

DuPont Modeling Methodology and Results

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Modeling Methodology

EPA's Industrial Source Complex 3 (ISC3) Model *to Ca/c. ground-level conc. & deposition for yr 2000 actual*

Followed procedures in EPA's Guideline on Air Quality Models (Appendix W)

BIIP model to evaluate building downwash effects *all bldgs. on site eval. to see if they could impact stack results*

Terrain elevations imported from USGS electronic file

Receptor grid with 100-meter spacing - *extending out 4500 meters from source - also an additional receptor grid to determine dep. to watershed for LH well field - you'll see that*

On-site met data (1996) *from* *used Wilmington, OH for upper air data*

(Useless in Calc Dis, almost done with as of 10/95)

Modeling Inputs

All inputs to the model were identical to information submitted pursuant to

Consent Order: 8/24/04 DEP - Doh

stack parameters

emission rates

buildings locations and heights

scavenging coefficients

DAQ was to model

*We weren't req'd to, but
did anyway*

Modeling Inputs - Stack Parameters

Permit Number	Permit Vent ID	Reg 29 Vent ID	Zone ID	Stack Height (ft)	Stack Diameter (ft)	Stack Box Volume (ft ³ /min)	Stack Velocity (ft/s)	Stack Temperature (°F)
1823A	T7IME	662	442025	150	1.33	3,349	40.2	172
815D	T6IFCE	644	442084	59	1.5	18,000	169.8	111
815D	T6IZCE	699	442091	63	18-1 ft	18000 ^a	21.2 ^b	111
1353A	164-5E	652	441920	70	1.96	9,800	54.1	200
Pre-Existing	164-2E	658	441923	68	1.63	2,800	22.4	300
	163-E-26	231	441952	93	0.67	500	23.6	130
614A	163-E-11	232	441953	81	0.67	600	28.4	130
781	163-E-33	216	441960	60	1.3	2,750	34.5	158
1953	242	242	441954	114.5	0.5	1,250	106.1	200
2365A	C1FSE	274	441787	110	0.69	1,000	44.6	255
Semiworks Application	RO22EEF6		442086	47	2.5	8836	30.0	80
Semiworks Application	RO22EEF86		442069	49	2.0	7540	40.0	80
Semiworks Application	RO22EEF87		442058	49	2.0	1885	10.0	80
Semiworks Application	RO22EEF89		442063	49	2.0	3770	20.0	80

^aVent ID T6IZCE consists of 18 one-foot diameter vents. The flow rate given is the total for all 18 vents.

^bThe velocity listed is the velocity calculated for one individual vent.

Point out 2 more small series since identified in 2365A not in model - largest ~ 8 ft/hr - (not as big as 2365A)

Modeling Inputs - Emission Rates

Permit Vent ID	Reg ID Vent ID	Year 2000		Year 2000		2000 Actual		2000 Actual	
		Particle Mass Fraction	Vapor Mass Fraction	Actual GSEmissions (lb/day)	Actual GSEmissions (lb/day)	Particle Phase EmissionRate (lb/s)	Vapor Phase EmissionRate (lb/s)	Particle Phase EmissionRate (lb/s)	Vapor Phase EmissionRate (lb/s)
T7ME	662	0	1	0	0	0	0	0	0
T6IFCE	644	0.54	0.46	13,977	0.2010	0.1086	0.0925	0	0.0925
T6IZCE	699	0.9	0.1	0	0	0	0	0	0
164-5E	652	0.9	0.1	33	0.0005	4.27E-04	4.75E-05	4.27E-04	4.75E-05
164-2E	658	0.9	0.1	79	0.0011	0.00102	1.14E-04	0.00102	1.14E-04
163-E-26	231	0.11	0.89	3,541	0.0509	0.00560	0.0453	0.00560	0.0453
163-E-11	232	0.09	0.91	4,680	0.0673	0.00606	0.0613	0.00606	0.0613
163-E-33	216	0	1	0	0	0	0	0	0
242	242	0.9	0.1	3,510	0.0505	0.0454	0.00505	0.0454	0.00505
CIFSE	274	0.03	0.97	5,414	0.0779	0.00234	0.0755	0.00234	0.0755
RO22EEF6		1	0	12	1.73E-04	1.73E-04	0	1.73E-04	0
RO22EEF86		1	0	0.3	4.32E-06	4.32E-06	0	4.32E-06	0
RO22EEF87		1	0	3	4.32E-05	4.32E-05	0	4.32E-05	0
RO22EEF89		1	0	0.6	8.63E-06	8.63E-06	0	8.63E-06	0

