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NSB KINGS BAY
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LETTER TO GEORGIA DEPARTMENT OF NATURAL RESOURCES REGARDING PROPOSED AIR EMISSIONS FROM AIR SPARGING PILOT STUDY NSB KINGS BAY GA
12/13/1993
GEORGIA DEPARTMENT OF NATURAL RESOURCES

13 December 1993

Gene Drew
Air Protection Branch
Department of Natural Resources
4244 International Parkway Suite 120
Atlanta, Georgia 30354

Subject: Air Sparging Pilot Study
Naval Submarine Base, Kings Bay, Georgia

Dear Mr. Drew:

ABB Environmental Services (ABB-ES) is proposing to conduct an air sparging pilot study as part of an Interim Measure at the Naval Submarine Base (NSB) in Kings Bay, Georgia. The purpose of the Interim Measure is to prevent further migration of the contaminated groundwater plume. This letter contains information on expected air emissions and air quality impacts from the air sparging operation. Ms. Norma Gordon, air quality consultant to ABB-ES, first approached the Air Protection Branch of the Georgia Department of Natural Resources regarding the groundwater remediation through telephone calls with Mr. Kurt Churchill and Mr. Tony Curter in January of this year. More recently, on July 15, she discussed this project briefly with Mr. Ron Methier, who recommended that information regarding the pilot study be sent to you.

Additionally, at a project information meeting with Bruce Khaleghi, Unit Coordinator of the Georgia Department of Natural Resources Environmental Protection Division (EPD) Hazardous Waste Management Branch, on 12 August 1993, ABB-ES was informed that treatment of the vapors from the Air Sparger will be required. A review comment of the Interim Measure Work Plan requires attainment of the Lowest Achievable Emission Rate. Based upon these conversations, it is our understanding that an air permit will likely be unnecessary for the pilot study at the NSB. We have attempted to supply all the information you need to evaluate the air quality aspects of this project.

Description of Air Sparging Pilot Study

Groundwater will be extracted from the area beneath the Old Camden County Landfill to prevent further migration of contaminants in the aquifer. The groundwater is known to contain volatile organic compounds (VOCs) as listed in Table 1. The VOCs will be removed from the groundwater utilizing an air stripping technology before discharge of the water to a treatment works.

The Air Sparger is a diffused aeration system where air is released into the water through diffusers that produce coarse bubbles. Mass transfer occurs across the air-water interface of the bubbles. Exhaust air exits the unit and is directed to a series of activated carbon adsorbers before being discharged through a single PVC stack to be released to the atmosphere at a minimum height of 16 feet.

Design air flow through the Air Sparger is 800 cubic feet per minute for an air to water ratio of 100 to 1 at a water feed rate of 60 gallons per minute.

The pilot study will operate up to 24 hours per day, 7 days per week, for a total of 45 days.

Figure 1 shows the approximate location of the Air Sparger, carbon adsorbers and stack.

Air Emissions

Seventeen chemicals have been identified in the groundwater which may be emitted into the air during the air sparging. These chemicals are listed in Table 1. Tables 2 and 3 provide the estimated emission rates for each chemical following vapor phase carbon adsorption (Column 3). Emission rates were calculated using the maximum groundwater concentration detected at any point in the constituent plume (Table 1, Column 1) and modeling for the Air Sparger and carbon adsorbers using the following equations:

$$C_1/C_0 = [1/(1+kt)]^N$$

Where:
C_0 = initial concentration
C_1 = effluent concentration from the Air Sparger
k = Henry's Law Constant
t = residence time
N = number of stages

And: $R/AW \times 1.203$ = vapor effluent in mg/m^3

Where:
R = concentration transferred to the vapor stream in micrograms per liter
AW = air to water ratio of Air Sparger

These equations have been documented to be a conservative calculation based on actual operating data of the Air Sparger unit to be used at the site.

The vapor phase activated carbon has been documented to remove a minimum of 99 percent of each constituent of concern with a retention time of 1.7 to 2 seconds. Four parallel streams of carbon adsorbers will be used to provide a retention time of 1.8 seconds in each adsorber. Two

units will be placed in series to provide a polishing stage and a sample point will be placed between the two units to monitor for breakthrough.

The maximum emission rate from the carbon adsorbers was calculated based on a 99 percent removal efficiency.

Ambient Air Quality Impacts

To estimate expected ambient air quality concentrations during the pilot test, air dispersion modeling was conducted. Maximum predicted impacts were then compared with calculated acceptable ambient concentrations to ensure public health would not be threatened during the system operation.

The United States Environmental Protection Agency (USEPA) SCREEN model was used to predict air quality impacts for each chemical of concern. SCREEN uses a number of conservative assumptions and provides conservative estimates of ambient air concentrations. This model is recommended by the USEPA for conducting dispersion modeling for air pathway analyses. Based upon discussions with staff at the Georgia Air Protection Branch, the SCREEN model is the preferred screening model for estimating air quality impacts.

