PACIFIC
ENVIRONMENTAL
GROUP, INC.

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August 24, 1994
PACIFIC Project No. 730-001.01

Juliet Shin
Alameda County Health Services Agency
Haz Mat Division
1131 Harbor Bay Parkway
Alameda, California 94502

Re: **Biodegradation Reference; Fate & Transport Model**
ARCO Station No. 608
17601 Hesperian Boulevard
San Lorenzo, California

Dear Juliet:

Per your request at our July 8, 1994 meeting, Pacific Environmental Group, Inc. is pleased to forward the references used for estimating biodegradation rates for benzene in groundwater at the above referenced site.

If you have any questions regarding the above information, please call us.

Sincerely,

Pacific Environmental Group, Inc.

G. Cleve Solomon
Senior Hydrogeologist, RG

Encl: (3) pages from Dragun, J., 1988

cc: Keith Winemiller, (PACIFIC)
Mike Whelan (ARCO)

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THE SOIL CHEMISTRY OF HAZARDOUS MATERIALS

James Dragun, Ph.D.

Hazardous Materials Control Research Institute
Silver Spring, Maryland

TABLE 9.9 Biodegradation and Disappearance Rates for Several Organic Chemicals[a] (cont.)

Organic Chemical	Biodegradation or Disappearance Rate	Medium and Inoculum	Reference
benz(a)anthracene (contd)	240-680d half life	si, nmf	41
benzene	43% in 7d	scf, sdw	38
	110d half life	sgw, fo	43
	68d half life	sgw, fo	47
	48d half life	gwi, nmf	47
	20-90% in 80d	si, nmf	48
	100% in 434d	sgw, fo	48
	>99% in 120w	si, nmf	49
m-benzene-disulphonic acid	3.4 mgCOD/g/h	bss, as	42
benzenesulphonic acid	10.6 mgCOD/g/h	bss, as	42
benzo(b)fluoranthene	360-610d half life	si, nmf	39
benzo(k)fluoranthene	910-1400d half life	si, nmf	39
benzoic acid	88.5 mgCOD/g/h	bss, as	42
	7.3h (ring) aerobic half life	si, nmf	44
	3.9h (carboxyl) aerobic half life	si, nmf	44
	18.2h (ring) an-aerobic half life	si, nmf	44
	26d (ring) half life	gwi, nmf	45
	41d (carboxyl) half life	gwi, nmf	45
benzo(g,h,i)perylene	590-650d half life	si, nmf	39
benzo(a)pyrene	28% in 16 mo	si, nmf	41
	220-530d	si, nmf	39
alpha-BHC	0% in 7d	scf, sdw	38
beta-BHC	0% in 7d	scf, sdw	38
delta-BHC	0% in 7d	scf, sdw	38
gamma-BHC	0% in 7d	scf, sdw	38
biphenyl	37d half life	sgw, fo	43
bis-(2)chloroethoxy)-methane	0% in 7d	scf, sdw	38
bis-(2-chloroethyl)ether	100% in 7d	scf, sdw	38
bis-(2-chloroisopropyl) ether	74% in 7d	scf, sdw	38
bis-(2-ethylhexyl)-phthalate	0% in 7d	scf, sdw	38
borneol	8.9 mgCOD/g/h	bss, as	42
bromochloromethane	100% in 7d	scf, sdw	38
bromodichlorobenzene	<4.5%/w	si, nmf	50
bromodichloromethane	>99% in 2d	cfc, bm	51
bromoform	8% in 7d	scf, sdw	38
	>99% in 2d	cfc, bm	51
4-bromodiphenyl ether	0% in 7d	scf, sdw	38
1,4-butanediol	40 mgCOD/g/h	bss, as	42

TABLE 9.9 Biodegradation and Disappearance Rates for Several Organic Chemicals[a] (cont.)

Organic Chemical	Biodegradation or Disappearance Rate	Medium and Inoculum	Reference
n-butanol	84 mgCOD/g/h	bss, as	42
sec-butanol	55 mgCOD/g/h	bss, as	42
tert-butanol	30 mgCOD/g/h	bss, as	42
sec-butylbenzene	100% in 7d	bgw, nmf	52
	100% in 192h	sp, nmf	53
butylbenzoate	4d half life	sgw, fo	43
butylbenzylphthalate	100% in 7d	scf, sdw	38
camphor	37d half life	sgw, fo	43
caprolactam	16 mgCOD/g/h	bss, as	42
3-carboxy-4-hydroxy-benzenesulfonic acid	11.3 mgCOD/g/h	bss, as	42
2-carboxypyridine	100% in 8d	si, nmf	46
3-carboxypyridine	100% in 4d	si, nmf	46
4-carboxypyridine	100% in 16d	si, nmf	46
chloramphenicol	3.3 mgCOD/g/h	bss, as	42
chlordane	0% in 7d	scf, sdw	38
2-chloroaniline	16.7 mgCOD/g/h	bss, as	42
3-chloroaniline	6.2 mgCOD/g/h	bss, as	42
4-chloroaniline	5.7 mgCOD/g/h	bss, as	42
chlorobenzene	60% in 7d	scf, sdw	38
	37d half life	sgw, fo	43
	<3.8%/w	si, nmf	50
	0.2-1.9%/w	si, nmf	54
chlorodibromomethane	18% in 7d	scf, sdw	38
4-chlorodiphenyl ether	0% in 7d	scf, sdw	38
2-chloroethyl vinyl ether	64% in 7d	scf, sdw	38
2-chloronaphthalene	100% in 7d	scf, sdw	38
2-chloro-4-nitrophenol	5.3 mgCOD/g/h	bss, as	42
2-chlorophenol	85% in 7d	scf, sdw	38
	25 mgCOD/g/h	bss, as	42
4-chlorophenol	11 mgCOD/g/h	bss, as	42
2-chloropyridine	100% in 8d	si, nmf	46
3-chloropyridine	100% in 4d	si, nmf	46
4-chloropyridine	100% in 16d	si, nmf	46
chrysene	3% in 7d	scf, sdw	38
	16% in 16 mo	si, nmf	41
m-cresol	55 mgCOD/g/h	bss, as	42
o-cresol	54 mgCOD/g/h	bss, as	42
p-cresol	55 mgCOD/g/h	bss, as	42
cresols	4d half life	sgw, fo	43
1,2-cyclohexanediol	66 mgCOD/g/h	bss, as	42
cyclohexanol	28 mgCOD/g/h	bss, as	42
cyclohexanolone	51.5 mgCOD/g/h	bss, as	42
cyclohexanone	30 mgCOD/g/h	bss, as	42
	1.1d half life	sgw, fo	43

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