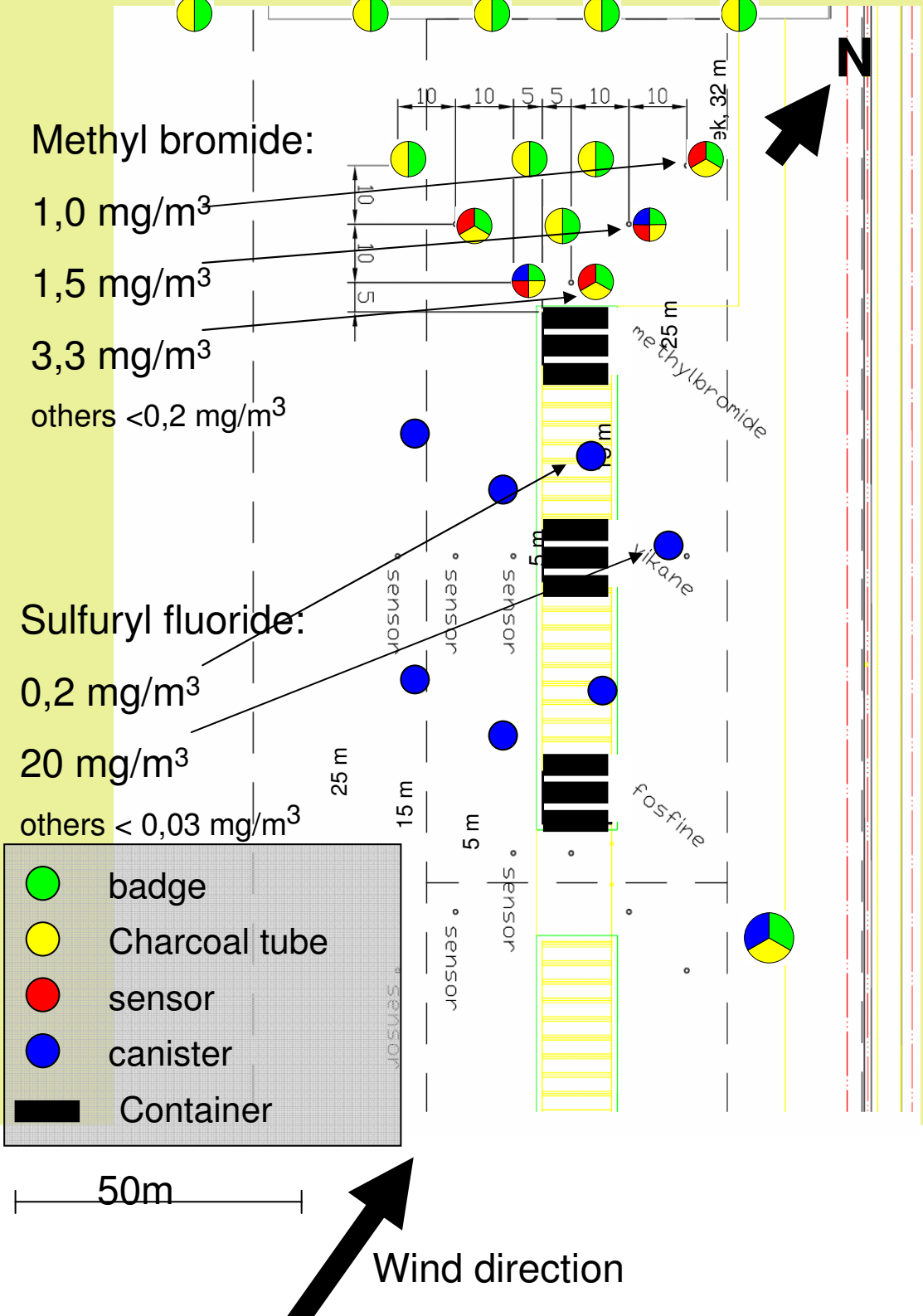
Results first experiment

Concentrations are 2-h TWA



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Second experiment

Containers with :

