Tomoka Landfill Site B37:
Preliminary Characterization of Contaminant Plumes and Proposed Monitor Well Installation

Volusia County, Florida

prepared for

Solid Waste Services Group
County of Volusia, Florida

April 13, 2001

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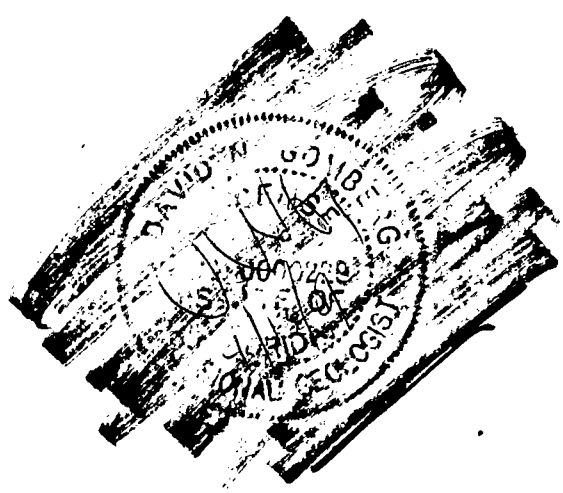

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Date: 4/13/00

Memo to: Susan Gaze, Environmental and Regulatory Compliance Specialist

Re: Tomoka Landfill Site B37 Contamination Assessment - Preliminary Characterization of Contaminant Plumes in Layers 1-2 and 4, and Proposed Monitor Well Installation

Purpose of this memo. Field work was completed in April and June, 2000, to characterize and define the boundaries of contaminant plumes in the vicinity of monitoring site B37. One purpose of this memo is to describe that field work, and the results obtained.

The methods employed - temporary push wells and instantaneous analyses utilizing an on-site, mobile laboratory - are considered to yield preliminary results. They are sufficient, however, to evaluate where permanent monitoring wells should be located. Thus, a second purpose of this memo is to recommend locations and specifications for installation of monitoring wells.

Summary. Groundwater contaminated with Volatile Organic Compounds (VOC's) is found near monitoring site B37, on the southern boundary of the old waste cell at Tomoka Landfill. The contamination occurs in two shallow sandy strata, to depths of 30-35 feet below ground. A small contaminant plume in the upper layer (Layer 1-2) extends outward from the landfill about 200 feet, and contains vinyl chloride, benzene, and dichloroethene in concentrations that exceed Maximum Contaminant Levels (MCL's). The plume in the deeper layer (Layer 4) extends outward about 400 feet, and contains vinyl chloride and benzene in concentrations greater than the MCL's.

Four new wells in Layer 1-2 and 6 new wells in Layer 4 are proposed, to verify the punch-well results, provide continuing characterization of contaminant identities and concentrations, and monitor the position of plume margins.

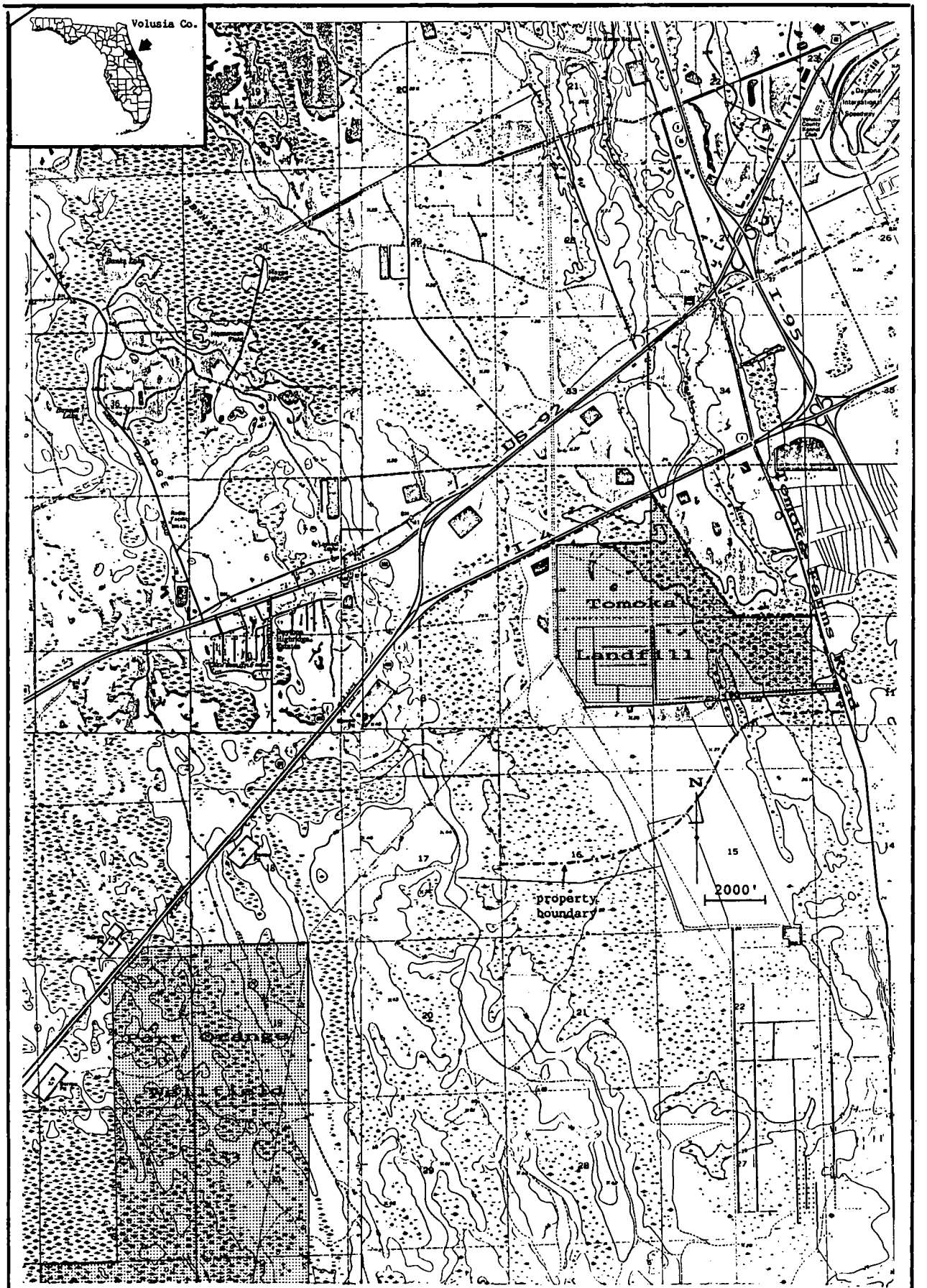


Figure 1. Location of Tomoka Landfill

Introduction and background. Figure 1 shows the location and boundaries of the 2629-acre landfill property. It also shows, about 2000 feet from the nearest property boundary, the approximate position of the B37 Contamination Assessment site. The landfill site plan and current groundwater monitoring network are shown on Figure 2. The B37 site is along the southern perimeter of the old, unlined landfill, and about 1000 feet east of the juncture of that landfill and the Class I area which has recently been completed and closed.

Wells B37-1 (the deeper well) and B37-2 were installed in late l994, were sampled semi-annually through 1997, and every two months since then (except for one gap in 1998). The results are summarized in Table 1, where only VOC's that have been detected at least once are tabulated. The numbers are in **bold** where a concentration exceeds the MCL for groundwater concentrations.

Well B37-1 has regularly exceeded the MCL for benzene (1 ug/l) since the onset of sampling, with the concentrations remaining relatively constant at less than 20 ug/l (see Fig. 3). The only other exceedance in the sampling history of B37-1 was a 1 ug/l value reported for vinyl chloride (MCL = 1 ug/l), in August, l999.

