AR 301

113578

BROWNVALLEY FARM

Farm 359-4878; Ed 359-7456; Tim 359-5084

BROWNVALLEY FARMS
1365 Georgetown Road
Littlestown, Pa. 17340

May 20, 1996

TO: Chris Corbett

RE: FYI - articles & data sheets

From: Marcia Brown MB

Here is some materials which I have already provided to Bill Wentworth, but I want to give you a copy too. There are sticky notes on the articles which are self-explainatory. The data sheets show the basis for my comments in the past that the pasture springs are the discharge points for the landfill connected via the cleavage and fracture zones.

Table 4-8 is from the Intermediate Design plan submitted May, 1995. The highest level of each element found at K-3 or K-1 has been highlighted. Then I took the sampling data for our property that Bill had given me, and highlighted the locations with the highest levels of each element. Levels found at K-3 are clearly mirrored at the leachate seep and MD-S 5 & 6. A secondary pattern also exists for the contaminants originating from the area around K-1 that is supported by VOC findings too.

These two sampling events taken 5 months apart clearly show the on-site to off-site connection. Some of the results are not as obvious. For example, the data from MD-S-5 taken last fall does not show the pattern at all. Because of the extremely dry weather last year, I suspect the sample reflected rain water instead of groundwater discharge seepage. I know for a fact that area was dried up for a while last year.

+ , K-1 (contaminants, waterway vs pasture?) [redacted]

* = Found only at [redacted] leachate seeps MD 5-5 + 6, known pathways

Table 3

DATA SUMMARY FORM: INORGANICS

WATER SAMPLES

(ug/L)

Site: Keystone Sanitation

Case No. 23314 Sampling Date(s): 3/6-14/95

SDG No. MCFX84

+ Due to dilution, sample quantitation limit is affected. See dilution table for specifics.

CRDL	ANALYTE	MCFX86	MCFX88	MCFX90	MCFX92	MCFX94	MCGG56	MCGG58	MCGG60	MCGG62
	Sample No.	MCFX86	MCFX88	MCFX90	MCFX92	MCFX94	MCGG56	MCGG58	MCGG60	MCGG62
	Dilution Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Location	SW-19	SW-20	PW-1	PW-2	PW-4	PW-3	SW-33	PW-6	PW-5
		Tributary Brunner Pasture	Pond middle	Seep 1 Leachate Seep	Seep 2 Back Waterway	Seep 4 Back Waterway	Seep 3 [redacted]	Pond Spring end	Seep 6 MD-5-6	Seep 5 MD-5-5
200	Aluminum +	[127] B	[33.5] B	1760	706	1240	230 B	238 B	9640	7940
60	Antimony									
10	*Arsenic	[2.3] L	UL	UL	UL	UL	[4.1] J	UJ	[7.2] J	[6.3] J
200	Barium	[16.5]	[12.4]	[191]	[15.6]	[53.7]	[24.2]	[110]	[87.7]	[131]
5	Beryllium * (Detection limit 75)								[1.2]	[1.1]
5	*Cadmium	UL	UL	UL	UL	UL				
5000	Calcium	12200	12600	18700	8140	16400	13400 J	7480 J	15400 J	15400 J
10	*Chromium + *								11.6 K	10.8 K
50	Cobalt +			138	UL	[11.6] K			[11.8] K	[7.2] K
25	Copper +			[9.0] B	36.8 B	26.8 B	[22.1] K	26.4 K	* [25.0] K	43.? K
100	Iron +	513	299	4670	1970	14800	616	606	32600	27500
3	*Lead +			8.1	48.9	6.2	[2.3]	5.1	32.6	22.2
5000	Magnesium	5050	7380	15400	[4470]	5600	7900 J	6410 J	9800 J	10800 J
15	Manganese (only K-8 2.5 times)	97.8	[14.0] K	6830	53.6	1970	26.3	106	432	108
0.2	Mercury +		0.38		0.23					
40	*Nickel *			[35.5]					[27.0]	[32.2]
5000	Potassium	[1210]	[1410]	19100	[708]	[981]	[1710]	[951]	[1480]	[1980]
5	Selenium				7.6 B	[3.1] K		8.0 K		
10	Silver									
5000	Sodium	[4520]	6300	89700	[4140]	[4230]	6190 J	[4160] J	5450 J	7250 J
10	Thallium	UL	UL	UL	UL	UL				
50	Vanadium * (Detection Limit 750)				UL				[11.9]	[8.5]
20	Zinc +			79.1	31.5 B	47.1 B	20.6 K	28.1 K	81.2	102
	# Highlighted	1	9	2	1		1	1	13	15