These 2 series not expected to affect results.
Results driven by 14,000 lb. source
(But do plan to run the model again w/ them)

Modeling Inputs - Particle Phase Scavenging Coefficients

emissions are partitioned between
vap + part. phases — dep. runs by
modelling @ phase separately.

This size distr. for part. phase from
testing at site. This from that largest
source that drives model, but have to use
User's Guide.

Particle Phase:

Particle Diameter (microns)	Mass Fraction	Particle Density (g/cm ³)	Scavenging Coefficients	
			Liquid Precipitation (s ⁻¹ /mm-h ⁻¹)	Frozen Precipitation (s ⁻¹ /mm-h ⁻¹)
0.2	0.538	2.2	1.2x10 ⁻⁴	4x10 ⁻³
0.4	0.267	2.2	5x10 ⁻⁵	1.67x10 ⁻³
0.75	0.035	2.2	4x10 ⁻⁵	1.33x10 ⁻³
2.0	0.127	2.2	1.3x10 ⁻⁴	4.33x10 ⁻³
4.0	0.033	2.2	2.8x10 ⁻⁴	9.33x10 ⁻³

Scavenging coeff
from EPA ISC3
User's Guide.

Modeling Inputs - Vapor Phase Scavenging Coefficients

These based on calc.
DP submitted under the
CS w/ WDEP/SDM.

based on rainfall intensity

P _r mm/hr	Scavenging Coefficient /hr
0	4.408E-05
1	2.311E-02
2	3.106E-02
4	4.067E-02
6	4.705E-02
8	5.190E-02
10	5.583E-02
12	5.915E-02
14	6.203E-02
16	6.457E-02
18	6.685E-02
20	6.892E-02
22	7.082E-02
24	7.256E-02
26	7.418E-02
28	7.570E-02
30	7.711E-02

Since

Only one scavenging coefficient can be

entered into the model choose the worst case, lowest
As table that gives highest
Coefficients presented in consent order scav. AC.
submittal must be adjusted by dividing by
rainfall intensity

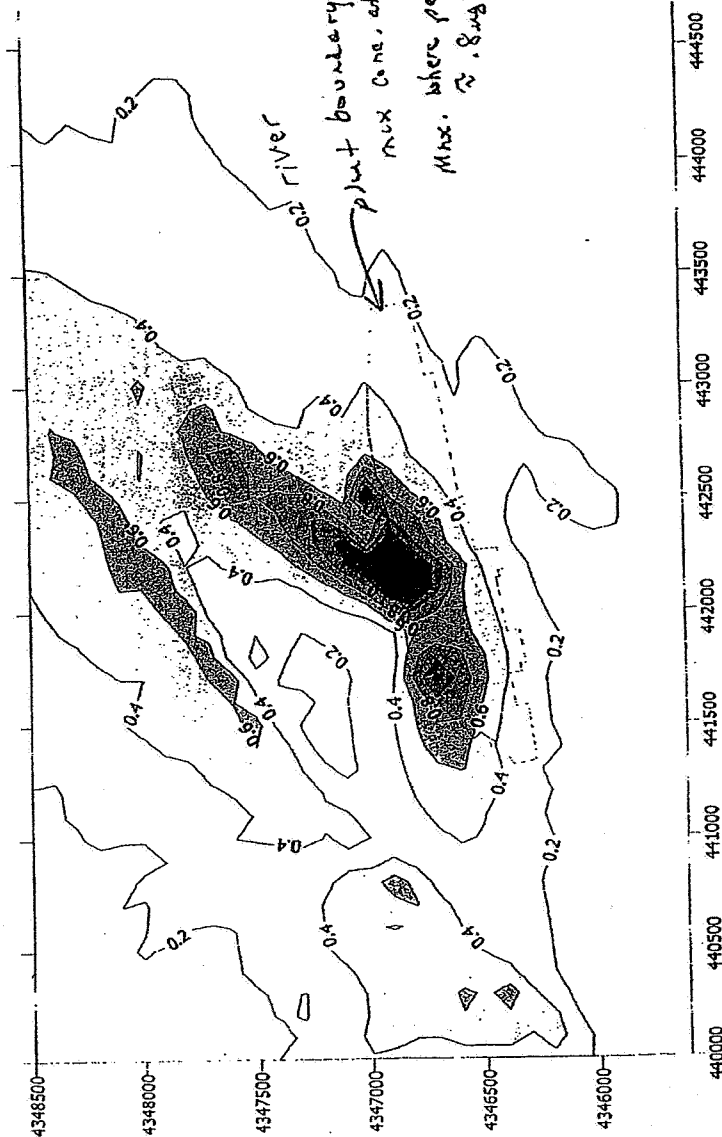
Worst-case coefficient (based on 1 mm/hr
rain intensity) was used