Methyl bromide

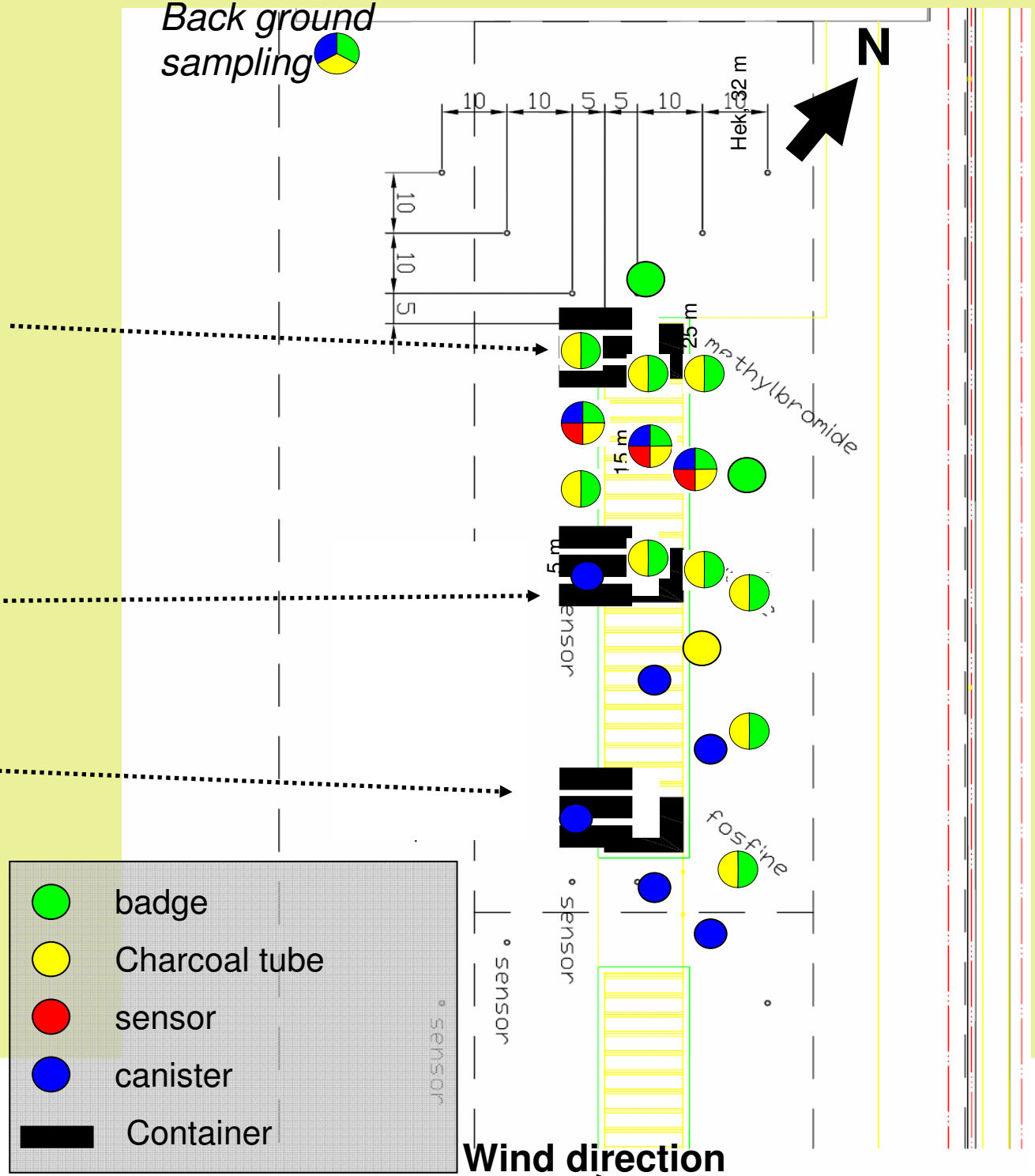
(2 / 0 / 4 kg)

Sulfuryl fluoride

(1 / 2 / 1 kg)

Phosphine

(7 / 1 / 0 g)