CRDL = Contract Required Detection Limit

*Action Level Exists

SEE NARRATIVE FOR CODE DEFINITIONS

revised 07/90

3-13 to 16-95 Sampling Date

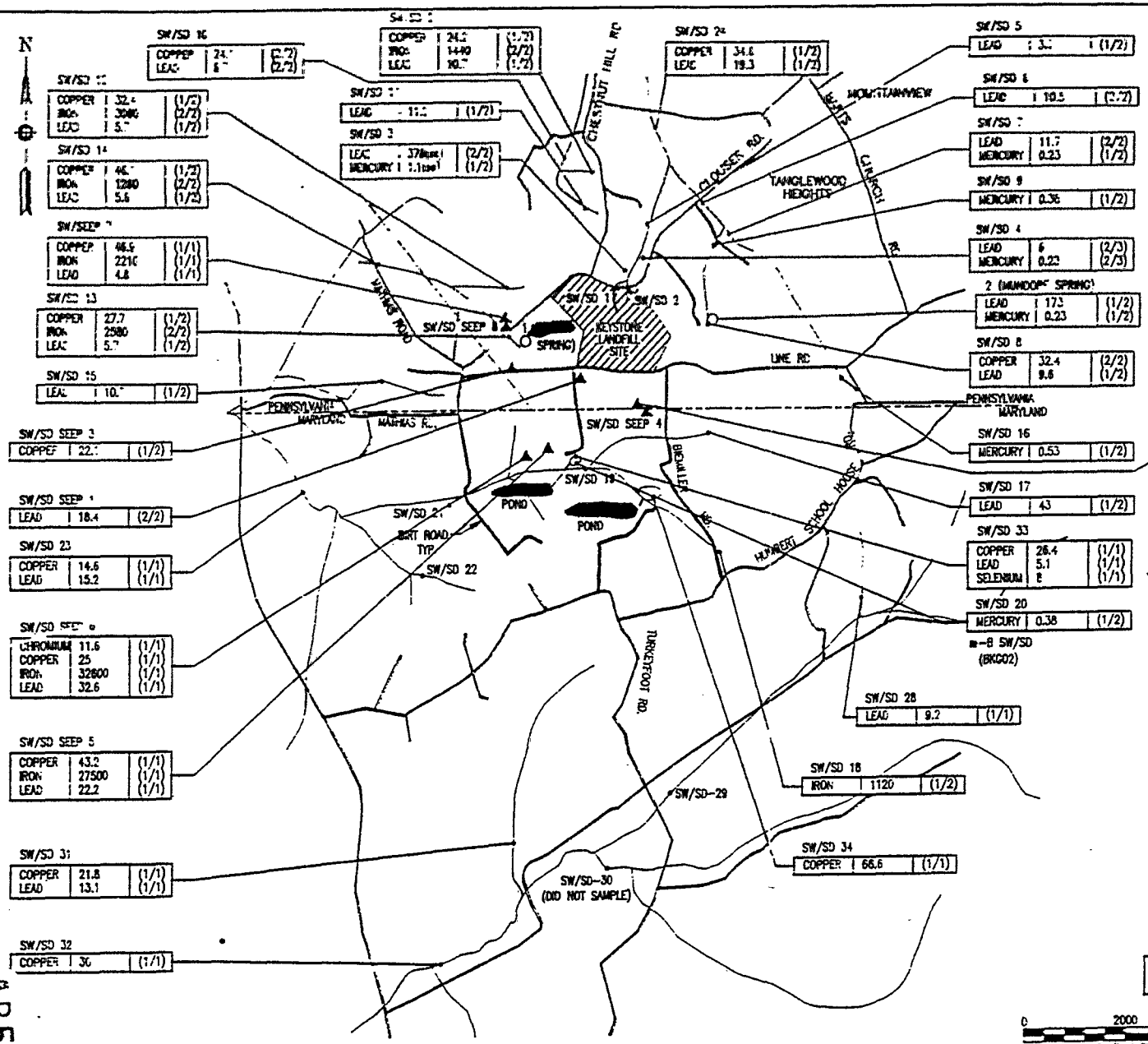
AR501716

VOLATILES Water samples-date Location () = Soil samples	3/95 [redacted] seep	3/95 MD-1	2 & 3/95 MD-2	2 & 3/95 MD-3	3/95 Leachate Seep	3/95 Back waterway	3/95 Pond Spring	3/95 Pond Middle	3/95 MD-S-5 Spring	3/95 MD-S-6 Spring
Chloroethane					1.4 J					
1,1 Dichloroethane					.5 J	.6 J				
cis-1,2- Dichloroethene		.5J				3.3	.7	.6J	1.2	.6J
Dichlorodifluoro- methane				.6 J		1 J			1.5J	1.5J
Trichloroethene						1.1			1.1	
Tetrachloroethene	2.1	1 J	1.8	.5 J		2.9	1.7	1.4	6.7	4.4 (13)J
Toluene							(28)		(15300)	(46)
2-Butanone					(46)J				(180)J	

J = estim ate

ug/L

AR501717



KEYSTONE LANDFILL

SURFACE WATER SAMPLE RESULTS

ABOVE BENCHMARK CRITERIA FOR LEAD AND MERCURY

SAMPLING EVENTS (4/94, 9/94 AND 2-3/95)

LEGEND

- • SW/SD 10 – SURFACE WATER SAMPLING LOCATION
- ■ –B SW/SD – BACKGROUND SAMPLING LOCATION
- ▲ SW/SD – SEEP LOCATION
- O SW/SD – POTABLE SPRING LOCATION
- (ss) – SUSPENDED SOLIDS ARE INDICATED BY HIGH LEVELS OF ALUMINUM, IRON, AND MANGANESE; MANY OF THE METALS RESULTS IN THIS SAMPLE MAY BE DUE TO PARTICULATE LEVELS AND NOT DISSOLVED METALS

NOTE: ALL RESULTS PRESENTED ARE FROM UNFILTERED ANALYSIS

CHEMICAL	RESULT IS THE MAXIMUM OF ROUNDS VALUE IN ug/l	(FREQUENCY OF DETECTION)

Halliburton NUS CORPORATION

AR501718

= highest level found at K-3

= highest or elevated levels in other wells with impact to the south.