Samples from well B37-2 have exceeded the MCL for vinyl chloride (MCL = 1 ug/l), benzene, and for cis-1,2-dichloroethene (MCL = 70 ug/l). Concentrations of vinyl chloride ranged upward to several hundred ug/l during l997 through 1999, but have declined to less than 20 ug/l for the last 6 sampling events. The pattern has been about the same for dichloroethene, which last exceeded the MCL in October of 1999, and has been less than 10 ug/l for the last 6 samplings. Benzene has never exceeded 2 ug/l, and has not been detected since the Feb., 1998 sampling. These results are graphed in Figure 3.

Site hydrogeology. The sedimentary profile at site B37 is known from a 50-foot test boring, completed there at the time of monitor well installation. Figure 4 summarizes that profile, which is essentially identical to others from the southern part of the landfill site. The sequence has been divided into 8 unconsolidated units, consisting essentially of moderately permeable sandy and shelly strata separated from one another by silty and

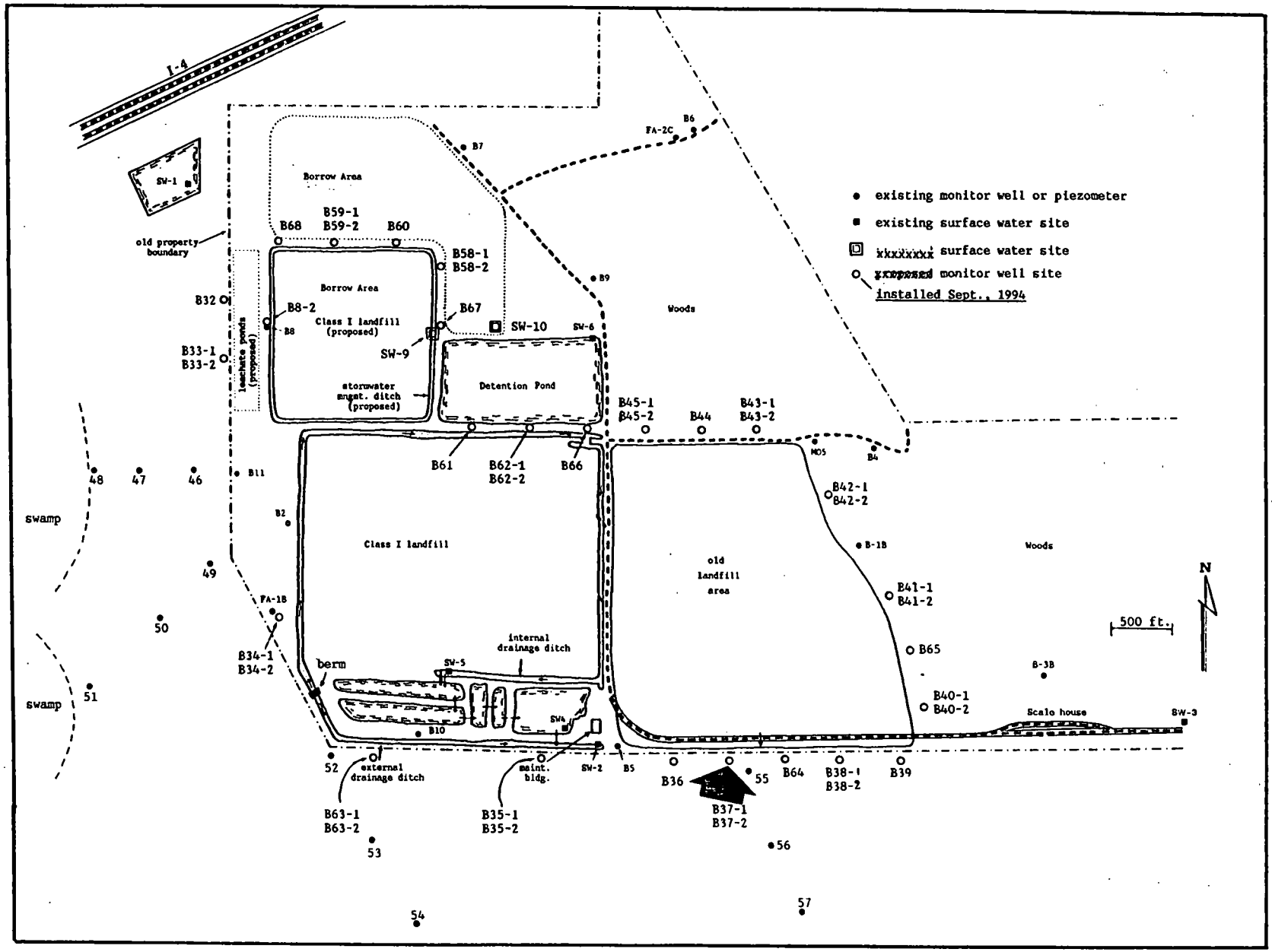


Figure 2. Landfill Site Plan & Location of Monitoring Site B37

B37-1

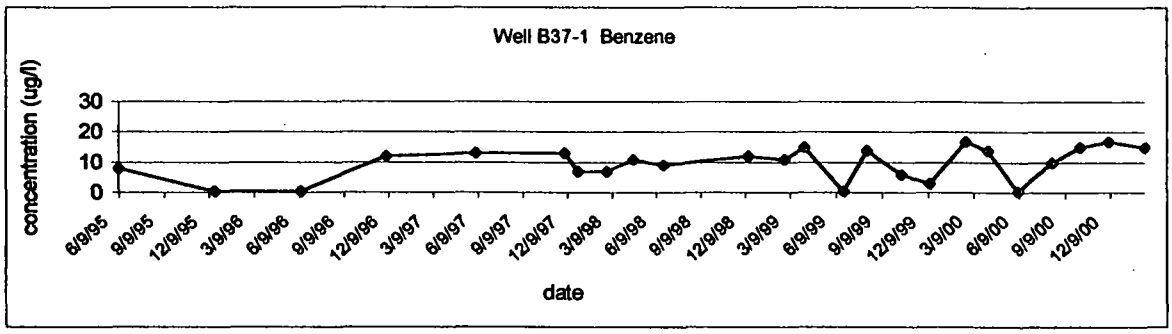
date	dichloroethene cis	dichloroethene trans	benzene	toluene	vinyl chloride	xylenes	chloro-benzene	dichlorofluo-romethane	acetone	chloro-methane	1-4dichloro benzene	total
MCL	70	100	1	1000	1	10000	100	1400		6		
6/9/95	<	<	8	1	<	63	5	<	<	<	<	77
12/20/95	<		<	<	<	2	<		<	<	<	2
6/11/96	<		<	<	<	<	<		<	<	<	<
12/4/96	<		12	<	<	2	7		<	<	<	21
6/4/97	<		13	<	<	10	6		<	<	<	29
12/3/97	<		13	<	<	11	8		<	<	<	32
12/30/97		<	7	<	<	5	3	12	<	<	<	27
2/26/98			7	13	<	3	4	<	<	<	<	27
4/22/98			11	<	<	6	8	58	<	<	<	83
6/24/98	<	<	9	<	<	1	7		<	<	<	17
12/15/98	<		12	<	<	<	9		<	<	<	21
2/26/99	<	<	11	<	<	3	8		<	<	<	22
4/6/99	<	<	15	<	<	5	10		<	<	<	30
6/23/99	<	<	<	14	<	<	<		51	<	<	65
8/9/99	<	<	14	3	1	1	<		<	<	<	19
10/18/99	<	<	6	<	<	6	<		<	1	<	13
12/13/99	<	<	3	<	<	<	<		<	<	<	3
2/21/00	<	<	17	<	<	1	<		<	<	<	18
4/7/00	<	<	14	<	<	<	11		<	<	<	25
6/6/00	<	<	<	<	<	<	<		<	<	<	<
8/14/00	<	<	10	1	<	<	<		<	<	<	11
10/10/00	<	<	15	<	<	3	<		<	<	<	18
12/6/00	<	<	17	<	<	2	11		<	<	<	30
2/19/01	<	<	15	<	<	2	12		<	<	2	31