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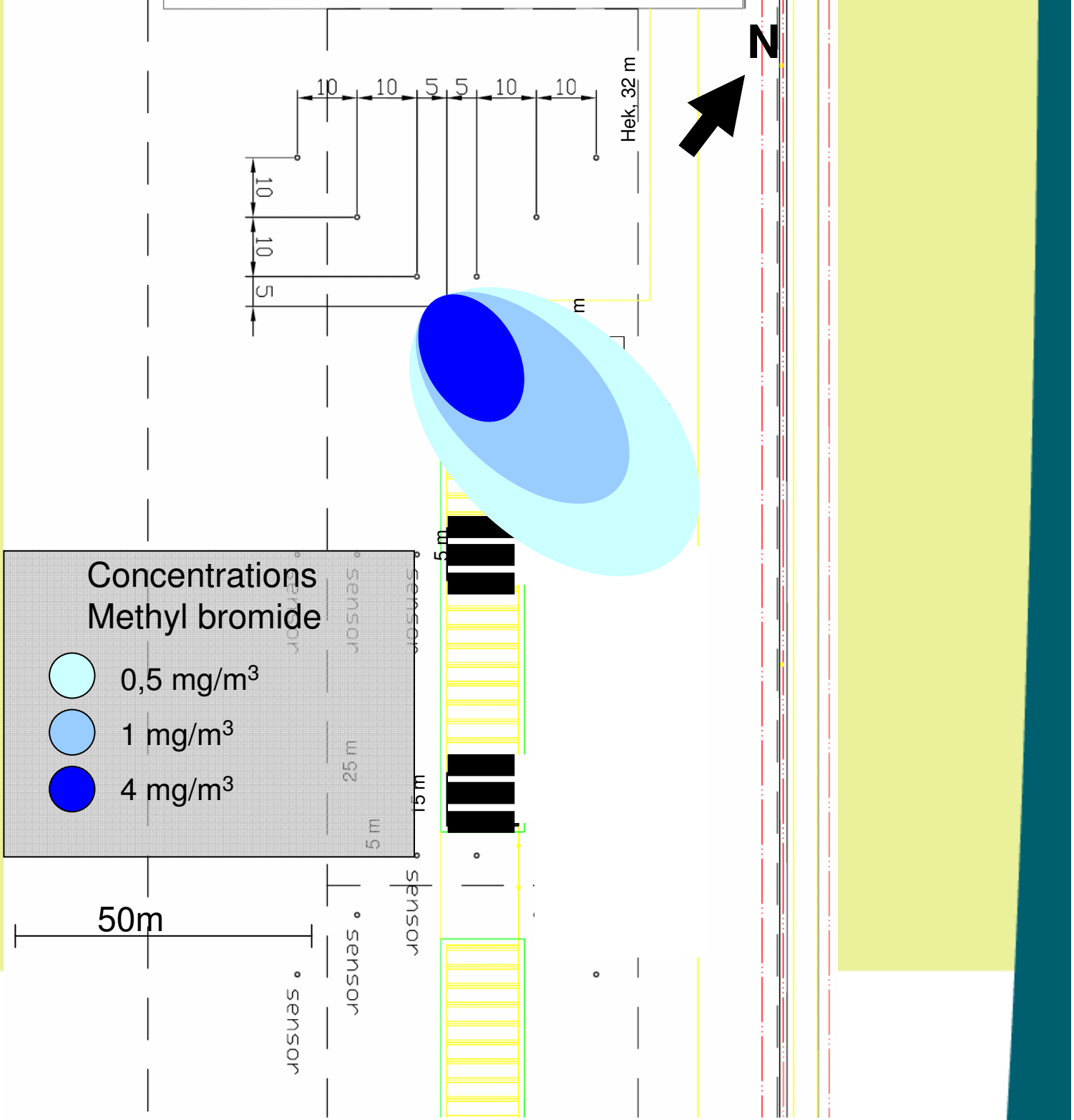
Results second experiment

