



SCENARIO A SIZEWELL

How far from reality



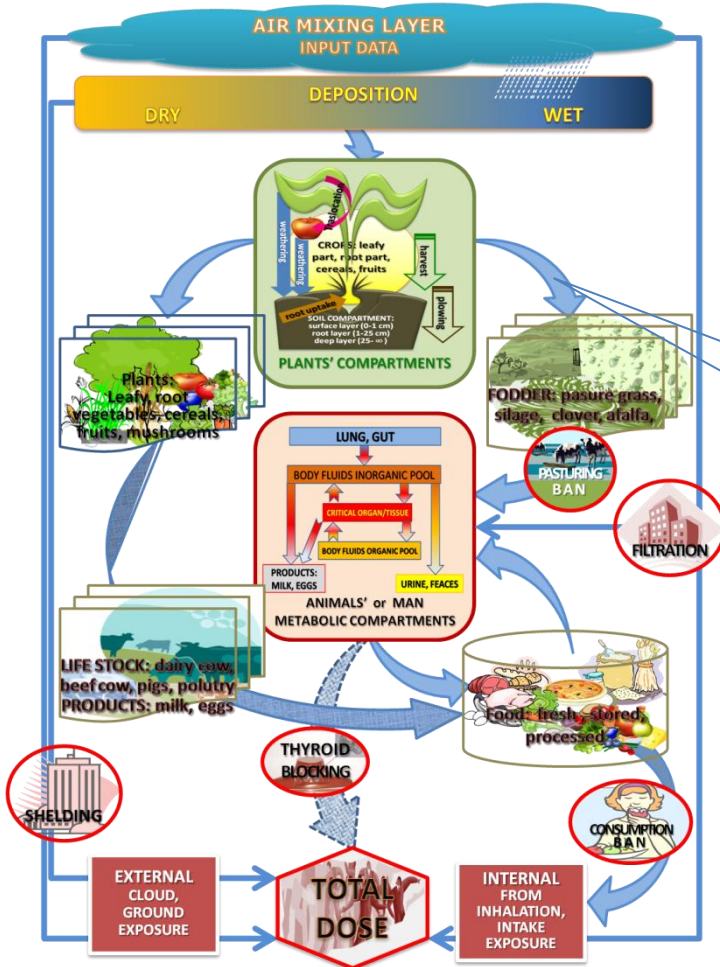
Paweł Krajewski, Grażyna Krajewska





CLRP

CONCENTRATIONS LEVELS RAPID PREDICTION
2009



Flowchart of CLRP calculation sequence. Blue arrows show an order of calculations in the particular compartments, where the results obtained in one compartment (**output data**) are used as **input data** in the next compartment