$$2.31 \times 10^{-2} \frac{1}{hr} \times \frac{hr}{3600s} \times \frac{hr}{1mm} = 6.4 \times 10^{-6} \frac{hr}{s \cdot mm} = 6.4 \times 10^{-6} \frac{s^{-1}}{mm \cdot hr^{-1}}$$

Modeling Results - Predicted Ground Level Concentrations

Averaging time of one yr. used to determine avg. ground level conc.

C8 2000 Actual Emissions
Annual Average Vapor Concentrations (ug/m3)
Actually total - both vapor + particulate

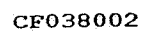


DAG had essentially
identical - 1950/75 -
same hot spot location

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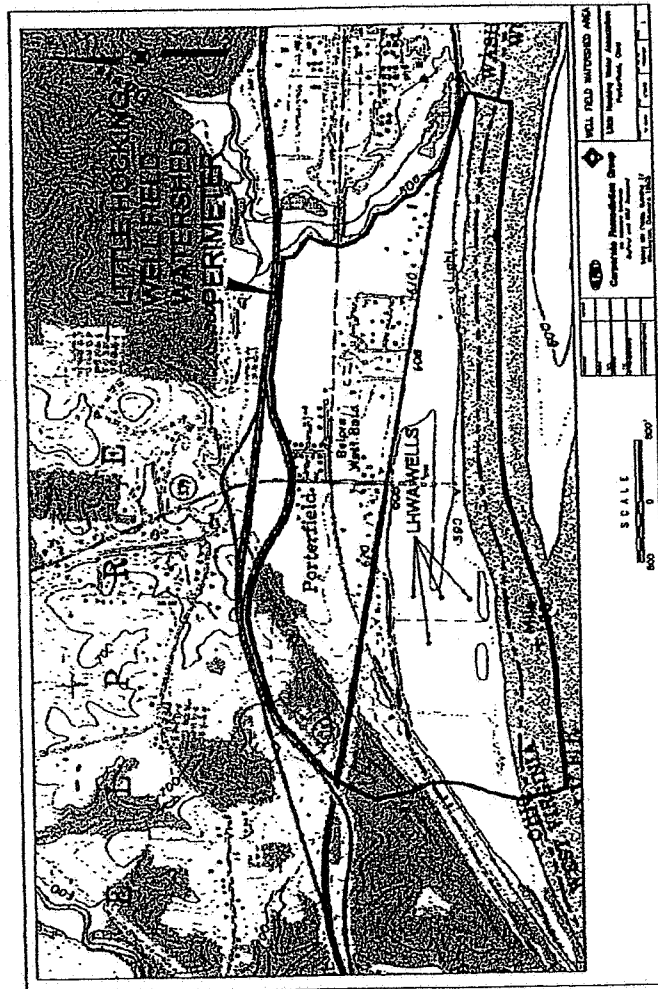
dep. at -
max same as the
red diamonds are the
red sources.