TABLE 4-8 KEYSTONE LANDFILL - SAMPLING ANALYSIS DATA
SAMPLING EVENT OF 24-25 OCTOBER 1994

COMPOUND	UNITS	SAMPLE LOCATION								MAX VALUE
		K1	K1DL	K2	K3	K4	K5	K6	K7	
Aluminum, Dissolved	ug/L	<200		<200	346	<200	<200	<200	<200	1480
Aluminum, Total	ug/L	1020		689	1230	<200	<200	1480	<200	1480
Antimony, Dissolved	ug/L	<60		<60	<60	<60	<60	<60	<60	0
Antimony, Total	ug/L	<60		<60	<60	<60	<60	<60	<60	0
Arsenic, Dissolved	ug/L	<10		<10	<10	<10	<10	<10	<10	0
Arsenic, Total	ug/L	<10		<10	<10	<10	<10	<10	<10	0
Barium, Dissolved	ug/L	<200		<200	3280	<200	<200	<200	255	3280
Barium, Total	ug/L	<200		<200	3260	<200	<200	<200	260	3260
Beryllium, Dissolved	ug/L	<5		<5	<5	<5	<5	<5	<5	0
Beryllium, Total	ug/L	<5		<5	<5	<5	<5	<5	<5	0
Cadmium, Dissolved	ug/L	<5		<5	<5	<5	<5	<5	12	12
Cadmium, Total	ug/L	18		<5	<5	<5	6.1	<5	16	18
Calcium, Dissolved	ug/L	40800		30500	378000	14900	14300	15000	50600	378000
Calcium, Total	ug/L	40200		27700	372000	14500	13600	14300	46300	372000
Chromium, Dissolved	ug/L	<10		<10	22.3	<10	<10	<10	13.2	22.3
Chromium, Total	ug/L	48		<10	15.7	<10	76.4	<10	13.1	76.4
Cobalt, Dissolved	ug/L	356		<5	62.7	<50	<50	81.3	291	356
Cobalt, Total	ug/L	380		<50	67.9	<50	<50	77.6	287	380
Copper, Dissolved	ug/L	<10		<10	<10	<10	<10	<10	<10	0
Copper, Total	ug/L	214		<10	64.1	<10	125	14.4	<10	214
Hardness (as CaCO3)	mg/L	208.5		141	2190	54	75.4	87	246.9	2190
Iron, Dissolved	ug/L	7640		<100	8990	<100	9640	<100	52600	52600
Iron, Total	ug/L	70000		3680	12500	513	25300	5180	58700	70000
Lead, Dissolved	ug/L	<3		<3	<3	<3	<3	4.6	<3	4.6
Lead, Total	ug/L	148		<3	<3	<3	<3	49.5	<3	148
Magnesium, Dissolved	ug/L	27000		19000	314000	4590	10500	12500	35100	314000
Magnesium, Total	ug/L	26300		17400	308000	4350	10100	12500	31900	308000
Manganese, Dissolved	ug/L	12100		316	43000	458	882	1790	32900	43000
Manganese, Total	ug/L	11900		284	41900	433	895	1850	30100	41900
Mercury, Dissolved	ug/L	<0.20		1.9	<0.20	<0.20	<0.20	1.3	<0.20	1.9
Mercury, Total	ug/L	3.4		3.6	0.45	<0.20	0.31	2.6	<0.20	3.6
Molybdenum, Dissolved	ug/L	<50		<50	181	<50	<50	<50	125	181
Molybdenum, Total	ug/L	172		<50	185	<50	73.2	<50	134	185
Nickel, Dissolved	ug/L	67.8		<40	167	<40	70.3	<40	58.1	167
Nickel, Total	ug/L	94.7		<40	176	<40	133	<40	60.7	176
Potassium, Dissolved	ug/L	2080		1570	22600	<1000	<1000	2600	5120	22600
Potassium, Total	ug/L	2060		1460	20200	<1000	<1000	2520	4670	20200
Selenium, Dissolved	ug/L	<5		<5	<5	<5	<5	<5	<5	0
Selenium, Total	ug/L	<5		<5	<5	<5	<5	<5	<5	0
Silver, Dissolved	ug/L	<10		<10	20.3	<10	<10	<10	<10	20.3
Silver, Total	ug/L	<10		<10	17.9	<10	<10	<10	<10	17.9

ARSU1719

TABLE 4-8 KEYSTONE LAND[illegible] SAMPLING ANALYSIS DATA
SAMPLING EVENT [illegible] 24-25 OCTOBER 1994