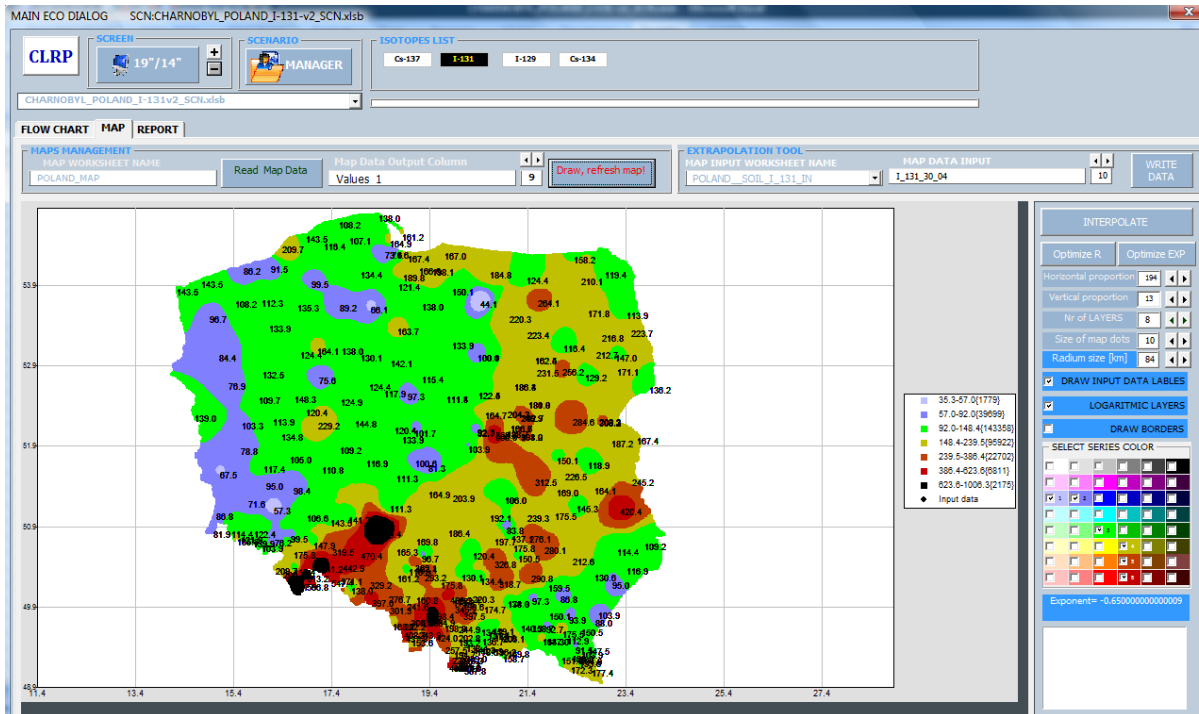
Fourth Meeting of EMRAS II Working Group 1 "Controlling Discharges"

Ukrainian Radiation Protection Institute (RPI)

21–23 September 2010



CLRP
CONCENTRATIONS LEVELS RAPID PREDICTION
2009



GIS User Form driver installed in CLRP – example of map of 137Cs concentration in soil – the study zones were calculated by IDW Shepard interpolations from 370 measured point in 1km×1km grid.





2009
 Atmospheric
 dispersion module in
 installed in CLRP –
 Gaussian plume
 modified Pasquill
 Gilford
 Briggs parameters

AREA BOUNDARIES RECTANGLE		
Longitude (X1)	Latitude (Y2)	V. heigh[km]
1.54221	52.1867	6.14
Longitude (X2)	Latitude (Y1)	H. width[km]
1.69485	52.2416	10.5
		CALC
		DEFAULT
		ACCEPT
INPUT DATA		
INPUT WORKSHEET NAME	COLUMN NAME	
MAIN TOWNS_INT_1	Names	
◀ ▶ 8		
MAP VIEW INTERPOLATION DISPERSION..		
CALCULATE DISPERSION	WRITE DATA TO MAP OUTPUT COLUMN	Average Air concentration [Bq/m ³]
Worksheet of INPUT DATA		
SOURCE_AIR_IN		6.75E-01
Maximum radius [m]	σ_y	17
100000	σ_z	17
METEOROLOGICAL CONDITIONS		
Plume reflection		Dispersion Models
<input type="radio"/> Plume reflection with uniform mixing layer	<input type="radio"/> Pasquill-Gifford	<input checked="" type="radio"/> Briggs
<input checked="" type="radio"/> No plume reflection; no stable layer or	Stability	<input checked="" type="radio"/> Rural
	D	<input type="radio"/> Urban
Mean wind speed [m/s]	Ambient air temp. [K]	Wind
5	300	
Effective wind speed [m/s]	Test wind [m/s]	Mixing layer [m]
5.93	0.00	800
SOURCE&AREA CHARACTERISTICS		
Disarges		Height adjustment
Activity [Bq/s]	Stack heigh [m]	Plume rise [m]
31700	10	10
Heat [cal/s]	Buildings [m]	Effective Heigh [m]
100	10	20
	Type of Surface	
	rural	
Stack Longitude(X)		Stack Latitude(Y)
1.617724		52.212434
		Elevation[m]
		1