The point source algorithm in SCREEN was used in the analysis. Flat terrain and rural dispersion were assumed. Concentrations were calculated for the full range of meteorological conditions available in the model. Automated receptor distances from one meter to 50 kilometers were selected for a single wind direction. One additional receptor, 200 feet from the stack, was calculated to represent the nearest public property. Because stack gas temperature is expected to be close to ambient temperature, the default ambient temperature assumed by the model, 293 Kelvin, was also used as the stack gas temperature. The stack gas velocity is based on the blower capacity (800 cubic feet per minute) and stack diameter (4 inches). To reduce the number of model runs and for ease of calculating air quality impacts for each of the chemicals, the model was conducted using a unit emission rate of one pound per hour (lb/hr).

The emission rates and modeled maximum ground level concentrations for each chemical of concern are provided in Tables 2 and 3. Table 4 presents the SCREEN model documentation for calculating the maximum ground level concentrations. Stack parameters used as input to the model are shown in Table 5.

Dimensions of the Air Sparger to be installed are approximately 14 feet long by 8 feet wide by 26 inches high. The unit on a skid will be a height of approximately 3 feet. Due to its size and the height of the stack, the Air Sparger is not expected to affect dispersion of air emissions. The tallest nearby structure to the stack is the Equalization Tank (7 feet high with a 6 foot diameter). The stack height of 16 feet follows Good Engineering Practice (GEP) for stack heights, defined as the height of a nearby structure plus 1.5 times the lesser of the height or width of the nearby

structure. Because the stack height is equivalent to the GEP stack height, building downwash is not expected to occur. The Equalization Tank dimensions were input to the model to confirm that emissions will not be subject to downwash effects.

Table 3 represents the maximum one-hour concentrations that will occur during various dispersion situations following vapor treatment. Table 4 represents the maximum concentrations for a 24-hour averaging time. The maximum predicted one-hour concentration for a 1 lb/hr emission rate was 90.37 $\mu g/m^3$ (Table 4). The maximum impact for a 1 lb/hr emission rate occurred at 421 meters for F stability and a 1 meter per second wind speed. Using a factor of 0.4 to convert this one-hour impact to a 24-hour concentration, the maximum 24-hour impact for a 1 lb/hr emission rate is 36.15 $\mu g/m^3$. The USEPA recommends this 0.4 factor to be applied to one-hour results from the SCREEN model to estimate 24-hour impacts. The 24-hour concentration was multiplied by the emission rate for each chemical to obtain the maximum ambient air concentrations as presented in the tables.

Modeling of the dispersion following the Air Sparger without vapor treatment was also performed to estimate the confidence of emissions not exceeding Acceptable Ambient Concentrations (defined below). Table 6 represents the maximum one-hour concentrations that will occur during various dispersion situations following the Air Sparger without vapor treatment. Table 7 represents the maximum concentrations for a 24-hour averaging time following the Air Sparger without vapor treatment.

Acceptable Ambient Concentrations

In the telephone conversation with Ms. Gordon, Mr. Ron Methier indicated that no more recent guidance was available than the July 1984 guidance document followed in determining the Acceptable Ambient Concentrations (AAC). The basis for the calculation of the AAC comes from the toxicity data priority schedule provided in Part III, paragraph 1 of the guidance document. The American Conference of Governmental and Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) recommendations were converted to units of mg/m^3 for each constituent of concern. These values are included in the tables. The TLV values were adjusted for operation 24 hours a day, 7 days a week by multiplying by 40 hours per week and dividing by 168 hours per week. This is required by paragraph 2, Part III of the guidance document. The values were then adjusted by a safety factor that accounts for pollutant exposure to members of the public who may be more sensitive to pollutant effects than the average citizen, as required by paragraph 3. Table 1 indicates known carcinogens as category A, and all other pollutants as category B.

As indicated on Tables 2, 3, 6 and 7, the maximum ground level concentration calculated by the SCREEN model are well below the resulting AACs. The analysis reaffirms that air emissions will result in a negligible impact on air quality during the air sparging pilot test.

Proposed Monitoring

Daily stack monitoring for vinyl chloride will be conducted during the pilot study to collect actual air emission data. The modeling shows that a concentration of 37 mg/m^3 of vinyl chloride at the stack should not exceed a maximum ground level concentration of 0.01004 mg/m^3 (Table 8) for worst case meteorological conditions. This is less than the required AAC. ABB-ES proposes to monitor the stack and to initiate corrective action if the stack concentration exceeds 3.7 mg/m^3, providing a minimum safety factor of 10 times the AAC. If a stack concentration of 3.7 mg/m^3 of vinyl chloride is exceeded, corrective measures to reduce emissions will be initiated. Corrective measures will be defined in an Operations and Maintenance Plan. The on-site laboratory that will be used initially for this stack monitoring will use a maximum detection limit of 0.1 mg/m^3. When analytical functions are transferred to an off-site laboratory, this maximum detection limit will continue to be used.

We would appreciate your review of this information as soon as possible and your approval that an air permit is not necessary for operation of this pilot scale system at the NSB in Kings Bay, Georgia. If you have any questions or need additional information, please call Navy Representative.