COMPOUND	UNITS	SAMPLE LOCATION																MAX VALUE
		K1		K1DL		K2		K3		K4		K5		K6		K7		
Sodium, Dissolved	ug/L					17600		733000		5610		10600		12700		58900		733000
Sodium, Total	ug/L	34700				15700		675000		5300		9870		12400		53600		675000
Thallium, Dissolved	ug/L					<10		<10		<10		<10		<10		<10		0
Thallium, Total	ug/L	<10				<10		<10		<10		<10		<10		<10		0
Vanadium, Dissolved	ug/L					<50		<50		<50		<50		<50		<50		0
Vanadium, Total	ug/L	<50				<50		<50		<50		<50		<50		<50		0
Zinc, Total	ug/L	136				<20		<20		<20		21.8		117		20		136
Organic Compounds																		
Chloromethane	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
Bromomethane	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
Vinyl Chloride	ug/L	27		25	D	18		2	U	2	U	2	U	3		2	U	27
Chloroethane	ug/L	15		13	D	2	U	2	U	2	U	2	U	2	U	40		40
Methylene Chloride	ug/L	3	B	9	BDJ	2	U	2	U	2	U	2	U	10	B	2	BJ	10
Acetone	ug/L	2	U	10	U	2	U	11		2	U	13		2	U	2	U	13
Carbon Disulfide	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
1,1-Dichloroethene	ug/L	5		5	DJ	2	U	2	U	2	U	2	U	2	U	2	U	5
1,1-Dichloroethane	ug/L	48	E	45	D	2		2	U	3		16		25		32		48
1,2-Dichlorothene (total)	ug/L	80	E	75	D	11		1	J	2	U	4		25		1	J	80
Chloroform	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
1,2-Dichloroethane	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	1	J	2	U	10
2-Butanone	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
1,1,1-Trichloroethane	ug/L	2		10	U	2	U	2	U	2		2		2	J	2	J	10
Carbon Tetrachloride	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
Bromodichloromethane	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
1,2-Dichloropropane	ug/L	2	J	10	U	2	U	2	U	2	U	2	U	1	J	2	U	10
cis-1,3-Dichloropropene	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
trans-1,3-Dichloropropene	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
Trichloroethene	ug/L	38		34	D	2	J	2	U	2	U	4		20		2	J	38
Dibromochloromethane	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
1,1,2-Trichloroethane	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
Benzene	ug/L	7		7	DJ	2		8		2	U	2	U	2	J	2		8
Bromoform	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
4-Methyl 1-2 Pentanone	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
2-Hexanone	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
Tetrachloroethene	ug/L	19		17	D	1	J	2	U	4		7		16		2	U	19
1,1,2,2-Tetrachloroethane	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
Toluene	ug/L	2		10	U	2	U	2	U	2	U	2	U	2	U	9		10
Chlorobenzene	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
Ethylbenzene	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10
Styrene	ug/L	2	U	10	U	2	U	2	U	2	U	2	U	2	U	2	U	10