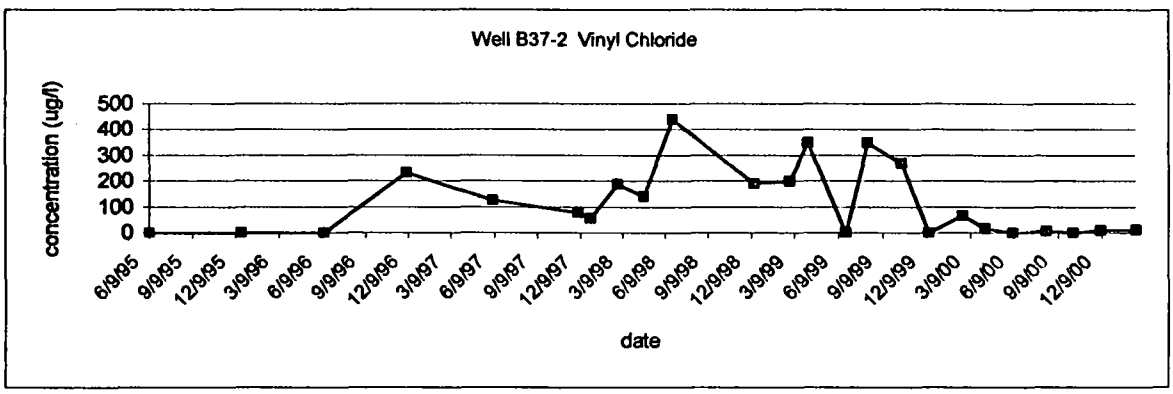
B37-2

date	dichloroethene cis	dichloroethene trans	benzene	toluene	vinyl chloride	xylenes	chloro-benzene	dichlorofluo-romethane	acetone	chloro methane	1-4dichloro benzene	total
MCL	70	100	1	1000	1	10000	100	1400		6		
6/9/95	260	6	2	5	<	<	<	<	<	<	<	273
12/20/95	<		1	<	<	<	<		<	<	<	1
6/11/96	<	<	<	<	<	<	<		<	<	<	0.5
12/4/96	<		2	26	232	<	<		<	<	<	260
6/4/97	<	<	2	4	126	<	<		<	<	<	132
12/3/97	<	<	1	<	79	<	<		<	<	<	80
12/30/97		<	<	<	56	<	<	3	<	<	<	59
2/26/98			1	<	188	<	<	<	<	<	<	188
4/22/98			<	4	142	<	<	<	<	<	<	146
6/24/98	330	<	<	16	440	<	<		<	<	<	786
12/15/98	320		<	12	190	<	<		<	<	<	522
2/26/99	220	<	<	6	200	<	2		>	<	<	428
4/6/99	380	<	<	10	350	<	<		<	<	<	740
6/23/99	<	<	<	1	<	<	<		<	<	<	1
8/9/99	<	<	<	<	350	<	<		<	<	<	350
10/18/99	140	<	<	2	270	<	<		<	<	<	412
12/13/99	<	<	<	<	<	<	<		<	<	<	<
2/21/00	30	0.5	<	<	66	<	<		<	<	<	97
4/7/00	6.7	<	<	<	17	<	<		<	<	<	24
6/6/00	<	<	<	<	<	<	<		<	<	<	<
8/14/00	2.1	<	<	<	8	<	<		<	<	>	10
10/10/00	<	<	<	<	<	<	<		<	<	<	<
12/6/00	3	<	<	<	9	<	<		<	<	<	12
2/19/01	3	<	<	<	12	<	<		<	<	<	15

Notes: "0.5" or "<" indicates that the measured value was below the detection limit
a blank indicates that the parameter was not analyzed for.
"bold" indicates that the measured value exceeds the MCL

Table 1. VOC's Measured in Wells B37-1 and B37-2
(through 2/01 sampling; values in ug/l)





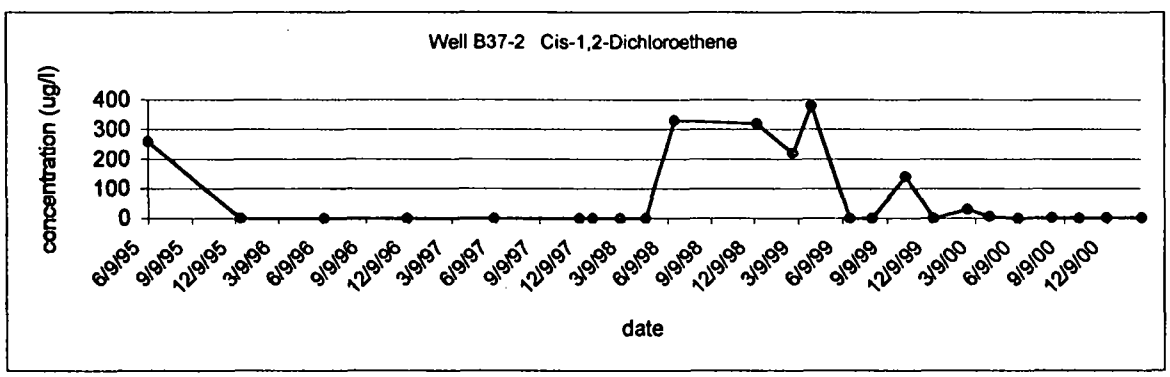


Figure 3. Updated Concentrations of Principal Contaminants in Wells B37-1 & B37-2

clayey layers of lower permeability. Six of those strata were sampled and described at site B37.

For simplicity, the layers have been given numbers, starting from the top downward. (The numbers are shown on the right-hand side of Fig. 4.) Relevant to this discussion are layers 1 through 5, Layer 5 being a basal clay-rich confining bed with very low hydraulic conductivity. Layer 1-2 consists of two sandy strata that are visually distinct, partly silty, and comprise the water table aquifer. This is the uppermost unit in which contaminants have been detected, and is the layer which well B37-2, with a screen at 5-15 ft. below ground, samples. Layer 3 is a silty, partly clayey fine sand that functions as an aquitard, inhibiting the exchange of fluids between Layer 1-2 and the next deeper permeable bed, Layer 4. A distinctive olive-gray to yellowish-gray very fine sand is characteristic of Layer 4, which is sampled through the well screen of Well B37-1, at 27-37 ft. below ground.

Contaminant distribution.

Methodology and data collection. Using punch-well technology (described below), 19 temporary wells were installed into Layer 1-2, and water samples were collected from each of these, plus existing well B37-2 and nearby piezometer B55. Forty-four wells were completed into Layer 4, and water samples obtained from each of these plus existing well B37-1. The samples were analyzed at the wellhead for pH, conductivity, temperature, turbidity, and dissolved oxygen. A mobile laboratory brought to the site analyzed the samples for VOC's within about an hour of their collection, allowing rapid decisions to be made regarding the need for, and location of, subsequent punch wells. With this procedure, the outer limits of the contaminant plumes in Layers 1-2 and 4 were defined with a grid spaced at 50-foot to 100-foot sampling intervals.