SCENARIO A SIZEWELL

How far from reality

Metrological data: wind blow frequency table,
mixing layer 800 m ???, no rain

Sectors	A	B	C	D	E	F	G
1	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
2	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
3	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
4	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
5	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
6	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
7	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
8	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
9	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
10	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
11	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
12	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%



SCENARIO A SIZEWELL

How far from reality

Sizewell raster registered in 50m×50 m grid

FLOW CHART MAP REPORT

MAPS MANAGEMENT
 MAP DATA: **SIZEWELL_TEST_MAP** Categories column: [] Receptor points preview: Point value: 7.44E-01 Longitude(X): 1°37'17" Latitude(Y): 52°12'35" Radius [m]: 3.09E+02 Elevation [m]: 1

COMPARTMENTS: AIR 8 List of categories in th: [] UPDATE

AREA BOUNDARIES RECTANGLE
 Longitude (X1) Latitude (Y2) V.height[km]
 1.54221 52.1867 6.14
 Longitude (X2) Latitude (Y1) H.width[km]
 1.69485 52.2416 10.55

INPUT DATA
 INPUT WORKSHEET NAME: MAIN TOWNS_INT_1_ Column NAME: Names 8

MAP VIEW/ INTERPOLATION/ DISPERSION..

CALCULATE DISPERSION WRITE DATA TO MAP OUTPUT COLUMN Average Air concentration [Bq/m3]
 Worksheet of INPUT DATA: **SOURCE_AIR_IN** 7.97E-01
 Maximum radius [m]: 100000 σ_y : 16 σ_z : 16

METEOROLOGICAL CONDITIONS
 Plume reflection: Plume reflection with uniform mixing layer No plume reflection; no stable layer or
 Dispersion Models: Pasquill-Gifford Briggs
 Stability: Rural Urban
 Mean wind speed [m/s]: 5 Ambient air temp. [K]: 300 Wind
 Effective wind speed [m/s]: 5.87 Test wind [m/s]: 0.00 Mixing layer [m]: 800

SOURCE&AREA CHARACTERISTICS
 Discharges: Activity [Bq/s]: 31700 Heat [cal/s]: 100
 Height adjustment: Stack height [m]: 10 Plume rise [m]: 9 Effective Height [m]: 19
 Buildings [m]: 10 Type of Surface: rural
 Stack Longitude(X) Stack Latitude(Y) Elevation[m]: 1.617724 52.212434 1



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SCENARIO A SIZEWELL

How far from reality

Air Concentration
0.64 Bq·m⁻³

Radius
330 m

FLOW CHART MAP REPORT

MAPS MANAGEMENT

MAP DATA: **SIZEWELL_TEST_MAP** Categories column

COMPARTMENTS: AIR 8 List of categories in th UPDATE

Receptor points preview

Pol. value	Longitude(X)	Latitude(Y)	Radius [m]	Elevation [m]
6.36E-01	1°36'48"	52°12'35"	3.31E+02	1

AREA BOUNDARIES RECTANGLE

Longitude (X1)	Latitude (Y2)	V.height[km]
1.54221	52.1867	6.14
Longitude (X2)	Latitude (Y1)	H.width[km]
1.69485	52.2416	10.55

INPUT DATA

INPUT WORKSHEET NAME: MAIN TOWNS_INT_1 COLUMN NAME: Names 8

MAP VIEW INTERPOLATION DISPERSION..