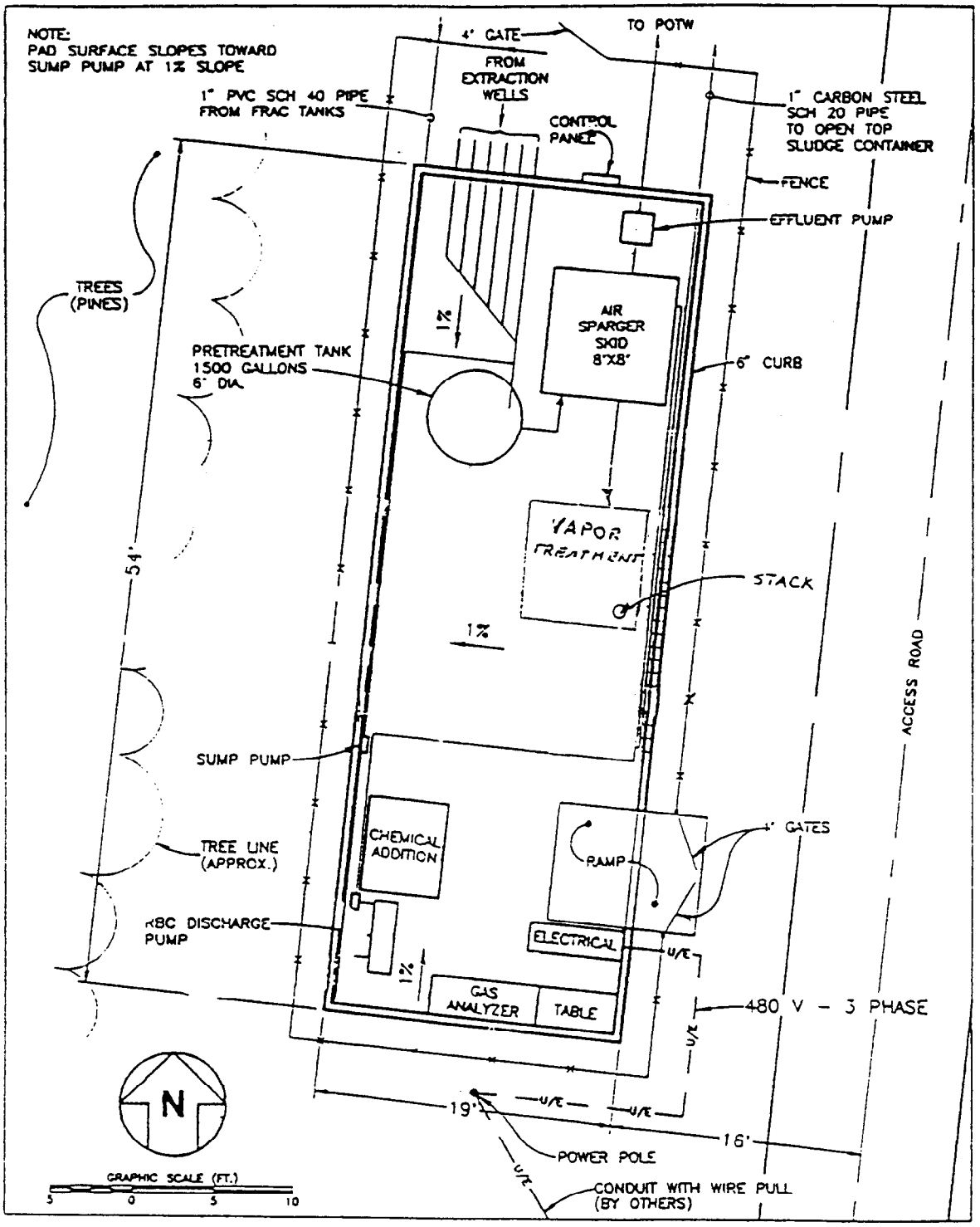
Respectfully,

pc: Bruce Khaleghi
David Driggers
Frank Cater

ATTACHMENTS

FIGURE 1 and

TABLES 1 - 8



DWN:	DES:	PROJECT NO.:	TITLE:
DMF	HF	08503.02	TREATMENT PAD
CHKD: KDS	APPD.: GMB	FIGURE NO.: 1	
DATE: 9-14-93	REV.:		

TABLE 1

SCREEN MODEL EVALUATION
GROUNDWATER INFLUENT CONCENTRATIONS
INTERIM MEASURE DESIGN CALCULATIONS
NSB KINGS BAY, GEORGIA

-ES Project No.: 8503-01
ned By: V. RULE
NOVEMBER 24, 1993
ked By: S. Pierett
December 8, 1993

ce Identification: Site 11 Landfill
ce Location: NSB Kingsbay, GA

Max. Influent Flow Rate (GPM)	:	60
Max. Air Flow Rate (CFM)	:	800
Emission Pt. Height (St. Height) (ft)	:	16
Max. Hrs. of Operation (hrs/wk)	:	168