Installation of the "punch" wells was accomplished with Hydro-Punch drilling equipment furnished and operated by Universal Engineering Sciences (UES). This involved driving a steel casing with a sacrificial tip to the desired sampling depth, inserting a small diameter PVC well screen and riser into the casing, threading it to the sacrificial tip, then removing or partly removing the casing, exposing the well screen to

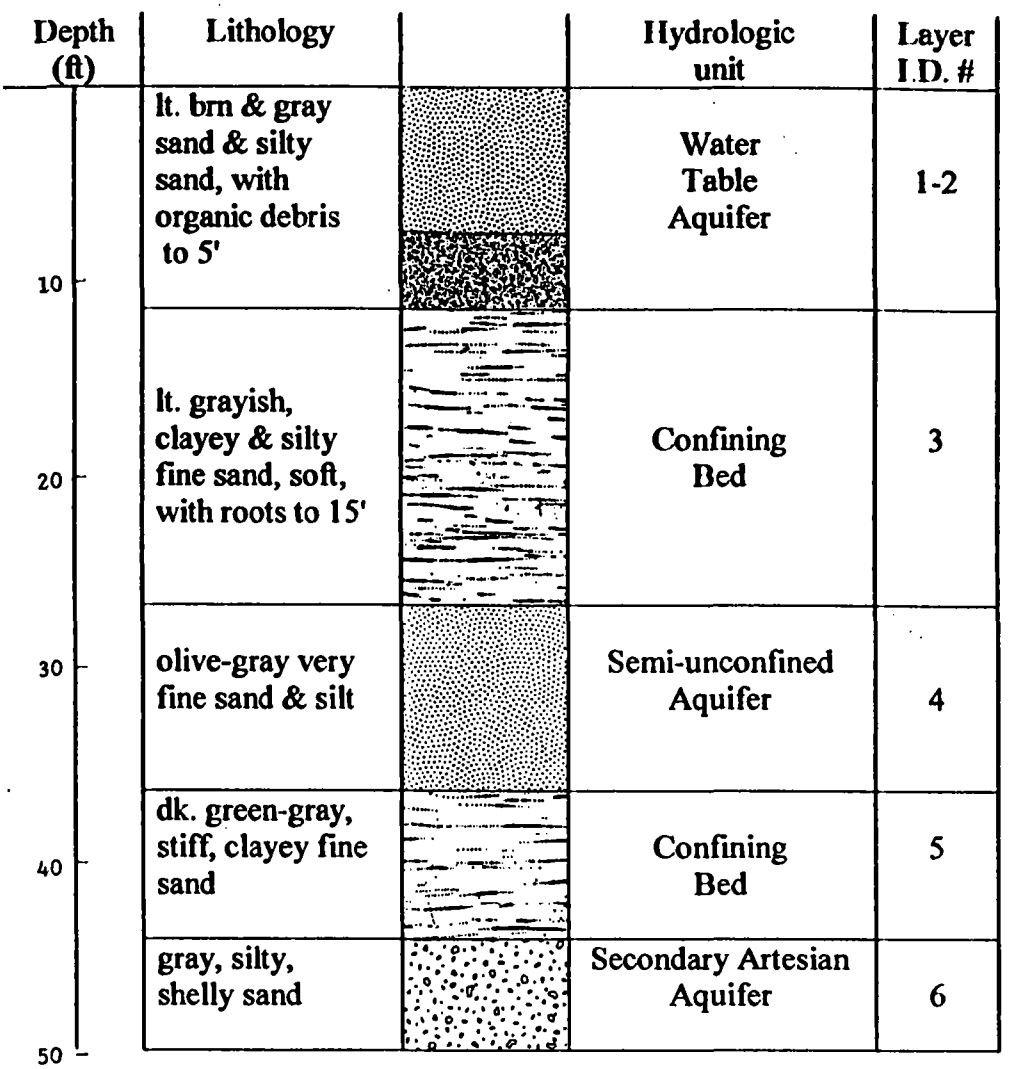


Figure 4.
Hydrogeologic Profile at Site B37

the selected depth interval. With reference to Figure 4, screens for punch wells were positioned at 7-12 or 30-35 feet below ground, respectively, to sample either Layer 1-2 or Layer 4.

Once the temporary well was complete, a field crew from E-lab developed the well by slow (i.e. less than 1 gpm) pumping, measured the field parameters, and collected samples with a disposable Teflon bailer. They then delivered the sample for VOC analysis to the onsite laboratory operated by Environmental & Analytical Management, Inc. (EAM), which carried out the analysis in accordance with their FEP approved CompQAP #970172.

Wells completed into Layer 4 were sampled by retracting the outer steel casing a few feet, to expose the screened interval while retaining the integrity of the Layer 3 confining bed. Once a sample was obtained, these wells were abandoned by unscrewing and removing the inner PVC casing, then pumping a thick bentonite slurry into the outer casing as it was withdrawn.

In the several cases where there was standing water on the ground, sampling of Layer 1-2 wells was done before removing the outer steel casing, which was pulled back a few feet to expose the well screen, and then left in place with its top higher than the surrounding water level. Wells screened into Layer 1-2 were left in the ground only until analytical results were reported from the mobile lab, generally no more than a few hours. They were then removed from the ground and the hole filled with bentonite slurry.

Waste materials consisted only of a few hundred gallons of well development water. This water was collected in 55-gallon drums and disposed of in the new lined cell of the active landfill.

The complete results reported by EAM are contained in the appendix to this memo. Duplicate samples from all temporary wells were also analyzed for VOC's by E-lab, and for iron, TDS, chlorides and sulfates. The E-lab data, which will be useful for the evaluation phase of the Contamination Assessment, are voluminous (more than 200 pages), are not reported or discussed further here, but are available on request.

Contaminant distribution and recommended monitoring in Layer 1-2.

Figure 5 shows the area in the immediate vicinity of well B37-2, and the punch-well

locations where samples were collected and VOC's in Layer 1-2 were measured. Also depicted is a line showing the approximate outer edge of the contaminant plume in Layer 1-2, defined as the position beyond which no VOC exceeds a Maximum Contaminant Level. Finally, the recommended locations of new monitor wells to be installed in Layer 1-2 are shown.