Concentrations are 2-h TWA



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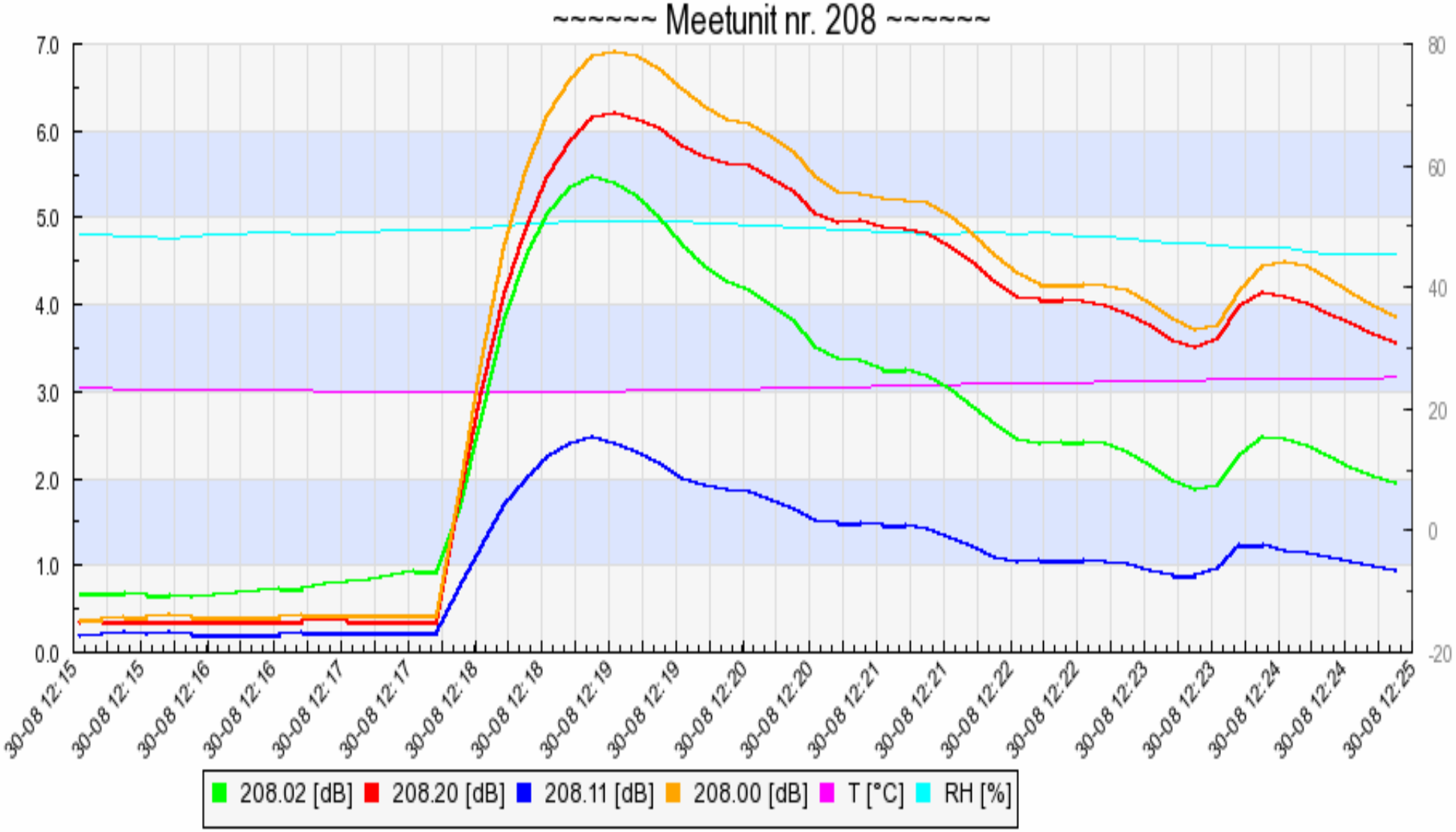
Results methyl bromide sensor



8 minutes

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Measuring results

Methyl bromide / sulfuryl fluoride

- Very high concentrations after a few minutes up to 30 metres
- Hourly averages about some mg/m3
- Worst case (apart from the observed weather conditions)

No results for phosphine at these experiments.

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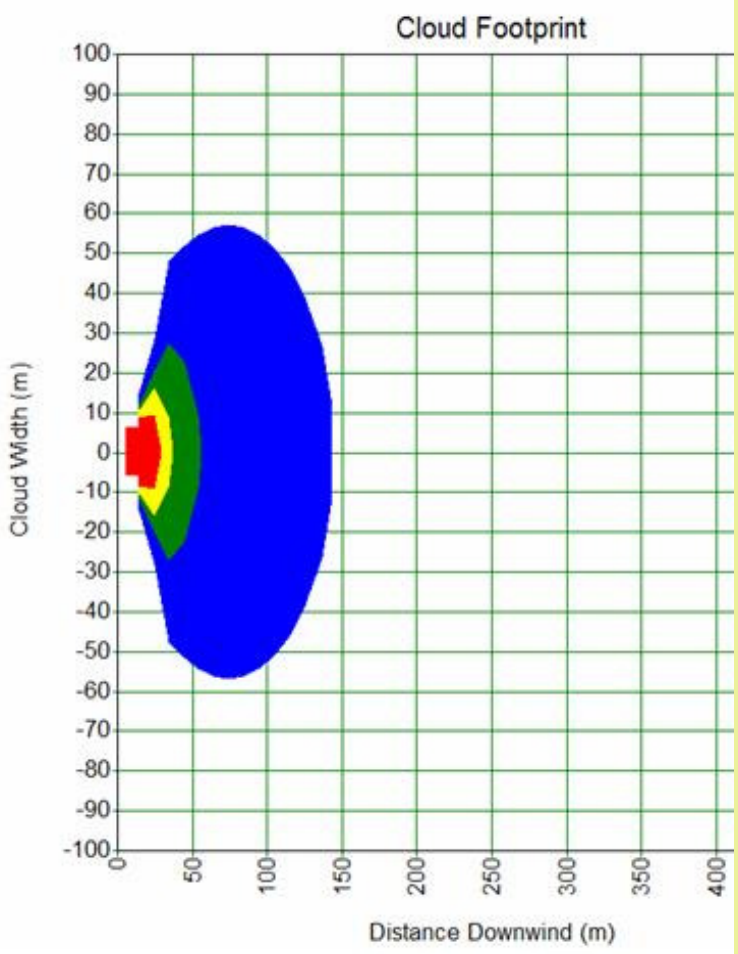
Modeling results methyl bromide