Contaminant Name	Max Conc in Ground Water (ppb)	TLV (Note 2) (mg/m3)	Category (Note 3) (A or B)	AAC (Note 4) (mg/m3)
Benzene	5	3	A	0.00238
2-Butanone (MEK)	580	590	A	0.46825
Chlorobenzene	10	350	A	0.27778
Dichlorobenzene	12	450	B	1.07143
1,1-Dichloroethane	24	810	A	0.64286
1,2-Dichloroethane	9	40	A	0.03175
cis-1,2-Dichloroethene	3600	790	A	0.62698
trans-1,2-Dichloroethene	23	790	A	0.62698
1,2-Dichloropropane	6	345	A	0.27381
Ethylbenzene	41	435	A	0.34524
2-Hexanone (MBK)	70	20	A	0.01587
MIBK	110	205	A	0.16270
Tetrachloroethene	3	335	A	0.26587
Toluene	840	375	B	0.89286
Trichloroethene	45	270	A	0.21429
Total Xylenes	120	435	A	0.34524
Vinyl chloride	310	13	A	0.01032

TES:
BASED ON 1 LB/HR MODEL
THF OLD LIMIT VALUE
CAT. RY A - CARCINOGEN
CATEGORY B - OTHER
ACCEPTABLE AMBIENT CRITERIA

TABLE 2

SCREEN MODEL EVALUATION
ONE HOUR POINT SOURCE CONCENTRATION VALUES
INTERIM MEASURE DESIGN CALCULATIONS
NSB KINGS BAY, GEORGIA

ABB-ES Project No.:	8503-01
Designed By:	V. RULE
Date:	NOVEMBER 24, 1993
Checked By:	S. Pierett
Date:	December 8, 1993

Source Identification: Site 11 Landfill	Max. Influent Flow Rate (GPM):	60
Source Location: NSB Kingsbay, GA	Max. Air Flow Rate (CFM):	800
	Emission Pt. Height (St. Height){ft} :	16
	Max. Hrs. of Operation (hrs/wk) :	168

#	Contaminant Name	Max Conc in Ground Water (ppb)	Max. Vapor Emission From Air Sparger (mg/m3)	Max. Vapor Emission From Carbon (mg/m3)	Maximum Ground Level Concentration (mg/m3)	AAC (Note 2) (mg/m3)
1	Benzene	5	0.12030	0.00120	0.00000	0.00238
2	2-Butanone (MEK)	580	0.93700	0.00937	0.00000	0.46825
3	Chlorobenzene	10	0.24030	0.00240	0.00000	0.27778
4	1,4-Dichlorobenzene	12	0.28800	0.00288	0.00000	1.07143
5	1,1-Dichloroethane	24	0.57700	0.00577	0.00000	0.64286
6	1,2-Dichloroethane	9	0.20650	0.00207	0.00000	0.03175
7	cis-1,2-Dichloroethene	3600	8.56480	0.08565	0.00002	0.62698
8	trans-1,2-Dichloroethene	23	0.55320	0.00553	0.00000	0.62698
9	1,2-Dichloropropane	6	0.14300	0.00143	0.00000	0.27381
10	Ethylbenzene	41	0.98630	0.00986	0.00000	0.34524
11	2-Hexanone (MBK)	70	0.05240	0.00052	0.00000	0.01587
12	MIBK	110	0.06830	0.00068	0.00000	0.16270
13	Tetrachloroethene	3	0.07200	0.00072	0.00000	0.26587
14	Toluene	840	20.19700	0.20197	0.00005	0.89286
15	Trichloroethene	45	0.10800	0.00108	0.00000	0.21429
16	Total Xylenes	120	2.88000	0.02880	0.00001	0.34524
17	Vinyl chloride	310	7.45800	0.07458	0.00002	0.01032

Notes:
1) BASED ON 1 LB/HR MODEL
2) ACCEPTABLE AMBIENT CONCENTRATION

TABLE 3

SCREEN MODEL EVALUATION
24 HOUR POINT SOURCE CONCENTRATION VALUES
INTERIM MEASURE DESIGN CALCULATIONS
NSB KINGS BAY, GEORGIA

ABB-ES Project No.: 8503-01
Designed By: V. RULE
Date: NOVEMBER 24, 1993
Checked By: S. Pierett
Date: December 8, 1993

Source Identification: Site 11 Landfill
Source Location: NSB Kingsbay, GA

Max. Influent Flow Rate (GPM): 60
Max. Air Flow Rate (CFM): 800
Emission Pt. Height (St. Height){ft} : 16
Max. Hrs. of Operation (hrs/wk) : 168

#	Contaminant Name	Max Conc in Ground Water (ppb)	Max. Vapor Emission from Air Sparger (mg/m3)	Max. Vapor Emission from Carbon (mg/m3)	Maximum Ground Level Concentration (mg/m3)	AAC (Note 2) (mg/m3)
1	Benzene	5	0.12030	0.00120	0.00000	0.00238
2	2-Butanone (MEK)	580	0.93700	0.00937	0.00000	0.46825
3	Chlorobenzene	10	0.24030	0.00240	0.00000	0.27778
4	1,4-Dichlorobenzene	12	0.28800	0.00288	0.00000	1.07143
5	1,1-Dichloroethane	24	0.57700	0.00577	0.00000	0.64286
6	1,2-Dichloroethane	9	0.20650	0.00207	0.00000	0.03175
7	cis-1,2-Dichloroethene	3600	8.56480	0.08565	0.00001	0.62698
8	trans-1,2-Dichloroethene	23	0.55320	0.00553	0.00000	0.62698
9	1,2-Dichloropropane	6	0.14300	0.00143	0.00000	0.27381
10	Ethylbenzene	41	0.98630	0.00986	0.00000	0.34524
11	2-Hexanone (MBK)	70	0.05240	0.00052	0.00000	0.01587
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14	Toluene	840	20.19700	0.20197	0.00002	0.89286
15	Trichloroethene	45	0.10800	0.00108	0.00000	0.21429
16	Total Xylenes	120	2.88000	0.02880	0.00000	0.34524
17	Vinyl chloride	310	7.45800	0.07458	0.00001	0.01032