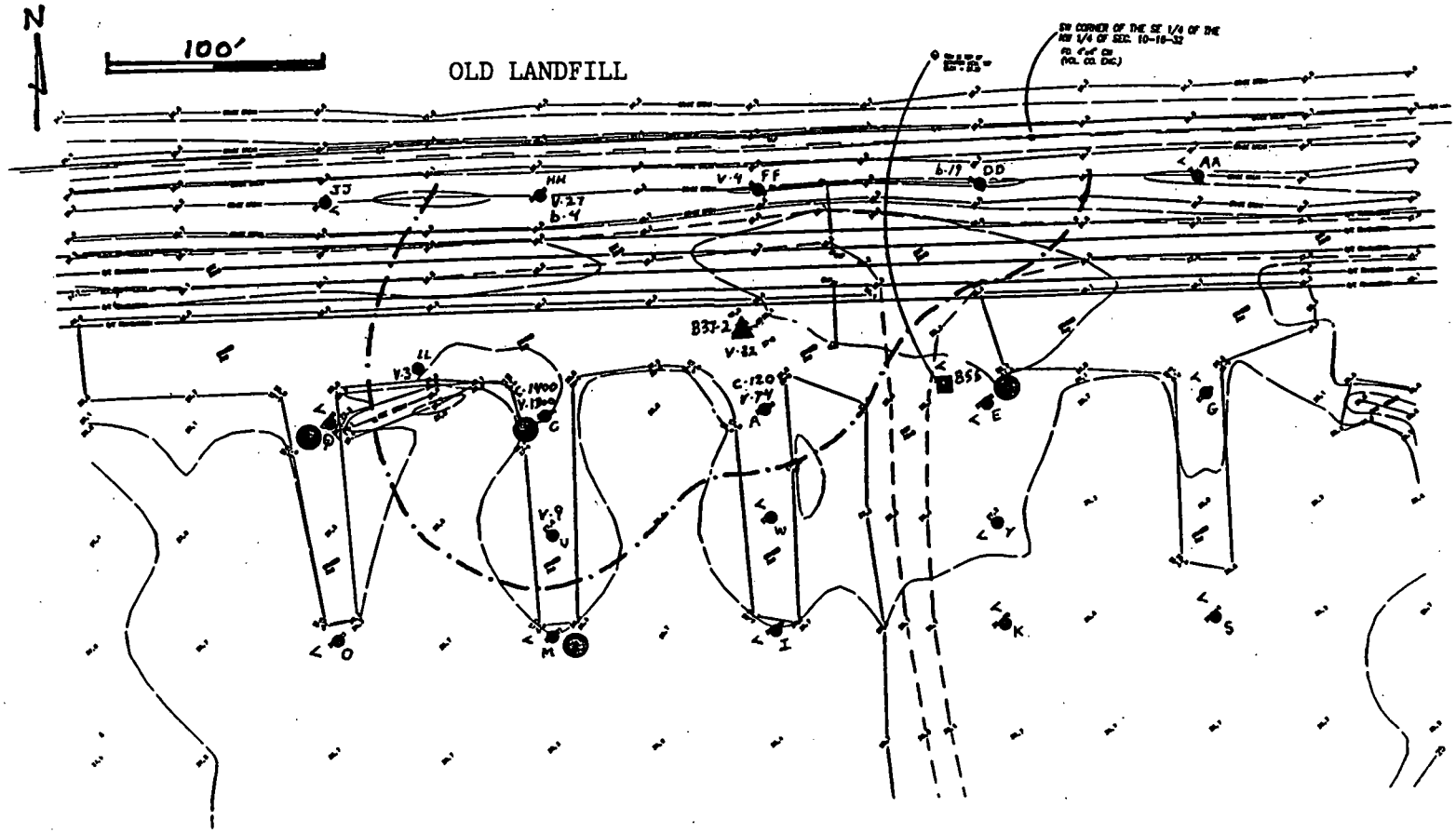
VOC's were detected in 9 wells, and one or more VOC exceeded its MCL in 7 of the wells. Seven different VOC's were identified; 3 had concentrations in one or more wells that exceeded their respective MCL. Those 3 were vinyl chloride, benzene, and cis-1,2-dichloroethene. A summary of the water quality results for Layer 1-2 is given in Table 2.

Table 2. VOC's detected in Layer 1-2
(values in ug/l)

VOC	Maximum Contaminant Level	highest measured concentration & punch well I.D.	number of wells in which the VOC was identified
cis-1,2-dichloroethene	70	1400 - C	5
vinyl chloride	1	1300 - C	7
benzene	1	19 - DD	2
toluene	1000	71 - HH	2
1-1-1-trichloroethane	200	2 - HH	1
chlorobenzene	100	3 - JJ	1
xylenes	10000	5 - FF,HH,37-2	6

The elongate plume shown in Figure 5 extends 200-250 feet south of the margins of the old landfill and occupies an area of approximately 50,000 ft^2 (1.1 acre). The highest concentrations of vinyl chloride and cis-1,2-dichloroethene were not found adjacent to the old landfill, but near the center of the tongue of the plume extending southward (punch well C).

Four new wells, in addition to current monitoring well B37-2, are recommended to confirm the position and characteristics of the Layer 1-2 plume. One of these wells will be located inside the plume boundaries, near where temporary punch well C was installed. That well plus B37-2, about 100 feet away, will be used for continuing characterization of VOC identities and concentrations. Three new wells are proposed to confirm the perimeter location of the contaminant plume, and monitor any outward



contaminant plume boundary

punch well

proposed Layer 1-2 monitor well

< no VOC exceeds Maximum Contaminant Level

b·s benzene concentration

v·s vinyl chloride concentration

c·s cis-1,2-dichloroethene concentration

Figure 5. Contaminant Distribution and Recommended Monitoring in Layer 1-2

movement. Those wells will be located on the eastern side of the plume near punch well E, south of the plume near punch well M, and west of the plume near punch well Q. Like B37-2, the wells will be screened from 5-15 feet below ground, to intercept essentially the entire saturated thickness of Layer 1-2. Additional specifications and techniques for installation are given below.

Contaminant distribution and recommended monitoring in Layer 4. Figure 6 shows the area near well B37-1, and the punch-well locations where samples were collected and VOC's in Layer 4 were measured. A line marking the approximate margin of the contaminant plume in Layer 4 is also shown, as are the recommended locations of monitor wells to be installed in Layer 4.

VOC's were detected in 29 wells. Benzene and vinyl chloride were present in each of these wells at concentrations greater than the 1 ug/l MCL. In no case did any of the other 9 identified VOC's exceed its MCL. A summary of the water quality results for Layer 4 is given in Table 3.

The Layer 4 contaminant plume shown in Figure 6 extends about 450 feet south of the margins of the old landfill and occupies an area of approximately 265,000 ft^2 (6.1 acre). The highest concentrations of vinyl chloride and benzene were, as in Layer 1-2, not found adjacent to the old landfill, but closer to the central and southerly part of the contaminant plume, in samples from punch wells NN and PP.

Table 3. VOC's detected in Layer 4
(values in ug/l)

VOC	Maximum Contaminant Level	highest measured concentration & punch well I.D.	number of wells in which the VOC was identified
cis-1,2-dichloroethene	70	60 - Z	8
vinyl chloride	1	680 - NN	19
benzene	1	48 - MM	23
ethyl benzene	700	3 - B	2
toluene	1000	35 - N	9
chlorobenzene	100	23 - MM	9
xylenes	10000	17 -V,D	18
trichloroethene	3	2 - PP	1
trans-1,2-dichloroethene	100	13 - NN	2
chloroethane	12	5 - VV	4