CALCULATE DISPERSION WRITE DATA TO MAP OUTPUT COLUMN Average Air concentration [Bq/m³]

Worksheet of INPUT DATA

SOURCE_AIR_IN 7.38E-01

Maximum radius [m] 100000

σ_y 16

σ_z 16

METEOROLOGICAL CONDITIONS

Plume reflection: Plume reflection with uniform mixing layer No plume reflection: no stable layer or

Dispersion Models: Pasquill-Gifford Briggs Rural Urban

Stability: D

Mean wind speed [m/s] 5 Ambient air temp. [K] 300 Wind

Effective wind speed [m/s] 5.89 Test wind [m/s] 0.00 Mixing layer [m] 800

SOURCE&AREA CHARACTERISTICS

Discharges	Height adjustment	Plume Effective
Activity [Bq/s] 31700	Stack height [m] 10	Stack size [m] 9
Heat [cal/s] 100	Buildings [m] 10	Type of Surface rural

Stack Longitude(X) 1.617724 Stack Latitude(Y) 52.212434 Elevation[m] 1



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SCENARIO A SIZEWELL

How far from reality

Air Concentration
0.74 Bq·m⁻³

Radius
309 m

FLOW CHART MAP REPORT

MAPS MANAGEMENT
MAP DATA: SIZEWELL_TEST_MAP
COMPARTMENTS: AIR

Receptor points preview
Point Value: 7.44E-01
Longitude(X): 1°37'17"
Latitude(Y): 52°12'35"
Radius[m]: 3.09E+02
Elevation[m]: 1

Area Boundaries Rectangle
Longitude (X1): 1.54221, Latitude (Y2): 52.1867, V.height[km]: 6.14
Longitude (X2): 1.69485, Latitude (Y1): 52.2416, H.width[km]: 10.5

INPUT DATA
INPUT WORKSHEET NAME: MAIN TOWNS_INT_1, COLUMN NAME: Names, 8

MAP VIEW | INTERPOLATION | DISPERSION

CALCULATE DISPERSION | WRITE DATA TO MAP OUTPUT COLUMN | Average Air concentration [Bq/m3]: 7.97E-01

Worksheet of INPUT DATA
SOURCE_AIR_IN | Maximum radius [m]: 100000
σ_y: 16, σ_z: 16

METEOROLOGICAL CONDITIONS
Plume reflection: with uniform mixing layer, No plume reflection: no stable layer or
Dispersion Models: Pasquill-Gifford, Briggs
Stability: Rural, Urban

Mean wind speed [m/s]: 5, Ambient air temp. [K]: 300
Effective wind speed [m/s]: 5.87, Test wind [m/s]: 0.00, Mixing layer [m]: 800

SOURCE&AREA CHARACTERISTICS
Discharges: Activity [Bq/s]: 31700, Stack height [m]: 10, Plume rise [m]: 9, Effective Height [m]: 19
Heat [cal/s]: 100, Buildings [m]: 10, Type of Surface: rural

Stack Longitude(X): 1.617724, Stack Latitude(Y): 52.212434, Elevation[m]: 1



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SCENARIO A SIZEWELL

How far from reality

Air Concentration
 $0.174 \text{ Bq}\cdot\text{m}^{-3}$

Radius
1006 m

FLOW CHART MAP REPORT

MAPS MANAGEMENT
* MAP DATA
COMPARTMENTS AIR 8

SIZEWELL_TEST_MAP Categories column
List of categories in th UPDATE

Reactor points preview
Point value Longitude(X) 1°36'9" Latitude(Y) 52°12'35" Radius [m] 1.06E+03 Elevation [m] 1

52.23
52.22
52.21
52.20
52.19

1.54 1.56 1.58 1.60 1.62 1.64

Sizewell NPP
Sizewell
Leiston
Knodishall
Coldfair Green
Aldringham
Sizewell, Leiston, IP16 4, Wielka Brytania

AREA BOUNDARIES RECTANGLE
Longitude (X1) Latitude (Y2) V.height[km] CALC
1.54221 52.1867 6.14
Longitude (X2) Latitude (Y1) H.width[km] DEFAULT
1.69485 52.2416 10.55 ACCEPT

INPUT DATA
INPUT WORKSHEET NAME COLUMN NAME
MAIN TOWNS_INT_1 Names 8

MAP VIEW | INTERPOLATION | DISPERSION..