Notes:
1) BASED ON 1 LB/HR MODEL
2) ACCEPTABLE AMBIENT CRITERIA

TABLE 4

11-30-93
13:48:37

* SCREEN-1.1 MODEL RUN ***
** VERSION DATED 88300 ***

NSB Kings Bay, GA - Interim Measure - TABLE 4 - SCREEN MODEL

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	.1260
STACK HEIGHT (M)	=	4.88
STK INSIDE DIAM (M)	=	.10
STK EXIT VELOCITY (M/S)	=	46.50
STK GAS EXIT TEMP (K)	=	293.00
AMBIENT AIR TEMP (K)	=	293.00
RECEPTOR HEIGHT (M)	=	.00
IOPT (1=URB,2=RUR)	=	2
BUILDING HEIGHT (M)	=	2.13
MIN HORIZ BLDG DIM (M)	=	1.83
MAX HORIZ BLDG DIM (M)	=	1.83

1 lb/hr

BUOY. FLUX = .00 M**4/S**3; MOM. FLUX = 5.41 M**4/S**2.

*** FULL METEOROLOGY ***

****
* SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	0	.0	.0	.0	.0	.0	.0	NA
100.	63.74	3	3.0	3.0	960.0	9.5	12.5	7.6	NO
200.	77.95	5	1.0	1.0	5000.0	13.8	12.3	7.4	NO
300.	85.58	5	1.0	1.0	5000.0	13.8	17.4	9.6	NO
400.	90.19	6	1.0	1.0	5000.0	13.0	15.2	8.1	NO
500.	88.32	6	1.0	1.0	5000.0	13.0	18.4	9.3	NO
600.	82.15	6	1.0	1.0	5000.0	13.0	21.6	10.5	NO
700.	74.60	6	1.0	1.0	5000.0	13.0	24.8	11.6	NO
800.	67.03	6	1.0	1.0	5000.0	13.0	27.9	12.6	NO
900.	60.24	6	1.0	1.0	5000.0	13.0	31.0	13.6	NO
1000.	54.27	6	1.0	1.0	5000.0	13.0	34.1	14.5	NO
1100.	49.14	6	1.0	1.0	5000.0	13.0	37.2	15.3	NO
1200.	44.69	6	1.0	1.0	5000.0	13.0	40.2	16.2	NO
1300.	40.82	6	1.0	1.0	5000.0	13.0	43.2	16.9	NO
1400.	37.44	6	1.0	1.0	5000.0	13.0	46.2	17.7	NO
1500.	34.48	6	1.0	1.0	5000.0	13.0	49.2	18.5	NO
1600.	31.87	6	1.0	1.0	5000.0	13.0	52.1	19.2	NO
1700.	29.55	6	1.0	1.0	5000.0	13.0	55.1	19.9	NO
800.	27.50	6	1.0	1.0	5000.0	13.0	58.0	20.6	NO
1900.	25.66	6	1.0	1.0	5000.0	13.0	60.9	21.3	NO
2000.	24.01	6	1.0	1.0	5000.0	13.0	63.8	22.0	NO
2100.	22.59	6	1.0	1.0	5000.0	13.0	66.7	22.6	NO
2200.	21.30	6	1.0	1.0	5000.0	13.0	69.5	23.1	NO
2300.	20.13	6	1.0	1.0	5000.0	13.0	72.4	23.7	NO
2400.	19.07	6	1.0	1.0	5000.0	13.0	75.2	24.2	NO

TABLE 4 (continued)

