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DEPARTMENT OF
PUBLIC WORKS

OFFICE OF THE DIRECTOR

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CALIFORNIA

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February 9, 1988

Transportation and Community Development Committee
Sacramento, California

Honorable Members in Session:

SUBJECT: Landfill Gas Migration Report

SUMMARY:

This report informs the Transportation and Community Development Committee that landfill gas monitoring wells around the perimeter of the City Landfill have recently indicated the presence of subsurface landfill gas in significant concentrations. Additional testing has found subsurface landfill gas beyond the south and east site boundaries. Further, there is evidence that landfill gas may be causing distress and death to some vegetation along the north side of the landfill near the American River. The Department of Public Works has been aggressively responding with various mitigating and precautionary measures and increased monitoring. All steps being taken have been with the full knowledge, cooperation, and approval of several state regulatory and federal agencies.

BACKGROUND:

1. Landfill Gas General Information:

Virtually all sanitary landfills produce gases which result from the decomposition of organic waste. Landfill gas (LFG) usually consists of approximately equal amounts of methane and carbon dioxide. The specific concentrations of each depends on stage of waste decomposition and other factors. LFG can also contain small amounts of other compounds. LFG leaves the interior cells of the landfill by venting to the atmosphere either vertically or by migrating laterally through

the soil via the path of least resistance. This natural process causes problems when the LFG accumulates in confined spaces and provides the potential for fire, explosion, and asphyxiation. Methane is combustible in the atmosphere in concentrations from 5% to 15% of total volume. Five percent (5%) volume of methane is often referred to as the lower explosive limit (LEL). LFG can distress or kill plants if it depresses the oxygen level in the root zone of the soil. Also, the movement of LFG can provide a mechanism for transporting contaminants. On the positive side, LFG is a potentially valuable resource. It has been successfully mined to provide a source of natural gas (methane) for heating, production of electricity, and other applications. City of Sacramento 28th Street Landfill Air Quality Solid Waste Assessment Test (SWAT) Report published by the Department of Public Works in late 1987 contains a more detailed discussion of LFG found at the City's landfill.

2. History of LFG at the City Landfill:

In 1974, LFG was first found to be accumulating in the dispatch and maintenance building at the 28th Street site. The problem was solved by constructing a venting system underneath and around the perimeter of the building foundations. Ten (10) LFG monitoring wells were installed along the west end of the southern landfill boundary closest to the "C" Street residential area. These 10 wells (identified as Nos. 1 thru 10) consistently showed no LFG. In the active area of the landfill, some gas was found in the storm water drainage pipes. A blower was installed to prevent the accumulation of LFG in the pipes. As part of the landfill expansion project, additional LFG monitoring wells were required after the first placement of waste in the expansion area. Construction of these wells (17 of them, identified as well Nos. 11 thru 27) was completed in August 1987. For several years now the Department of Public Works has been working on a project to sell the LFG for burning in the nearby Almond Growers Co-generation Facility. Agreements have been executed but the air emission concerns of the local Air Pollution Control District have stalled the project. At this time, the City has agreed to pay the Air District to perform some computer modeling of air emissions in an attempt to demonstrate that burning LFG in the Almonds Growers Facility will not cause an emissions problem.

3. Recently Observed Plant Distress in Landfill Vicinity:

In late August, 1987 the U.S. Fish and Wildlife Service wrote to the Department of Public Works about observed distress in recently planted Elderberry trees. The Elderberry trees were planted along the north side of the landfill near the American River as a mitigation project

