

**A FIELD STUDY OF FOG AND DRY DEPOSITION
AS SOURCES OF
INADVERTENT PESTICIDE RESIDUES
ON ROW CROPS**

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Environmental Hazards Assessment Program



STATE OF CALIFORNIA
Department of Food and Agriculture
Division of Pest Management, Environmental Protection and Worker Safety
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A FIELD STUDY OF FOG AND DRY DEPOSITION AS SOURCES
OF INADVERTENT PESTICIDE RESIDUES ON ROW CROPS

By

Bonnie Turner, Sally Powell, Nancy Miller and Jane Melvin

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ABSTRACT

An investigation to examine possible transport mechanisms of pesticides from dormant spray operations in orchards to nearby cultivated fields in northern Stanislaus County was undertaken in January 1989 by the California Department of Food and Agriculture's Environmental Hazards Assessment Program. One objective was to determine if pesticide residues on row crops were due to movement from local spraying or due to regional atmospheric transport. Since fogs occur during the dormant spray application period (December 1 - January 31) and have been shown to contain pesticides during the same period, the possible relationship between fog events and pesticide deposition on row crops was examined. Deposition of pesticide residues on deposition cards during wet (fog) and dry (non-fog) intervals was also investigated to see if measurable deposition occurred over short time periods.

Four organophosphate (OP) pesticides--parathion, diazinon, chlorpyrifos and methidathion--were analyzed in fog water, vegetation samples, and fallout cards at three sites during the one month investigation. Parathion use was prohibited within a 0.4 km buffer zone around sites 1 and 2, but was not prohibited around site 3. All applications of the 4 OP pesticides within a 0.4 km radius of each site during the 30-day study period were recorded.

Pesticides were found in all fog water samples collected during the study. The range of concentrations was comparable to those found in Central Valley fogs by other researchers. At each site, diazinon had the highest concentration in fog water while parathion, chlorpyrifos, and methidathion followed in decreasing order. The presence of pesticides in fog at sites with a 0.4 km buffer zone suggested a regional source (from outside the buffer zone) for the pesticides. Whether these pesticides are regionally translocated by fog, or transported by air and then scavenged by fog locally within the buffer zone, is unknown.

All 4 pesticides were found in vegetation at all sites. Both fog and dry deposition appeared to contribute to the residues. Pesticide concentrations in dill increased most notably during the last half of the investigation, which contained most of the fog events. Comparison of 3-day vegetation sampling intervals with and without fog events showed generally greater mean increases in pesticide in dill during intervals containing fog. However, not all of the pesticide residue in dill could be accounted for by fog deposition. Residue accumulation on dill during 4 intervals without fog was solely attributable to dry deposition. Moreover, approximately equal proportions of wet and dry deposition card samples contained detectable amounts of parathion.

Both regional and local transport mechanisms were responsible for pesticide residues in vegetation samples. Residues in vegetation clearly had sources outside the buffer zone, since no parathion was applied within 0.4 km of sites 1 or 2, no diazinon within 0.4 km of site 1, no chlorpyrifos within 0.4 km of site 2, and no methidathion within 0.4 km of any site, yet the pesticides were found in vegetation at every site. Sources inside the buffer zone were indicated by the greater concentrations of both parathion and diazinon in dill at site 3, where parathion and very large amounts of diazinon were applied within the buffer zone. In addition, detectable amounts of parathion were found on deposition cards at every site, but more frequently at site 3.

The chemical and physical properties of the pesticide, the application quantity and location relative to the site of interest, local, and regional meteorological factors, and vegetation variables, all contribute in determining how far and how much pesticide will be deposited.

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DISCLAIMER

The mention of commercial products, their source or use in connection with material reported herein is not to be construed as either an actual or implied endorsement of such product.