2500.	18.09	6	1.0	1.0	5000.0	13.0	78.0	24.7	NO
2600.	17.20	6	1.0	1.0	5000.0	13.0	80.9	25.3	NO
2700.	16.38	6	1.0	1.0	5000.0	13.0	83.7	25.8	NO
2800.	15.62	6	1.0	1.0	5000.0	13.0	86.5	26.3	NO
2900.	14.92	6	1.0	1.0	5000.0	13.0	89.2	26.8	NO
3000.	14.27	6	1.0	1.0	5000.0	13.0	92.0	27.3	NO
3500.	11.75	6	1.0	1.0	5000.0	13.0	105.7	29.3	NO
4000.	9.914	6	1.0	1.0	5000.0	13.0	119.2	31.1	NO
4500.	8.525	6	1.0	1.0	5000.0	13.0	132.6	32.8	NO
5000.	7.443	6	1.0	1.0	5000.0	13.0	145.7	34.4	NO
5500.	6.579	6	1.0	1.0	5000.0	13.0	158.7	36.0	NO
6000.	5.876	6	1.0	1.0	5000.0	13.0	171.6	37.4	NO
6500.	5.295	6	1.0	1.0	5000.0	13.0	184.4	38.8	NO
7000.	4.806	6	1.0	1.0	5000.0	13.0	197.0	40.2	NO
7500.	4.405	6	1.0	1.0	5000.0	13.0	209.6	41.4	NO
8000.	4.059	6	1.0	1.0	5000.0	13.0	222.0	42.5	NO
8500.	3.759	6	1.0	1.0	5000.0	13.0	234.4	43.5	NO
9000.	3.496	6	1.0	1.0	5000.0	13.0	246.6	44.6	NO
9500.	3.264	6	1.0	1.0	5000.0	13.0	258.8	45.6	NO
10000.	3.058	6	1.0	1.0	5000.0	13.0	270.9	46.6	NO
15000.	1.825	6	1.0	1.0	5000.0	13.0	388.4	55.0	NO
20000.	1.295	6	1.0	1.0	5000.0	13.0	501.0	60.4	NO
25000.	.9922	6	1.0	1.0	5000.0	13.0	609.8	65.0	NO
30000.	.7986	6	1.0	1.0	5000.0	13.0	715.6	69.0	NO
40000.	.5755	6	1.0	1.0	5000.0	13.0	920.2	74.6	NO
50000.	.4466	6	1.0	1.0	5000.0	13.0	1117.4	79.3	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

421.	90.37	6	1.0	1.0	5000.0	13.0	15.9	8.4	NO

for 1 lb/hr

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SCREEN DISCRETE DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
61.	59.82	2	3.0	3.0	960.0	9.5	12.3	6.8	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
SUMMARY OF TERRAIN HEIGHTS ENTERED FOR *
* SIMPLE ELEVATED TERRAIN PROCEDURE *
****

TERRAIN HT (M)	DISTANCE RANGE (M) MINIMUM	MAXIMUM

TABLE 4 (continued)

0.	1.	50000.
0.	61.	--

*** CAVITY CALCULATION - 1 ***			*** CAVITY CALCULATION - 2 ***		
CONC (UG/M**3)	=	.0000	CONC (UG/M**3)	=	.0000
CRIT WS @10M (M/S)	=	99.99	CRIT WS @10M (M/S)	=	99.99
CRIT WS @ HS (M/S)	=	99.99	CRIT WS @ HS (M/S)	=	99.99
DILUTION WS (M/S)	=	99.99	DILUTION WS (M/S)	=	99.99
CAVITY HT (M)	=	3.25	CAVITY HT (M)	=	3.25
CAVITY LENGTH (M)	=	3.02	CAVITY LENGTH (M)	=	3.02
ALONGWIND DIM (M)	=	1.83	ALONGWIND DIM (M)	=	1.83

CAVITY CONC NOT CALCULATED FOR CRIT WS > 20.0 M/S. CONC SET = 0.0

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	90.37	421.	0.

for 1 lb/hr input

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

TABLE 5

STACK PARAMETERS

Source Type:	Point	
Emission Rate:	0.1260 g/s	(1 lb/hr)
Stack Height:	4.88 meters	(16 feet)
Stack Inside Diameter:	0.1 meters	(4 inches)
Stack Exit Velocity:	46.5 m/s	(152.7 ft/s)
Stack Gas Exit Temp:	293 K	(68 °F)
Ambient Air Temp:	293 K	(68 °F)
Receptor Height:	0 meters	
Nearby Structure Height:	2.13 meters	(7 feet)
Minimum Horizon Dim:	1.83	(6 feet)
Maximum Horizon Dim:	1.83	(6 feet)

TABLE 6

SCREEN MODEL EVALUATION
ONE HOUR POINT SOURCE CONCENTRATION VALUES
FOLLOWING AIR SPARGER WITHOUT CARBON
INTERIM MEASURE DESIGN CALCULATIONS
NSB KINGS BAY, GEORGIA

ABB-ES Project No.: 8503-01
Designed By: V. RULE
Date: NOVEMBER 24, 1993
Checked By: S. Pierett
Date: December 8, 1993

Source Identification: Site 11 Landfill
Source Location: NSB Kingsbay, GA

Max. Influent Flow Rate (GPM): 60
Max. Air Flow Rate (CFM): 800
Emission Pt. Height (St. Height){ft} : 16
Max. Hrs. of Operation (hrs/wk) : 168

#	Contaminant Name	Max Conc in Ground Water (ppb)	Max. Vapor Emission from Air Sparger (mg/m3)	Maximum Ground Level Concentration (mg/m3)	AAC (Note 2) (mg/m3)
1	Benzene	5	0.12030	0.00003	0.00238
2	2-Butanone (MEK)	580	0.93700	0.00025	0.46825
3	Chlorobenzene	10	0.24030	0.00006	0.27778
4	1,4-Dichlorobenzene	12	0.28800	0.00008	1.07143
5	1,1-Dichloroethane	24	0.57700	0.00016	0.64286
6	1,2-Dichloroethane	9	0.20650	0.00006	0.03175
7	cis-1,2-Dichloroethene	3600	8.56480	0.00231	0.62698
8	trans-1,2-Dichloroethene	23	0.55320	0.00015	0.62698
9	1,2-Dichloropropane	6	0.14300	0.00004	0.27381
10	Ethylbenzene	41	0.98630	0.00027	0.34524
11	2-Hexanone (MBK)	70	0.05240	0.00001	0.01587
12	MIBK	110	0.06830	0.00002	0.16270
13	Tetrachloroethene	3	0.07200	0.00002	0.26587
14	Toluene	840	20.19700	0.00546	0.89286
15	Trichloroethene	45	0.10800	0.00003	0.21429
16	Total Xylenes	120	2.88000	0.00078	0.34524
17	Vinyl chloride	310	7.45800	0.00202	0.01032