for Elderberry trees lost to a flood control levee repair project upstream. Elderberry trees are the habitat of the threatened Valley Elderberry Longhorn Beetle. In addition to the distressed young Elderberry plants, it appears that other plants in the area might also be distressed or dead. However, it was difficult determine for sure since it was late summer when all the vegetation was dry. The Department personnel immediately inspected the area and formed a task force with regulatory agencies to investigate the possible connection between distressed vegetation and the landfill. On September 4, 1987 the first task force meeting was held. A proposed action plan was developed and investigations began immediately. Agencies involved were the U.S. Fish and Wildlife Service, State Department of Water Resources, State Waste Management Board, Central Valley Regional Water Quality Control Board, American River Flood Control District, Sacramento County Air Pollution Control District, Sacramento County Health Department, City Department of Parks and Community Services, and the City Department of Public Works. To date, investigations by the Department of Public Works included the preparation of soil cross section logs, installation of 64 shallow LFG monitoring wells, coordination of field inspection of riparian vegetation along the south bank of the lower American River, and color infra-red aerial photos of the landfill vicinity. Initial results were contradictory about the possibility of landfill gas impacting plants. But gradually, tentative conclusions are being developed. Additional studies must be done to confirm these tentative conclusions. Particularly, some work will need to be repeated in the spring when plant conditions are more obvious than in late summer and winter. Nevertheless, the task force has tentatively concluded the following:

a. Elderberry trees and other plants are visibly distressed or dead in the vicinity of the landfill. This will be more obvious in the spring. The distress is not apparent in other areas along the lower American River.

b. LFG (methane) has been found in the area of distressed vegetation. In the top 2 feet of soil, methane concentration ranges from 0-60% of total volume.

c. Leachate has not been found, although some soil pore moisture may be providing a contaminant transport mechanism.

d. LFG has been known to cause distress to vegetation as has been documented in available technical literature.

e. Other factors may be contributing to plant distress and cannot be ruled out. The recent flooding of January 1986 and associated high ground water conditions are examples.

f. As a result of the above observations, it is likely that LFG (and possibly soil pore moisture) is at least a contributing factor and may be the primary factor in the observed plant distress.

g. Additional work is required before final conclusions and recommendations for mitigation can be made.

4. Recent Indications of Off-site Subsurface LFG Migration:

Shortly after the aforementioned task force was formed to investigate the distressed vegetation along the north perimeter of the landfill, routine sampling of LFG monitoring wells indicated the presence of LFG along the south and east site boundaries. Each subsequent sample set has shown more monitoring wells containing higher concentrations of methane. The attached exhibits show the results obtained in mid January, 1988 plotted on a site map. Also, a table is included as exhibit C showing the results of each sample set since the first indication of LFG. Additional temporary shallow monitoring wells have been installed on the Lenanne property south of Business 80. These wells have shown that LFG has migrated under the Freeway. Wells Nos. 26 and 27 on the east side of the landfill shown that LFG has migrated under the railroad embankment and into the open field which separates the landfill from the River Park residential area. This off-site subsurface migration is in violation of the landfill operating permit.

5. Mitigation Measures Completed and in Progress:

At the time of writing this report, the following measures have already been taken:

a. Additional temporary shallow landfill gas monitoring wells were installed in the critical areas.

b. A contract has been executed for construction of seven (7) additional permanent LFG monitoring wells in critical areas.

c. Sampling frequency has been increased from once to twice monthly in areas where LFG is present.

d. Notification of the presence of subsurface LFG and recommended safety precautions has been given to City landfill employees and agencies maintaining facilities in the vicinity.

e. Safety ramifications have been discussed with the City Safety Officer and the City Fire Department hazmat coordinator. All recommendations have been accomplished or are in progress.

f. Work continues on the proposed LFG recovery project. Although the resource recovery may not result in immediate improvement of off-site subsurface migration, it should help in the long-term in conjunction with other migration control measures.

g. A consulting engineer has been contacted to immediately provide technical advice on LFG migration control measures currently in progress.

h. Work is beginning on the installation of a LFG migration barrier in the field between the landfill eastern boundary and the River Park residential area.

i. The Department of Public Works requested 1988/89 Fiscal Year Budget will include funds for design and installation of additional LFG migration control facilities.

j. The task force investigating the Elderberry Mitigation area is continuing its work and is expected to provide recommendations after inspection of plant conditions this coming spring.

k. The Department of Public Works is maintaining contact with the above mentioned regulatory and other agencies, and will implement appropriate recommendations.