AR501720

TABLE 4-8 KEYSTONE LANDFILL - SAMPLING ANALYSIS DATA
SAMPLING EVENT OF 24-25 OCTOBER 1994

COMPOUND	UNITS	SAMPLE LOCATION								MAX VALUE
		K1	K1DL	K2	K3	K4	K5	K6	K7	
Xylenes (total)	ug/L	2 U	10 U	2 U	2 U	2 U	2 U	2 U	1 J	10
Carbon Dioxide	ug/L	16 BJN	120 BDJN	45 BJN	54 BJN	12 BJN	34 BJN	32 BJN	69 BJN	120
Methane, chlorodifluoro	ug/L	18 JN	N/A	23 JN	N/A	N/A	N/A	N/A	20 JN	23
Unknown	ug/L	2 J	N/A	2 J	17 J	N/A	N/A	N/A	N/A	17
Methane, dichlorofluoro	ug/L	23 JN	20 DJN	5 JN	N/A	7 JN	20 JN	21 JN	51 JN	51
Ethane, 1,2-Dichloro-1,1,2	ug/L	8 JN	N/A	N/A	N/A	N/A	N/A	23 JN	N/A	23
Ether	ug/L	33 JN	34 DJN	3 JN	2 JN	N/A	1 JN	9 JN	5 JN	34
Methylethylbenzene isomer	ug/L	2 J	N/A	N/A	5 J	N/A	N/A	N/A	10 J	10
Benzene, 1,4-Dichloro	ug/L	4 JN	7 DJN	1 JN	2 JN	N/A	N/A	3 JN	2 JN	7
Methane, Chlorofluoro	ug/L	N/A	6 DJN	N/A	N/A	N/A	N/A	4 JN	28 JN	28
Ethane, 1,1,2-trichloro-1,2	ug/L	N/A	N/A	N/A	N/A	N/A	N/A	23 JN	N/A	23
Benzene, 1,2-dichloro	ug/L	N/A	N/A	N/A	N/A	N/A	N/A	1 JN	N/A	1
Dichlorodifluoromethane	ug/L	N/A	N/A	N/A	N/A	7 JN	N/A	N/A	N/A	7
Trichlorofluoromethane	ug/L	N/A	N/A	N/A	N/A	2 JN	N/A	N/A	N/A	2
Other Parameters										
Alkalinity, as CaCO3	mg/L	68.8		46.8	191	55.5	46	42.2	297	297
BOD	mg/L	34.5		2.6	12.2	3.2	9.8	2.2	8.9	34.5
COD	mg/L	47.4		40.8	72.3	33.8	<10	22.4	66.3	72.3
Chromium, Hexavalent, Dissolve	mg/L	<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	0
Chromium, Hexavalent, Total	mg/L	<0.010		<0.010	<0.010	0.011	<0.010	<0.010	<0.010	0.011
Nitrogen, Ammonia	mg N/L	3.9		0.1	9.4	0.2	0.17	0.15	0.57	9.4
Org. Carbon, Total	mg/L	15.6		2.3	24.4	2	2.1	3.8	10.4	24.4
Phosphorus, Total	mg P/L	1.2		0.091	0.26	0.091	<0.050	0.16	0.31	1.2
Residue, Total Nonfiltrable	mg/L	324		24	231	17	108	74	91	324
Residue, Total Filtrable	mg/L	39		244	4290	127	127	152	529	4290
Sulfide, Total	mg/L	<1		<1	<1	<1	<1	<1	<1	0
pH		5.6		5.6	6.5	6.1	6	5.6	6.2	6.5