Notes:
1) BASED ON 1 LB/HR MODEL
2) ACCEPTABLE AMBIENT CONCENTRATION

TABLE 7

SCREEN MODEL EVALUATION
24 HOUR POINT SOURCE CONCENTRATION VALUES
FOLLOWING AIR SPARGER WITHOUT CARBON
INTERIM MEASURE DESIGN CALCULATIONS
NSB KINGS BAY, GEORGIA

ABB-ES Project No.: 8503-01
Designed By: V. RULE
Date: NOVEMBER 24, 1993
Checked By: S. Pierett
Date: December 8, 1993

Source Identification: Site 11 Landfill
Source Location: NSB Kingsbay, GA

Max. Influent Flow Rate (GPM): 60
Max. Air Flow Rate (CFM): 800
Emission Pt. Height (St. Height){ft} : 16
Max. Hrs. of Operation (hrs/wk) : 168

#	Contaminant Name	Max. Conc in Ground Water (ppb)	Max Vapor Emission from Air Sparger (mg/m3)	Maximum Ground Level Concentration (mg/m3)	AAC (Note 2) (mg/m3)
1	Benzene	5	0.12030	0.00001	0.00238
2	2-Butanone (MEK)	580	0.93700	0.00010	0.46825
3	Chlorobenzene	10	0.24030	0.00003	0.27778
4	1,4-Dichlorobenzene	12	0.28800	0.00003	1.07143
5	1,1-Dichloroethane	24	0.57700	0.00006	0.64286
6	1,2-Dichloroethane	9	0.20650	0.00002	0.03175
7	cis-1,2-Dichloroethene	3600	8.56480	0.00093	0.62698
8	trans-1,2-Dichloroethene	23	0.55320	0.00006	0.62698
9	1,2-Dichloropropane	6	0.14300	0.00002	0.27381
10	Ethylbenzene	41	0.98630	0.00011	0.34524
11	2-Hexanone (MBK)	70	0.05240	0.00001	0.01587
12	MIBK	110	0.06830	0.00001	0.16270
13	Tetrachloroethene	3	0.07200	0.00001	0.26587
14	Toluene	840	20.19700	0.00218	0.89286
15	Trichloroethene	45	0.10800	0.00001	0.21429
16	Total Xylenes	120	2.88000	0.00031	0.34524
17	Vinyl chloride	310	7.45800	0.00081	0.01032

Notes:
1) BASED ON 1 LB/HR MODEL
2) ACCEPTABLE AMBIENT CONCENTRATION

TABLE 8

11-30-93
13:51:51

*** SCREEN-1.1 MODEL RUN ***
** VERSION DATED 88300 ***

NSB Kings Bay, GA - Interim Measure - TABLE 8 - STACK MONITORING

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	.1400E-01 = 37 mg/m³ @ Stack
STACK HEIGHT (M)	=	4.88
STK INSIDE DIAM (M)	=	.10
STK EXIT VELOCITY (M/S)	=	46.50
STK GAS EXIT TEMP (K)	=	293.00
AMBIENT AIR TEMP (K)	=	293.00
RECEPTOR HEIGHT (M)	=	.00
IOPT (1=URB,2=RUR)	=	2
BUILDING HEIGHT (M)	=	2.13
MIN HORIZ BLDG DIM (M)	=	1.83
MAX HORIZ BLDG DIM (M)	=	1.83

BUOY. FLUX = .00 M**4/S**3; MOM. FLUX = 5.41 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	0	.0	.0	.0	.0	.0	.0	NA
100.	7.083	3	3.0	3.0	960.0	9.5	12.5	7.6	NO
200.	8.661	5	1.0	1.0	5000.0	13.8	12.3	7.4	NO
300.	9.509	5	1.0	1.0	5000.0	13.8	17.4	9.6	NO
400.	10.02	6	1.0	1.0	5000.0	13.0	15.2	8.1	NO
500.	9.813	6	1.0	1.0	5000.0	13.0	18.4	9.3	NO
600.	9.128	6	1.0	1.0	5000.0	13.0	21.6	10.5	NO
700.	8.289	6	1.0	1.0	5000.0	13.0	24.8	11.6	NO
800.	7.447	6	1.0	1.0	5000.0	13.0	27.9	12.6	NO
900.	6.693	6	1.0	1.0	5000.0	13.0	31.0	13.6	NO
1000.	6.030	6	1.0	1.0	5000.0	13.0	34.1	14.5	NO
1100.	5.460	6	1.0	1.0	5000.0	13.0	37.2	15.3	NO
1200.	4.965	6	1.0	1.0	5000.0	13.0	40.2	16.2	NO
1300.	4.535	6	1.0	1.0	5000.0	13.0	43.2	16.9	NO
1400.	4.160	6	1.0	1.0	5000.0	13.0	46.2	17.7	NO
1500.	3.831	6	1.0	1.0	5000.0	13.0	49.2	18.5	NO
1600.	3.541	6	1.0	1.0	5000.0	13.0	52.1	19.2	NO
1700.	3.284	6	1.0	1.0	5000.0	13.0	55.1	19.9	NO
1800.	3.055	6	1.0	1.0	5000.0	13.0	58.0	20.6	NO
1900.	2.851	6	1.0	1.0	5000.0	13.0	60.9	21.3	NO
2000.	2.668	6	1.0	1.0	5000.0	13.0	63.8	22.0	NO
2100.	2.510	6	1.0	1.0	5000.0	13.0	66.7	22.6	NO
2200.	2.367	6	1.0	1.0	5000.0	13.0	69.5	23.1	NO
2300.	2.237	6	1.0	1.0	5000.0	13.0	72.4	23.7	NO
2400.	2.119	6	1.0	1.0	5000.0	13.0	75.2	24.2	NO