[illegible]

[illegible]

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Little Hocking Well Field Watershed

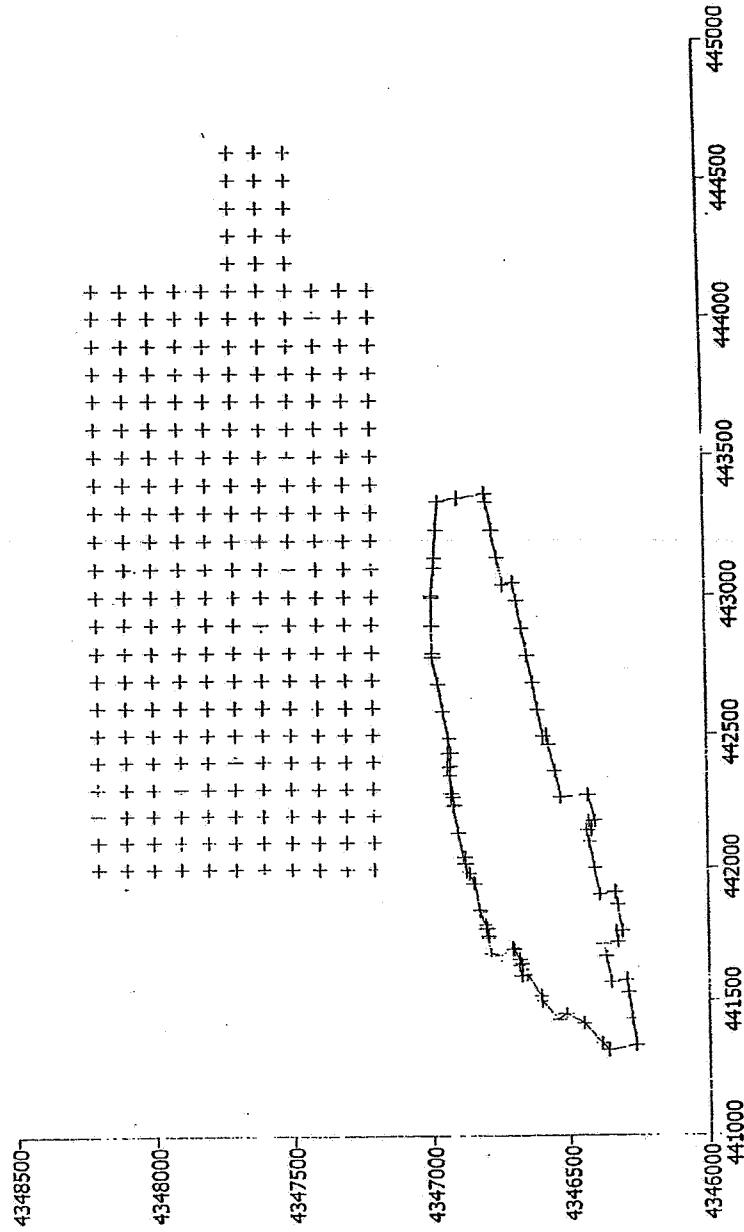


Andrew?
USGS topo map to
determine watershed
Within square of A
top, generous
left.
We had ignored
off anyway.

CF038004

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Little Hocking Watershed Receptor Grid



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Little Hocking Watershed Deposition Results

Receptor grid area = 2.57 km²

Imported deposition rates from model into spreadsheet to calculate total deposition over the watershed:

Particle Phase

Dry Deposition = 6,966 g/yr

Wet Deposition = 12,484 g/yr

Total Deposition = 19,450 g/yr

Vapor Phase

Wet Deposition = 1,642 g/yr

Part. phase dominates

Total = 47 lbs/yr.

*PAQ has not yet modeled dep. —
going to get Lakes Env. Package to run it on*

CF038006

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