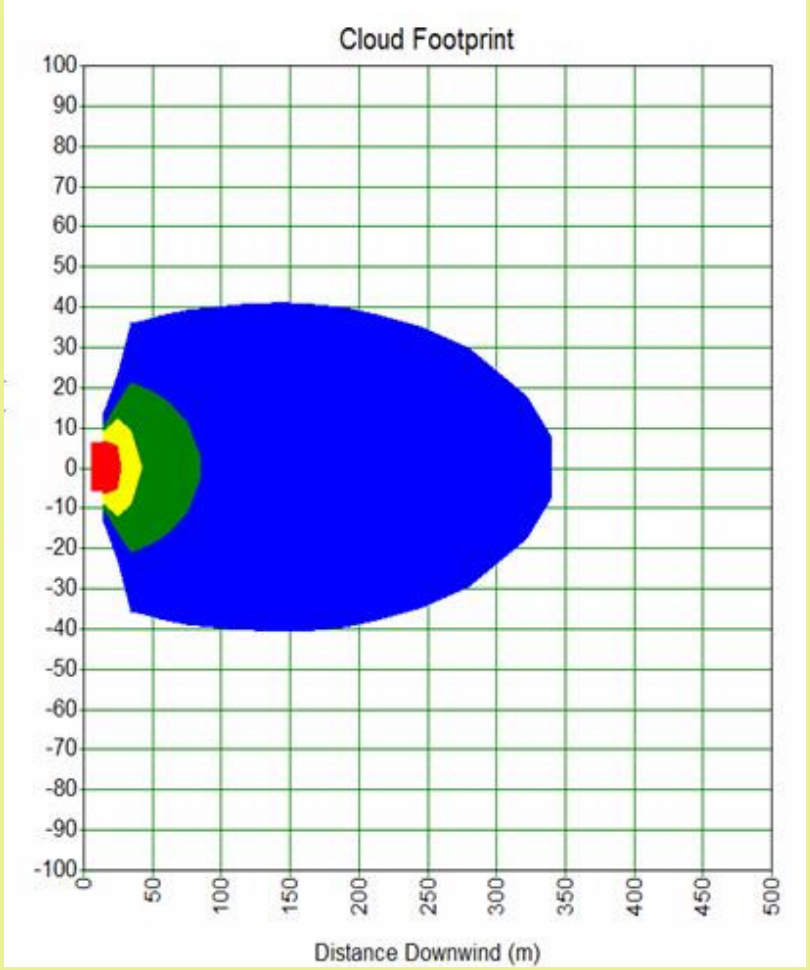
"summer day"

Study Folder: begassingsproef
17082006 IMD
Run Row: 1
Audit No: 7379
Model: MeBr 5 kg
Weather: Category 3/A
Material: METHYL BROMIDE
Averaging Time: ERPG(3600 s)
Height: 1 m
Concentration
Time: 50,24 s

0,2 mg/m3
1 mg/m3
2 mg/m3
4 mg/m3



"windy day"



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Modeling results methyl bromide

Distances for expected concentrations (1-h TWA)

when 5 kg methyl bromide in container

Concentration	“summer day”	“something in between”	“Windy day”
10 mg m^{-3}	<20 meter	<20 meter	<20 meter
4 mg m^{-3}	<20 meter	20 meter	20 meter
2 mg m^{-3}	30 meter	50 meter	50 meter
1 mg m^{-3}	60 meter	80 meter	90 meter
0,2 mg m^{-3}	150 meter	280 meter	350 meter

Advises

- Distance should be depending on the amount of gas in the container and on the substance's health standard
- We advise using the distance where you expect 20% of the standard as a safe distance
- Due to the risk of leakage we advise a distance of 20 m as a minimum
- Do no start degassing at calm weather (wind speed < 0,5 m/s)

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Advise

Quantity in container	Safe distance
Methyl bromide < 1 kg Sulfuryl fluoride < 1 kg Phosphine < 10 g	20 meter
Methyl bromide ~ 5 kg Sulfuryl fluoride ~ 5 kg Phosphine ~ 60 g	50 meter
Methyl bromide > 10 kg Sulfuryl fluoride > 10 kg Phosphine > 100 g	Only under surveillance of Inspectorate and after model calculations

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