FINANCIAL DATA:

This report has no direct financial implications.

RECOMMENDATION:

This report is for information only and contains no recommendations.

Respectfully Submitted,

REGINALD YOUNG
Deputy Director of Public Works

FOR COMMITTEE INFORMATION:

DAVID R. MARTINEZ
Deputy City Manager

APPROVED:

FOR MELVIN H. JOHNSON
Director of Public Works

February 9, 1988
All Districts

Exhibits
A. Site Map with LFG Monitoring Wells
B. Elderberry Mitigation Site Map with Monitoring Wells
C. Table of Sampling Results

P88014:DP:lg

EXHIBIT A

SAMPLED 1-13-88

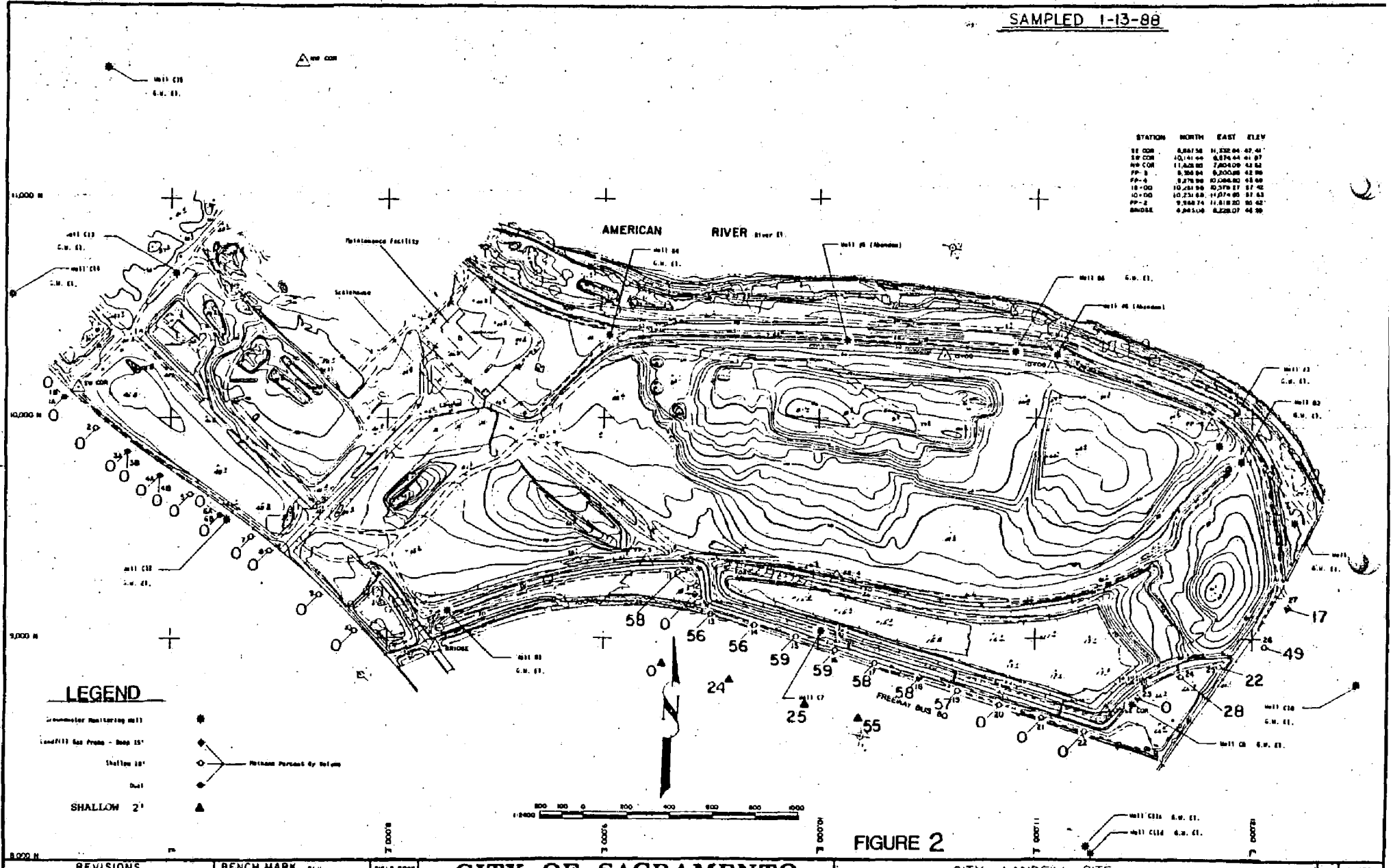

FIGURE 2

REVISIONS				BENCH MARK	FIELD BOOK
NO	DESCRIPTION	DATE	BY	DESCRIPTION	
1	ADDED NEW RESULTS	2-10	KAT		SCALE
					HORIZ.
					VERT.

CITY OF SACRAMENTO
DEPARTMENT OF PUBLIC WORKS

DRAWN BY: KAJ DATE
DESIGNED BY: DATE
CHECKED BY: DATE
R.C.E. R.C.E.

CITY LANDFILL SITE
METHANE MONITORING WELLS

SHEET 2 OF

EXHIBIT B

STATION	NORTH	EAST	ELEV.
SE COR.	8,667.36	11,332.64	47.41
SW COR.	10,141.44	6,574.44	41.87
NW COR.	11,628.65	7,604.09	42.62
FP-3	9,355.94	9,200.85	42.98
FP-4	9,278.96	10,086.60	43.68