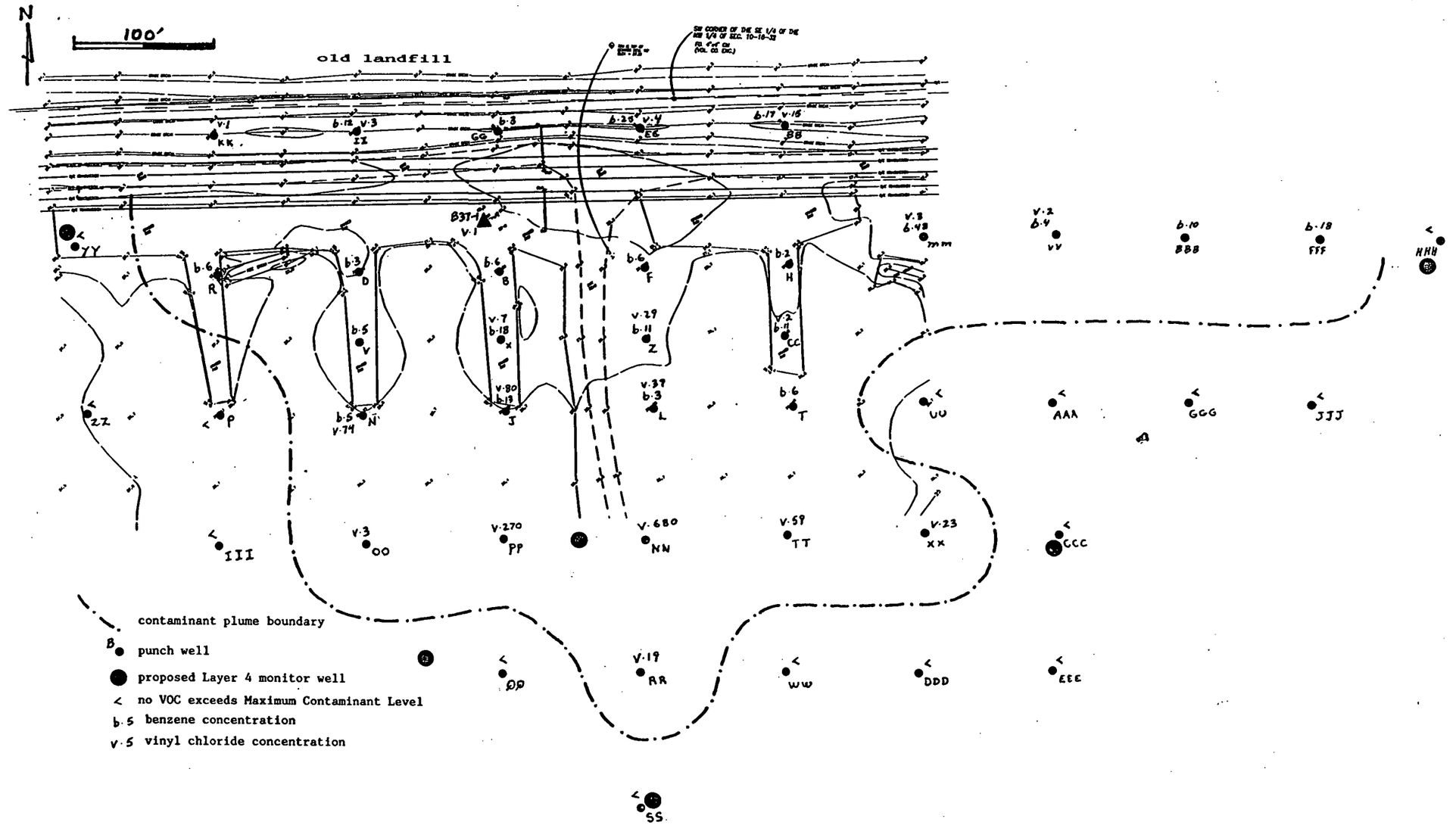


Figure 6. Contaminant Distribution and Recommended Monitoring in Layer 4

To supplement information collected from existing well B37-1, 6 new wells are recommended to monitor the position and characteristics of the Layer 4 plume. As in Layer 1-2, one well will be inside the plume boundaries, between punch wells NN and PP, near the highest identified concentrations of vinyl chloride. That well plus B37-1, about 230 feet away, will be used for continuing characterization of VOC identities and concentrations. Five new wells are proposed to confirm the perimeter location of the contaminant plume, and monitor any outward movement. Those wells would be located as shown in Figure 6. Like B37-1, the wells would be screened from 27-37 feet below ground.

Monitor well installation

The following narrative and figure is modified slightly from the approved Contamination Assessment Plan for site B37.

Monitor wells will be constructed using accepted and approved techniques. A schematic of a screened monitor well is shown in Figure 7. The casing and screen will be 2" diameter, Sch. 40, flush-joint, threaded PVC, installed through hollow-stem auger with an inside diameter of at least 6". The screen will be #8 slot, with a clean filter pack of 30/45 quartz sand emplaced in the annular space by hand-pouring to a few feet above the top of the screen. A slurry of Type 1 cement with 5% bentonite will be placed above the filter pack, to land surface. The wells will be finished with a cement pad and a protective, locking cover. Well development will be by gentle surging and purging, to a sand-free condition. Construction equipment will be steam-cleaned between sites, and materials and equipment will be handled in a manner that insures no down-hole contamination. The tops of the wells will be surveyed to determine the elevation to the nearest .01 foot.

Waste materials will all be disposed of in the new lined cell of the landfill. These materials will consist of development and purge water from the wells, wash water from equipment cleaning, and auger cuttings generated during well construction. Well and wash water will be collected in drums, then hauled to the landfill. Auger cuttings will be loaded into a wheelbarrow as they are produced, deposited in a plastic-lined dumpster maintained at the site for that purpose, and then hauled to the landfill.

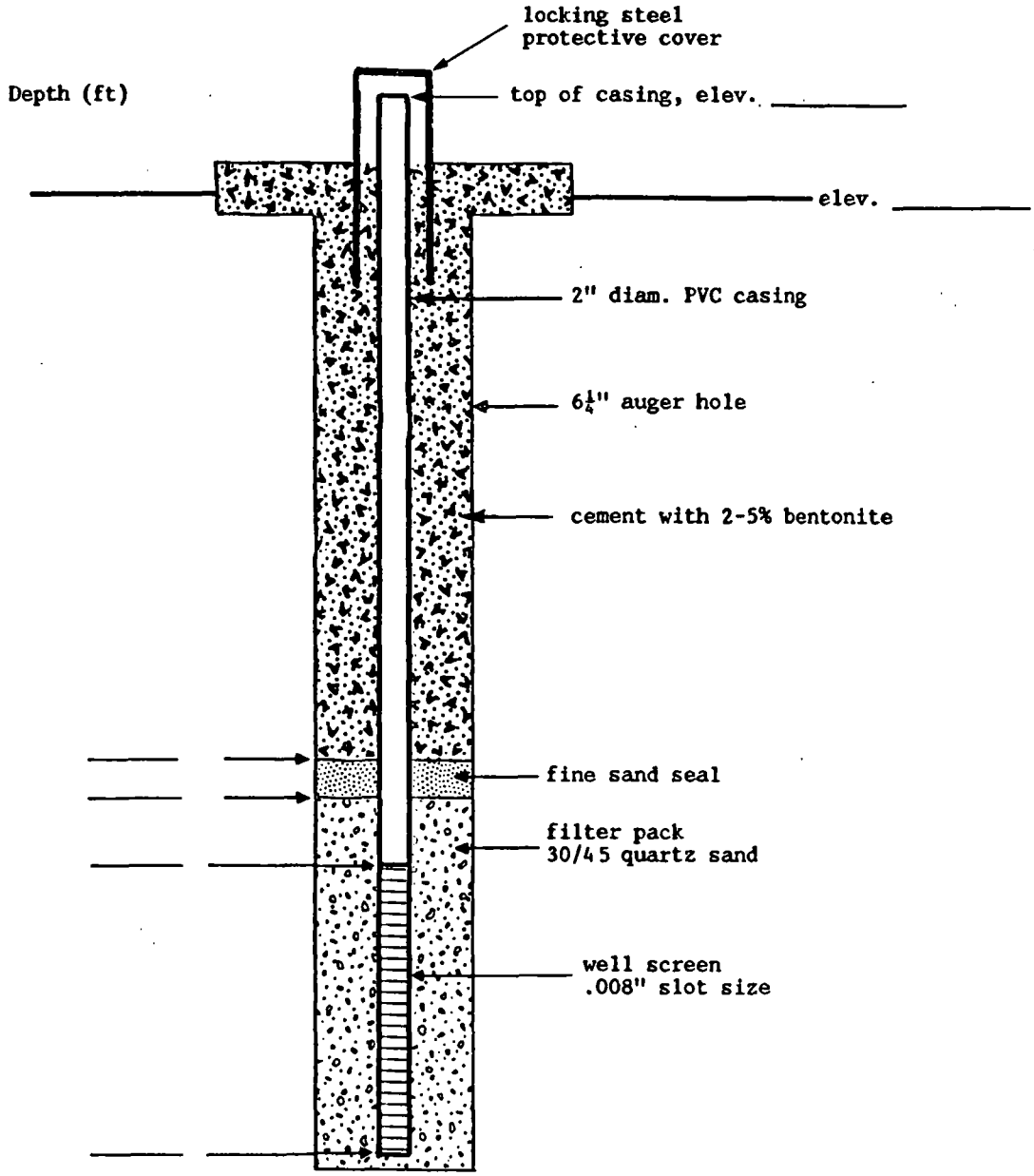


Figure 7. Generalized Diagram of Screened Monitor Well

Appendix: VOC Results Reported by EAM, Inc.