Notes:

1. For metals, "<" indicates that the actual analytical value may be between zero and the number given.
2. For organic compounds, the qualifiers indicate the following:

B - Indicates that the analyte is found in the assoicated blank as well as in sample.
D - Indicates that all compounds identified in the analysis at a secondary dilution factor.
E - Indicates that the concentration of compound exceed the calibration range of GC/MS instrument for specific analysis.
J - Indicates an estimated value.
N - Indicates presumptive evidence of a compound.
U - Indicates a compound on the target compound list (TCL) was analyzed for but not detected.
Numerical value shown represents method [illegible]tion limit.

AR501721

Since CO_2 is the other major gas given off by decomposition, this article may explain the variation in the crops from one year to the next at the area stressed vegetation in our field beside the landfill.

#13 EXTENSION NEWS SERVICE
6/95 CORNELL COOPERATIVE EXTENSION

GENERAL, ENVIRONMENT
NEW YORK'S CROPS FACE POTENTIAL ECONOMIC DISADVANTAGE IN A WORLD WITH MORE CARBON DIOXIDE
by Blaine Friedlander, Cornell News Service

The continued buildup of carbon dioxide (CO_2) in Earth's atmosphere may put New York's farmers at an economic disadvantage, a Cornell University fruit and vegetable expert says.

Although increased levels of CO_2 can cause a "fertilizing effect" on some plants, that does not automatically translate into increased profits, said David W. Wolfe, Cornell associate professor of fruit and vegetable science. The big question is whether New York farmers will reap the same benefits from higher CO_2 as farmers in competing regions.

"The data indicating that carbon dioxide concentrations have been and continue to rise at an exponential rate are indisputable," Wolfe said. "Most experts predict that atmospheric carbon dioxide concentrations are likely to double by the middle of the next century."

Plants use carbon dioxide to produce sugars via photosynthesis. The synthesized sugar gives plants energy to grow and thus, the fertilizing effect. However, if there are limiting factors, such as cool spring temperatures or a lack of water, having more CO_2 will do no good.

Wolfe believes that when New York farms are compared to neighbor states like New Jersey, Pennsylvania, and Ohio, the Empire State could be at an economic disadvantage. Slightly warmer temperatures and higher carbon concentrations might result in yield increases of some crops between 30 and 40 percent for New York's southern neighbors. However, because our relatively cool springs are too cool to reap the maximum benefits from higher CO_2, yield gains in New York may be much less. Even if a global warming effect accompanies the rise in CO_2 and other greenhouse gases, it is not likely to overcome our competitive disadvantage in the spring, Wolfe said.

Wolfe notes that increases in crop production vary between crop species. For example, New York's sweet corn industry can expect to see little production change when CO_2 levels increase. However, potato farmers could enjoy yield increases of 30 percent or more, Wolfe said.

"The photosynthesis process, and how plant enzymes process the carbon, is the crux of the whole thing," Wolfe said.

Depending on how plant enzymes process the carbon, species vary in their response to CO_2. Plants that biologists call "C3" types (so named because the first product of photosynthesis is a three-carbon sugar) benefit greatly from higher concentrations of CO_2 under optimum conditions. Examples of these are potatoes, tomatoes, melons and wheat.

In plants classified as "C4," a different enzyme is used to turn incoming CO_2 into a four-carbon sugar molecule. Wolfe explained that such plants--corn, sugar cane, millet and sorghum, for example--are already so highly efficient at capturing CO_2 molecules that they show no fertilizer effect from additional CO_2.

Further, cash crops are not the only plants affected by high levels of CO_2. Wolfe explained that certain weeds also are of the C3 type, and would grow as if they had been fertilized. That could cause a problem for farmers, he said, who would have to contend with increased costs of battling more weeds.

Aside from water vapor, carbon dioxide is the most abundant of the greenhouse gases, accounting for about 70 percent of the global warming potential. Wolfe says that low concentrations of methane, nitrous oxides, chlorofluorocarbons, and other greenhouse gases account for the remaining 30 percent.

Since the industrial revolution, the amount of atmospheric CO2 has risen exponentially. Pre-revolutionary levels of CO2 held steady at 280 parts per million. Today, those concentrations soar near 350 parts per million, and, Wolfe says, it continues to increase.