CALLULATE DISPERSION WRITE DATA TO MAP OUTPUT COLUMN Average Air concentration [Bq/m3]
Worksheet of INPUT DATA
SOURCE_AIR_IN 1.34E-01
Maximum radius [m] 100000 40
σy 40
σz 40

METEOROLOGICAL CONDITIONS
Plume reflection Dispersion Models
Plume reflection with uniform mixing layer Pasquill-Gifford Briggs
No plume reflection; no stable layer or Stability D
Rural Urban

Mean wind speed [m/s] 5 Ambient air temp. [K] 300 Wind
Effective wind speed [m/s] 6.49 Test wind [m/s] 800 Mixing layer [m] 0.00

SOURCE&AREA CHARACTERISTICS
Discharges Height adjustment
Activity [Bq/s] Stack height [m] Plume size [m] Effective Height [m]
31700 10 18 28
Heat [cal/s] Buildings [m] Type of Surface
100 10 rural

Stack Longitude(X) Stack Latitude(Y) Elevation[m]
1.617724 52.212434 1

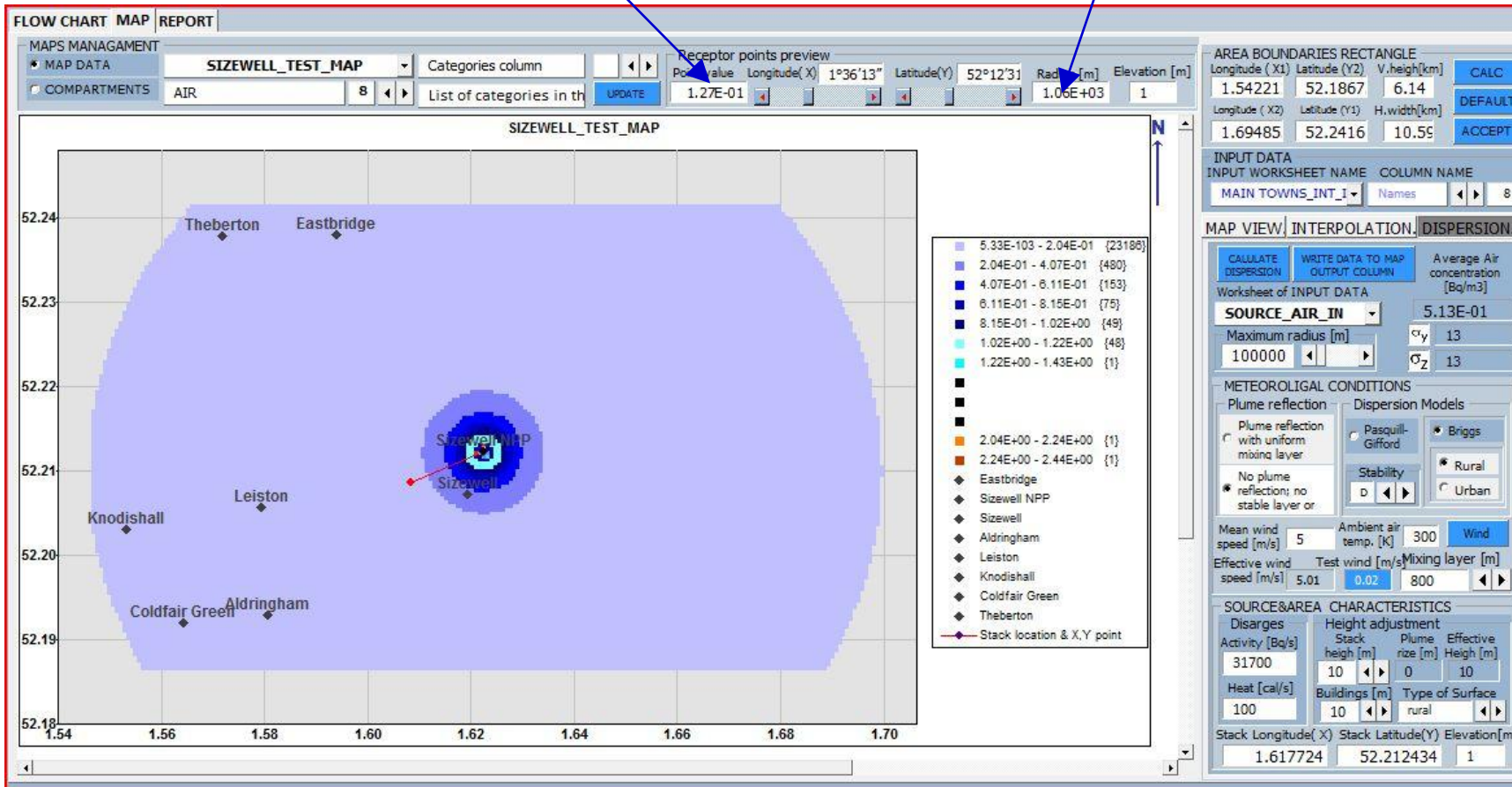


SCENARIO A SIZEWELL

How far from reality

Air Concentration
0.127 Bq·m⁻³

Radius
1006 m



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How far from reality

Isotope	AGE GROUP/SPECIFICATION	CLOUD EXTERNAL EXPOSURE	GROUND EXTERNAL EXPOSURE	INHALATION INTERNAL EXPOSURE	INGESTION EXPOSURE	TOTAL DOSE	DOSE TO CRITICAL ORGAN
I-131	A1 [green vegetable consumers] (I-131)	2.86E-07	1.55E-06	7.88E-05	9.69E-04	1.05E-03	1.65E-02