TABLE 8 (continued)

2500.	2.010	6	1.0	1.0	5000.0	13.0	78.0	24.7	NO
2600.	1.911	6	1.0	1.0	5000.0	13.0	80.9	25.3	NO
2700.	1.820	6	1.0	1.0	5000.0	13.0	83.7	25.8	NO
2800.	1.736	6	1.0	1.0	5000.0	13.0	86.5	26.3	NO
2900.	1.658	6	1.0	1.0	5000.0	13.0	89.2	26.8	NO
3000.	1.586	6	1.0	1.0	5000.0	13.0	92.0	27.3	NO
3500.	1.306	6	1.0	1.0	5000.0	13.0	105.7	29.3	NO
4000.	1.102	6	1.0	1.0	5000.0	13.0	119.2	31.1	NO
4500.	.9473	6	1.0	1.0	5000.0	13.0	132.6	32.8	NO
5000.	.8270	6	1.0	1.0	5000.0	13.0	145.7	34.4	NO
5500.	.7310	6	1.0	1.0	5000.0	13.0	158.7	36.0	NO
6000.	.6529	6	1.0	1.0	5000.0	13.0	171.6	37.4	NO
6500.	.5883	6	1.0	1.0	5000.0	13.0	184.4	38.8	NO
7000.	.5340	6	1.0	1.0	5000.0	13.0	197.0	40.2	NO
7500.	.4894	6	1.0	1.0	5000.0	13.0	209.6	41.4	NO
8000.	.4510	6	1.0	1.0	5000.0	13.0	222.0	42.5	NO
8500.	.4177	6	1.0	1.0	5000.0	13.0	234.4	43.5	NO
9000.	.3885	6	1.0	1.0	5000.0	13.0	246.6	44.6	NO
9500.	.3627	6	1.0	1.0	5000.0	13.0	258.8	45.6	NO
10000.	.3398	6	1.0	1.0	5000.0	13.0	270.9	46.6	NO
15000.	.2028	6	1.0	1.0	5000.0	13.0	388.4	55.0	NO
20000.	.1439	6	1.0	1.0	5000.0	13.0	501.0	60.4	NO
25000.	.1102	6	1.0	1.0	5000.0	13.0	609.8	65.0	NO
30000.	.8873E-01	6	1.0	1.0	5000.0	13.0	715.6	69.0	NO
40000.	.6394E-01	6	1.0	1.0	5000.0	13.0	920.2	74.6	NO
50000.	.4963E-01	6	1.0	1.0	5000.0	13.0	1117.4	79.3	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

421.	10.04	6	1.0	1.0	5000.0	13.0	15.9	8.4	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

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*********************************************
*  SUMMARY OF TERRAIN HEIGHTS ENTERED FOR   *
*    SIMPLE ELEVATED TERRAIN PROCEDURE      *
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TERRAIN HT (M)	DISTANCE RANGE (M) MINIMUM	MAXIMUM
0.	1.	50000.

```
*** CAVITY CALCULATION - 1 ***        *** CAVITY CALCULATION - 2 ***
 CONC (UG/M**3)       =    .0000        CONC (UG/M**3)       =    .0000
 CRIT WS @10M (M/S)   =   99.99         CRIT WS @10M (M/S)   =   99.99
 CRIT WS @ HS (M/S)   =   99.99         CRIT WS @ HS (M/S)   =   99.99
 DILUTION WS (M/S)    =   99.99         DILUTION WS (M/S)    =   99.99
 CAVITY HT (M)        =    3.25         CAVITY HT (M)        =    3.25
 CAVITY LENGTH (M)    =    3.02         CAVITY LENGTH (M)    =    3.02
 ALONGWIND DIM (M)    =    1.83         ALONGWIND DIM (M)    =    1.83

CAVITY CONC NOT CALCULATED FOR CRIT WS > 20.0 M/S.  CONC SET = 0.0

     ****************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
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TABLE 8 (continued)

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
IMPLE TERRAIN	10.04	421.	0.

for 37 mg/m³ @ stack

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
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