15+00	10,281.98	10,578.27	57.42
10+00	10,231.68	11,074.85	57.63
FP-2	9,968.74	11,818.20	55.62
BRIDGE	8,963.08	8,228.07	45.59

SAMPLED 1-12-88

AMERICAN RIVER

15+00

10+00

FP-2

FP-3

FP-4

EXHIBIT C

CITY OF SACRAMENTO 28TH STREET LANDFILL

SUBSURFACE LANDFILL GAS REPORTED AS PERCENT METHANE (VOLUME)

WELL #	9-23-87	10-9-87	12-7-87	12-29-87	1-13-88	1-19-88
1A	0	0	0	0	0	-
1B	0	0	0	0	0	-
2	0	0	0	0	0	-
3A	0	0	0	0	0	-
3B	0	0	0	0	0	-
4A	0	0	0	0	0	-
4B	0	0	0	0	0	-
5	0	0	0	0	0	-
6A	0	0	0	0	0	-
6B	0	0	0	0	0	-
7	0	0	0	0	0	-
8	0	0	0	0	0	-
9	0	0	0	0	0	-
10	0	0	0	0	0	-
11	5+	30%	56	0	58	-
12	5+	15%	0	0	0	-
13	5+	10%	52	55	56	-
14	0	0	55	55	56	-
15	0	0	50	56	59	-
16	0	0	53	57	59	-
17	0	0	50	55	58	-
18	0	0	4	55	58	-
19	0	0	4	55	57	-
20	0	0	0	0	0	-
21	0	0	0	0	0	-
22	0	0	0	0	0	-
23	0	0	0	0	0	-
24	0	0	0	18	28	-
25	0	0	0	18	22	-
26	0	0	41	48	49	-
27	0	0	0	3	17	-
Lennane 1	-	-	-	0	0	Trace
Lennane 2	-	-	-	12	24	38
Lennane 3	-	-	-	-	25	13
Lennane 4	-	-	-	-	55	58
Lennane 5	-	-	-	-	-	55
Lennane 6	-	-	-	-	-	0.5

Results in % of total volume of natural gas as methane
Dash indicates well not yet installed or no sample taken