Cs-137	A1 Green vegetable consumers (Cs-137)	4.54E-07	1.24E-03	2.42E-05	3.89E-04	1.65E-03	5.05E-04
Xe-135	A1 Green vegetable consumers (Xe-135)	2.14E-06					
						2.70E-03	
I-131	B1 [root vegetable consumers] (I-131)	2.86E-07	1.55E-06	7.88E-05	9.89E-04	1.07E-03	1.68E-02
Cs-137	B1 Root vegetable consumers (Cs-137)	4.54E-07	1.24E-03	2.42E-05	5.38E-04	1.80E-03	6.98E-04
						2.87E-03	
I-131	C1 [domestic fruit consumers] (I-131)	2.86E-07	1.55E-06	7.88E-05	1.13E-03	1.21E-03	1.92E-02
Cs-137	C1 Domestic fruit consumers (Cs-137)	4.54E-07	1.24E-03	2.42E-05	9.55E-04	2.22E-03	1.24E-03
						3.43E-03	
I-131	D1 [milk consumers] (I-131)	2.86E-07	1.55E-06	7.88E-05	3.13E-04	3.94E-04	5.32E-03
Cs-137	D1 Milk consumers (Cs-137)	4.54E-07	1.24E-03	2.42E-05	1.34E-03	2.60E-03	1.74E-03
						2.99E-03	
I-131	E1 [sheep meat consumers] (I-131)	2.86E-07	1.55E-06	7.88E-05	3.13E-04	3.94E-04	5.32E-03
Cs-137	E1 Sheep meat consumers (Cs-137)	4.54E-07	1.24E-03	2.42E-05	1.34E-03	2.60E-03	1.74E-03
						2.99E-03	
I-131	F1 [occupants for plume pathways (inner area)] (I-131)	4.74E-07	3.30E-06	1.18E-04	2.23E-04	3.45E-04	3.80E-03
Cs-137	F1 Occupants for plume pathways (inner area) (Cs-137)	7.51E-07	2.65E-03	3.63E-05	4.18E-04	3.11E-03	5.42E-04





SCENARIO B SIZEWELL

Metrological data: wind blow frequency table ?,
mixing layer 800 m ?, no rain ?