TABLE 1 **UPPER UNIT** **TOMOKA LANDFILL ASSESSMENT, B37**

L1-2

Sample ID		B37A	B37C	B37E	B37G	B37I	B37K	B37M	B37O	B37Q	B37S
pH	S.U.	5.93	6.36	6.4	7.14	5.39	7.15	6.39	7.06	7.41	6.71
Conductivity	uhmos/cm	275	361	2020	623	296	184	360	475	793	316
Temperature	Centigrade	21.1	19.7	20.8	7.73	17.4	19.9	20	21.7	20.3	21.2
Turbidity	NTU	48	25.8	30.7	20.4	10.23	52.3	16	65.9	10.49	60.7
Dissolved Oxygen	mg/l	1.79	3.15	5.08	2.8	3.8	3.73	1.99	1.91	2.26	1.98
Tetrachloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cis-1,2-Dichloroethene	ug/l	**120**	**1400**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trans-1,2-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	ug/l	**74**	**1300**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/l	<1.0	**11**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes	ug/l	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
@@@-TFT (20 ug/l)	ug/l	16	15	16	14	19	18	19	17	17	16

S.U. = Standard Units, C = Degrees Centigrade, uhmos = microohms per centimeter, mg/l = milligrams per liter(aq), ug/l = micrograms per liter w/v.

TABLE 1 **UPPER UNIT** **TOMOKA LANDFILL ASSESSMENT, B37**

L1-2

Sample ID		EQBLK	B37U	B37W	B37Y	B37AA	B37DD	B37FF	EQBLK	B37HH
pH	S.U.	7.24	6.72	6.95	5.6	6.55	6.31	7.22	7.28	7.03
Conductivity	uhmos	1.1	387	232	195	1176	1297	1077	1.1	121
Temperature	Centigrade	18.1	20.2	19.6	21.3	20	20.7	21	11.8	21.2
Turbidity	NTU	<1	47.3	26.5	97	28.4	39.8	27.2	<1	20.9
Dissolved Oxygen	mg/l	4.92	1.1	2.54	1.72	1.65	2.05	2.72	3.38	1.93
Tetrachloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cis-1,2-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**17**	<1.0	**2.8**
Trans-1,2-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	ug/l	<1.0	**9.1**	<1.0	<1.0	<1.0	<1.0	**36**	<1.0	**27**
1,1,1-Trichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2.4**
1,2-Dichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene (1)	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	**19**	<1.0	<1.0	**3.6**
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene (1000)	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**71**
Xylenes	ug/l	<3.0	<3.0	<3.0	<3.0	<3.0	**4.4**	**4.6**	<1.0	**4.6**
@@@-TFT (20 ug/l)	ug/l	17	16	39 (40 ug/l)	44	43	37	38	38	36

S.U. = Standard Units, C = Degrees Centigrade, uhmos = microohms per centimeter, mg/l = milligrams per liter(aq), ug/l = micrograms per liter w/

TABLE 1 UPPER UNIT TOMOKA LANDFILL ASSESSMENT, B37

L1-2

Sample ID		B37JJ	B37LL	B37-2	EQBLK
pH	S.U.	6.86	6.26	5.85	7.28
Conductivity	uhmos	1607	521	345	1.1
Temperature	Centigrade	21.2	20.2	18.1	11.8
Turbidity	NTU	18.3	12.1	2.49	<1
Dissolved Oxygen	mg/l	1.33	2.63	2.12	3.38
Tetrachloroethene	ug/l	<1.0	<1.0	<1.0	<1.0
Trichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0
Cis-1,2-Dichloroethene	ug/l	<1.0	<1.0	**16**	<1.0
Trans-1,2-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	ug/l	<1.0	**3.3**	**32**	<1.0
1,1,1-Trichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0
Chloroethane	ug/l	<1.0	<1.0	<1.0	<1.0
Chlorobenzene 133 ?	ug/l	**3.2**	<1.0	<1.0	<1.0
Benzene	ug/l	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0
Toluene	ug/l	<1.0	<1.0	<1.0	<1.0
Xylenes	ug/l	**4.3**	**4.1**	**4.7**	<3.0
@@@-TFT (20 ug/l)	ug/l	40	32	35	45

S.U. = Standard Units, C = Degrees Centigrade, uhmos = microohms per centimeter, mg/l = milligrams per liter(aq), ug/l = micrograms per liter w/v.

TABLE 2 **LOWER UNIT** **TOMOKA LANDFILL ASSESSMENT, B37**

Sample ID		B37B	B37D	B37F	B37H	B37J	B37L	B37LD	B37N	B37P	B37R
pH	S.U.	6.77	6.21	6.4	6.49	6.21	6.18	NS	6.76	6.89	6.7
Conductivity		3760	1815	2650	1662	2820	1475	NS	1821	1487	1375
Temperature	Centigrade	22.7	21.4	22	21.8	20	19.9	NS	22.1	21.8	21.4
Turbidity	NTU	3.27	4.77	3.37	9.87	5.1	5.33	NS	150	7.42	88.9
Dissolved Oxygen	mg/l	1.32	2.05	1.22	4.47	2.62	1.31	NS	1.98	2.56	2.75
Tetrachloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cis-1,2-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	**5.7**	**26**	**26**	**3.8**	<1.0	<1.0
Trans-1,2-Dichloroethen	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	ug/l	<1.0	<1.0	<1.0	<1.0	**80**	**38**	**39**	**74**	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	ug/l	**5.5**	**3.1**	**5.7**	1.6	**13**	**1.9**	**2.6**	**5.1**	<1.0	**5.6**
Ethylbenzene	ug/l	**2.7**	**2.1**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/l	<1.0	<1.0	<1.0	<1.0	**16**	**4.6**	**6.1**	**35**	<1.0	<1.0
Xylenes	ug/l	**4.3**	**17**	<3.0	<3.0	**14**	**13**	**15**	**10**	<3.0	<3.0
@@@-TFT (20 ug/)	ug/l	17	15	14		18	17	19	19	18	16

S.U. = Standard Units, C = Degrees Centigrade, uhmos = microohms per centimeter, mg/l = milligrams per liter(aq), ug/l = micrograms per liter w/v.

TABLE 2

TOMOKA LANDFILL ASSESSMENT, B37

			upper unit	LOWER UNIT						
		B37T	55	EQBLK	B37V	B37X	B37Z	B37BB	B37CC	B37EE	B37GG
pH	S.U.	6.8	6.32	7.25	6.38	6.63	6.31	6.71	6.98	6.85	6.99
Conductivity	uhmos	1230	167	1.1	1655	2840	1696	1783	1380	1542	1522
Temperature	Centigrade	21.1	19.7	10.5	21.6	20.5	21.5	22.2	21.8	22.9	22.5
Turbidity	NTU	5.44	16.3	<1	26.5	13.1	7.68	20.8	9.26	9.22	1.54
Dissolved Oxygen	mg/l	1.69	1.27	5.83	1.31	1.49	1.98	1.37	1.96	1.63	2.07
Tetrachloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cis-1,2-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	**60**	<1.0	<1.0	<1.0	<1.0
Trans-1,2-Dichloroethen	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	ug/l	<1.0	<1.0	<1.0	<1.0	**6.9**	**29**	**15**	**1.6**	**3.8**	<1.0
1,1,1-Trichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**6.8**	<1.0	**4.9**	**3.3**
Benzene	ug/l	**5.6**	<1.0	<1.0	**5.1**	**18**	11	**17**	**11**	**25**	**3.3**
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/l	<1.0	<1.0	<1.0	<1.0	**9.1**	**9.5**	<1.0	<1.0	<1.0	<1.0
Xylenes	ug/l	<3.0	<3.0	<3.0	**17**	**14**	**15**	<3.0	<3.0	<3.0	**9.4**
@@@-TFT (20 ug/l)	ug/l	16	20	16	15	44 (40 ug/l)	41	41	38	39	38

S.U. = Standard Units, C = Degrees Centigrade, uhmos = microohms per centimeter, mg/l = milligrams per liter(aq), ug/l = micrograms per liter w/v.