How that excess CO2 will directly affect plants and temperatures in specific geographic regions remains a major, unanswered question. "One problem we still have is that the climate models have poor geographic and seasonal resolution," Wolfe said. "This makes it difficult to predict which geographic area might be a winner or a loser...or whether we will all be losers in a future high CO2 world."

# # # #

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Source: Cornell Cooperative Extension, Cornell University, Ithaca, NY
Provider: Ag Information Services -- News & Publications, Penn State

June 4, 1995
Document Number: 28302969
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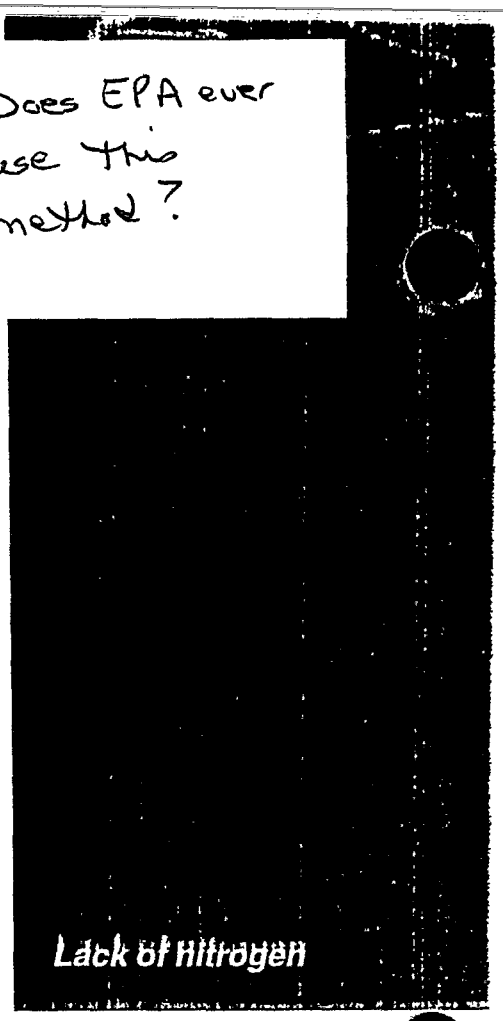
Keywords: AIR-QUALITY, CARBON-DIOXIDE, COMPETITION, CORNELL, CORNELL-AG-LIFE-SCIENCES, CORNELL-NEWS-RELEASE, CROP, CROP-PRODUCTION, CROP-SCIENCE, ENVIRONMENT, MEDIA-RESOURCE, NEW-YORK, NEWS-RELEASE, PENN-STATE, PENN-STATE-COLLEGE-AG-SCIENCES, PENNSYLVANIA, PEST-MANAGEMENT, POLLUTION, WATER-POLLUTION, WATER-QUALITY, WEED-CONTROL

Infrared science arrives on the farm

Does EPA ever use this method?

Given the rapid growth of technology, it's becoming clear that in the not-too-distant future not all farming will be done down on the ground. Along with global positioning systems (GPS), farming is taking to space and cyberspace.

George Waddington of Cropix in Irrigon, Ore., has a satellite view of crops and fields from Landsat 5 and SPOT, which orbit the Earth and gather data on every pass. These satellites transmit the digital data to Earth where computers interpret and create a visual image. By reviewing the data and the image, irrigation and drainage patterns can be discerned, as well as the start of disease and insect related problems. While the crop may look fine to the farmer or the field scout, the infrared image can pick up slight variations in color, which are the tipoff that something is not right. The data from the satellite are gathered by the company who owns the satellite. Information on specific sites is sent over the Internet to Cropix and is available to the grower 32 hours after the satellite has flown over the field.



Lack of Nitrogen

Digital advantages

The satellite "picture" is taken from the same angle and at the same time for all the fields in the area. Unlike regular infrared pictures, in which differences are judged by visual evaluations of variations in color, the satellite data are digital or numeric. With digital data, comparisons can be made between fields and sections of fields. Different fields or areas, planted at the same time with the same variety can be compared.