Sectors	A	B	C	D	E	F	G		SUM
1	0.00%	0.23%	1.30%	7.11%	0.90%	0.43%	0.17%	0.94%	11.09%
2	0.01%	0.30%	1.41%	9.01%	1.15%	0.56%	0.19%	1.19%	13.81%
3	0.01%	0.29%	1.15%	6.52%	0.63%	0.50%	0.15%	0.86%	10.11%
4	0.01%	0.29%	1.06%	5.16%	0.67%	0.41%	0.14%	0.70%	8.44%
5	0.01%	0.27%	0.99%	4.28%	0.51%	0.34%	0.13%	0.58%	7.12%
6	0.01%	0.31%	1.05%	4.12%	0.53%	0.34%	0.14%	0.56%	7.07%
7	0.02%	0.33%	1.21%	4.41%	0.68%	0.44%	0.17%	0.62%	7.87%
8	0.02%	0.35%	1.32%	3.04%	0.68%	0.46%	0.20%	0.45%	6.52%
9	0.02%	0.29%	1.08%	2.06%	0.66%	0.41%	0.17%	0.33%	5.02%
10	0.01%	0.29%	1.09%	3.23%	0.61%	0.44%	0.16%	0.47%	6.30%
11	0.02%	0.24%	0.99%	4.40%	0.60%	0.39%	0.14%	0.60%	7.37%
12	0.01%	0.21%	1.15%	5.95%	0.74%	0.31%	0.15%	0.78%	9.30%
									100.01%



SCENARIO B SIZEWELL CRITICAL GRUP

Summarised from Radiological Habits Survey Sizewell, 2005

Summary of adults' profiled habits data in the Sizewell area

Exposure group - adult profiles	Pathway Name										
	Total green vegetables	Total root veg inc potatoes	Total fruit	Milk	Meat - Cattle	Meat - Sheep	Fish - Sea	Crustacea	Mollusca	Gamma ext - Sediment	Plume (IN; 0-0.25km)
	kg	kg	kg	l	kg	kg	kg	kg	kg	h	h
1. Atmospheric pathway exposure groups											
A1	Green vegetable consumers	65.6	93.5	8.7		0.9		1.8	0.1		7
B1	Root vegetable consumers	68.9	110.9	5.4		1.3		1.4	0.1		198
C1	Domestic fruit consumers	64.4	84.8	42.4				4.7	0.3		123
D1	Milk consumers	4.1	19.1	0.5	208.4	15.8	2.4	1.5			
E1	Sheep meat consumers	4.1	19.1	0.5	208.4	15.8	2.4	1.5			
F1	Occupants for plume pathways (inner area)	18	11.3	5.9				0.5	0.5		7150
2. Aquatic pathway exposure groups											
A2	Sea fish consumers	1	3.4	0.6				23	2.1	0.5	81
B2	Crustacean consumers							26.7	11.2	1.6	83
C2	Mollusc consumers							16.2	9.3	5.1	50
D2	Occupants for exposure - Sediment		4.2	0.6				8.8	0.5		731
	Notes									occupancy over mud, silt marsh, sand, stone	internal & external occupancy

Atmospheric pathway

Critical group is exposure group with highest dose including direct shine

A1 - individuals with the top consumption of locally produced green vegetables

B1 - individuals with the top consumption of locally produced root vegetables

C1 - individuals with the top consumption of locally produced fruit

D1 - individuals with the top consumption of locally produced milk

E1 - individuals with the top consumption of locally produced sheep meat

F1 - individuals with the highest occupancy 0 - 0.25km from the site (occupants for plume pathways same as for direct radiation)

Aquatic pathway

Critical group is exposure group with highest dose (i.e. not including direct shine)

A2 - individuals with the top consumption of locally caught fish

B2 - individuals with the top consumption of locally caught crustaceans

C2 - individuals with the top consumption of locally caught mollusc

D2 - individuals with the highest occupancy over sediment