TABLE 2 **LOWER UNIT** **TOMOKA LANDFILL ASSESSMENT, B37**

		B37II	B37KK	B37KKD	B37-1	B37MM	B37NN	B37OO	B37PP	EQBLK
pH	S.U.	6.78	6.86	NS	6.15	7.04	6.98	6.56	6.49	8.41
Conductivity	uhmos	274	1491	NS	1556	1602	1068	861	1189	1.5
Temperature	Centigrade	22.6	22.4	NS	20.3	21.2	21.3	21.2	19.8	14.2
Turbidity	NTU	16.5	8.03	NS	0.6	22.7	2.26	16.5	25.4	<1.0
Dissolved Oxygen	mg/l	1.18	1.11	NS	2.13	1.29	1.86	1.86	1.86	NS
Tetrachloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.5**	<1.0
Cis-1,2-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	**21**	<1.0	**3.7**	<1.0
Trans-1,2-Dichloroethen	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	**13**	<1.0	**2.2**	<1.0
1,1-Dichloroethene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	ug/l	**3.2**	**1.0**	<1.0	**1.2**	**3.1**	**680**	**2.8**	**270**	**<1.0**
1,1,1-Trichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	ug/l	<1.0	<1.0	<1.0	**2.2**	**4.4**	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	ug/l	<1.0	**1.4**	**2.2**	**6.5**	**23**	<1.0	<1.0	<1.0	<1.0
Benzene	ug/l	**12**	**12**	**15**	**27.0**	**48**	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/l	**1.5**	<1.0	<1.0	<1.0	<1.0	**11**	**4.0**	<1.0	<1.0
Xylenes	ug/l	**16**	**5.9**	**6.3**	**6.2**	**8.0**	**4.1**	**7.0**	**9.7**	<3.0
@@@-TFT (20 ug/l)	ug/l	37	33	34	35	45	45	45	45	42

S.U. = Standard Units, C = Degrees Centigrade, uhmos = microohms per centimeter, mg/l = milligrams per liter(aq), ug/l = micrograms per liter w/v.

TOMOKA LANDFILL

L4

		Florida Groundwater Cleanup Target Levels	Ground water of Low Yield/ Poor Quality	Natural Attenuation Default Groundwater	Natural Attenuation Default Source	B37 VV DUPLICA	B37 ZZ	B37 AAA	EQBLK 28-Jun	B37 BBB	B37 CCC	B37 DDD	B37 EEE	B37 FFF	B37 FFF DUPLICA
pH	S.U.														
Conductivity	uhmos														
Temperature	Centigrade														
Turbidity	NTU														
Dissolved Oxygen	mg/l														
Tetrachloroethene	ug/l	3*	30*	3*	300***	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	ug/l	3*	30*	3*	300***	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cis-1,2-Dichloroethene	ug/l	70*	700*	70*	700**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trans-1,2-Dichloroethen	ug/l	100*	1000*	100*	1000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	ug/l	7*	70*	7*	700*	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	ug/l	1*	10*	1*	100*	**2.8**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	200*	2000*	200*	2000*	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	ug/l	3*	30*	3*	300*	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	70	700	70	700	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	ug/l	12	120	12	1200	**4.6**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	ug/l	100	1000	100	1000	<1.0	<1.0	<1.0	<1.0	**13**	<1.0	<1.0	<1.0	**19**	**21**
Benzene	ug/l	1*	10***	10*	1000***	<1.0	<1.0	<1.0	<1.0	**10**	<1.0	<1.0	<1.0	**18**	**22**
Ethylbenzene	ug/l	1000*	10,000***	1000*	10,000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/l	700*	7,000***	700*	7,000**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes	ug/l	10,000*	100,000***	10,000*	100,000**	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
@@@-TFT (20 ug/l)	ug/l					20	19	17	16	23	26	25	22	21	17

S.U. = Standard Units, C = Degrees Centigrade, uhmos = microohms per centimeter, mg/l = milligrams per liter(aq), ug/l = micrograms per liter w/v.
* = As provided in Chapters 62-550 and 62-520, F.A.C.
** = Groundwater criteria in Chapters 62-550 and 62-520, F.A.C. multiplied by 10X.
*** = Groundwater criteria in Chapters 62-550 and 62-520, F.A.C. multiplied by 100x.

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B37 ASSESSMENT,
VOLUSIA COUNTY,
FLORIDA

TOMOKA LANDFILL

L4

		Florida Ground water Cleanup Target Levels	Ground water of Low Yield/ Poor Quality	Natural Attenuation Default Ground water	Natural Attenuation Default Source	EQBLK 29-JUN	B37 GGG	B37 HHH	B37 III	B37 JJJ
pH	S.U.									
Conductivity	uhmos									
Temperature	Centigrade									
Turbidity	NTU									
Dissolved Oxygen	mg/l									
Tetrachloroethene	ug/l	3*	30*	3*	300***	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	ug/l	3*	30*	3*	300***	<1.0	<1.0	<1.0	<1.0	<1.0
Cis-1,2-Dichloroethene	ug/l	70*	700*	70*	700**	<1.0	<1.0	<1.0	<1.0	<1.0
Trans-1,2-Dichloroethene	ug/l	100*	1000*	100*	1000**	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	ug/l	7*	70*	7*	700*	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	ug/l	1*	10*	1*	100*	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	ug/l	200*	2000*	200*	2000*	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	ug/l	3*	30*	3*	300*	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	ug/l	70	700	70	700	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	ug/l	12	120	12	1200	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	ug/l	100	1000	100	1000	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	ug/l	1*	10***	10*	1000***	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	ug/l	1000*	10,000***	1000*	10,000**	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/l	700*	7,000***	700*	7,000**	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes	ug/l	10,000*	100,000***	10,000*	100,000**	<3.0	<3.0	<3.0	<3.0	<3.0
@@@-TFT (20 ug/l)	ug/l					22	19	16	16	15

S.U. = Standard Units, C = Degrees Centigrade, uhmos = microohms per centimeter, mg/l = milligrams per liter(aq), ug/l = micrograms per liter w/v.
* = As provided in Chapters 62-550 and 62-520, F.A.C.

County of Volusia

PUBLIC WORKS SERVICES CENTER
SOLID WASTE SERVICES GROUP
1990 Tomoka Farms Road • Daytona Beach, Florida 32124
Telephone (904) 947-2952

April 24, 2001 ENV-01-120

Mr. Brian Carrick, P.E.
Florida Department of Environmental Protection
3319 MaGuire Blvd., Suite 232
Orlando,
Florida
32803-3767

Dear Brian:

Enclosed for your review are the Tomoka Landfill Site B37 Preliminary Characterization of Contaminant Plumes and Proposed Monitor Well Installations.
If additional information or clarification is required please feel free to call me at (386) 947-2952.

Respectfully submitted,

Susan M. Gaze

Susan M. Gaze, Environmental Specialist III
Division of Solid Waste

C: Josef Grusauskas, Director of Division of Solid Waste