In one instance a field covered by a center pivot rig was examined. The picture showed a definite pattern in the field. When the center pivot was on it appeared that all the heads were working equally. The heads in the suspicious area were dismantled and found to be slightly clogged. The lack of adequate moisture would have reduced the yield in that section of the field without anyone suspecting why. In a review of data from a large field of potatoes, it was discovered that half the field was beginning to show signs of late blight, a devastating disease that would continue to affect the tubers in storage. The grower was alerted and he advanced his harvest schedule to get the crop out of the ground before the disease progressed further.

Unlike satellite data, the infrared film provides an actual photograph of the area and has been a useful tool for many growers.

Drawbacks remain

There are a few drawbacks to the system at this point. The first is that each "picture" covers about 60,000 acres, a bit more than most farmers need. Each pixel or dot of color represents data collected from a 20 x 20 meter area. This means that all the data collected in the area covered by the pixel is averaged into one value. If the rows are not closed over and there is bare soil visible, this will be averaged into the number for that pixel. Crops such as orchards that have spaces between plants will not be able to benefit from the technology. However, newer satellites orbiting at lower altitudes will soon be able to delineate smaller areas and give more accurate data.

One area where the satellite data has

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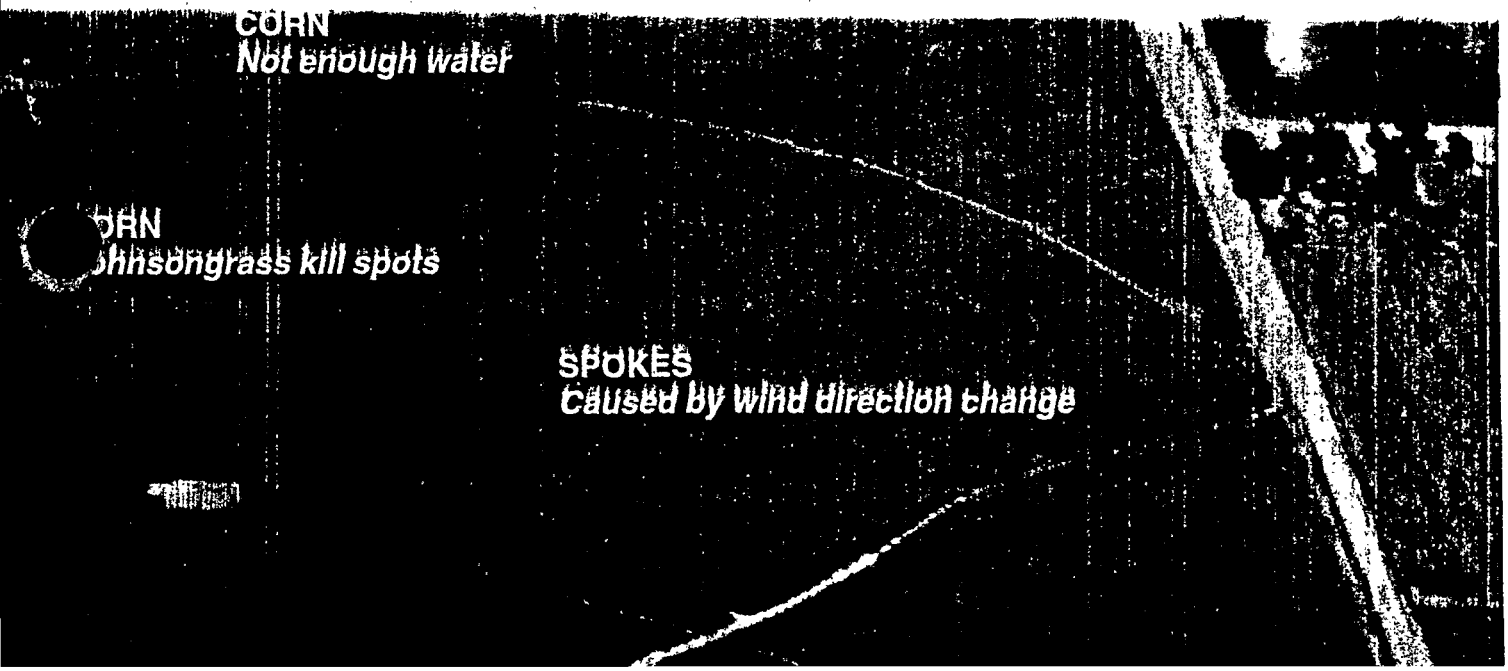
CORN
Not enough water
ORN
ohnsongrass kill spots
SPOKES
Caused by wind direction change