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INTRODUCTION

In January 1989, the California Department of Food and Agriculture (CDFA) Environmental Hazards Assessment Program (EHAP) began research to determine the source of inadvertent pesticide residues found on vegetable row crops in northern Stanislaus County. Organophosphate pesticide (OP) residues, specifically parathion, diazinon, chlorpyrifos, and methidathion, had been measured on various crops during routine CDFA testing of commercial produce during the winters of 1985/1986 and 1987/1988. Pesticides were present above tolerance levels on those crops which had established tolerances and were found on crops which did not have established tolerances.

In the orchard-growing areas of Stanislaus County, OP's are used during December and January primarily as dormant spray compounds. They are applied in solution using high volume spray equipment at rates of one to several kg active ingredient per hectare in almond, peach, and other fruit tree orchards. The dormant spray pesticide application period extends from December 1 through January 31 and coincides with the fog season in the central valley. OP residues were found on row crops in January and February, thus prompting this research to examine possible transport mechanisms for movement of pesticides from orchards to cultivated fields.

One of our research objectives was to determine whether the residues found on crops were the result of post-application movement from local spraying operations (within 0.4 km of row crop fields) or were due to regional atmospheric transport, i.e., transport from outside the 0.4 km distance. Pesticides applied by high volume airblast sprayers like those used in

orchards have wide droplet size distributions. Droplets greater than 10 μm in diameter are usually subject to gravitational settling soon after dispersal but smaller aerosols remain in the atmosphere for extended time periods and are translocated by atmospheric turbulence (Lewis and Lee, 1976). Volatilization, fragmentation, and coagulation of pesticide-containing aerosols in air occur during the time period before deposition or impaction. Temperature, humidity, and photoreactions also interact to delay or enhance these processes. The knowledge of whether inadvertent pesticide residues on row crops were of local or regional origin would be useful in determining mitigation procedures.

Another objective was to establish whether fog was responsible for the transport of organophosphates from orchards into non-orchard areas including cultivated fields. Since fog has been found to contain pesticides (Glotfelty et al, 1987), it would be of interest to know if pesticide deposition on row crops and fog events are correlated. Fog has been investigated as a mechanism for increasing nutrient availability and precipitation to plants (Azvedo and Morgan 1974, Nagel 1956, and Shuttleworth 1977) as well as a source of pollutant deposition to vegetative canopies (Fuhrer 1986, Jacob et al 1986, Schlesinger et al. 1974, and Waldman et al. 1977). To our knowledge, no studies have been done to relate pesticide residues on vegetation to fog in agricultural areas.

Dry deposition may be an appreciable source of pesticide residue in agricultural areas. Hicks (1986), in a review of measurement methods, noted the importance of dry deposition, concluding if all factors were equal, the area of highest concentrations in air will yield the greatest deposition. The

final objective was to determine if dry deposition of pesticide was measurable during non-fog periods in the same fields where fog and vegetation samples were collected.

Pesticide Characteristics and Use

As dormant spray compounds, diazinon, parathion, chlorpyrifos and methidathion are inexpensive, effective pesticidal agents for control of borers, mites and scale in orchards. Their application in winter reduces spring and summer treatments which may be more expensive and less effective, as well as less desirable for environmental reasons.

Physical characteristics of these compounds show that diazinon is the most volatile, followed by parathion, chlorpyrifos, and methidathion (Table 1). Vapor pressure and solubility play key roles in the environmental fate processes of all pesticides. For this study, they may be important factors in determining what quantities of pesticide are scavenged by fog droplets.

Stanislaus County pesticide use report statistics for 1985, 1986 and 1987 show that parathion and methidathion usage is increasing each year (Table 2). Diazinon and chlorpyrifos applications have increased as well but since these compounds are not restricted, only licensed pesticide control operators and aerial applicators are required to file pesticide use data with the county. Table 2, therefore, does not show the complete application records for diazinon and chlorpyrifos.

Table 1. Physical characteristics of selected dormant spray pesticides^a

Chemical	Molecular Weight	Vapor Pressure	Solubility	Chemical Name
Diazinon	304.35	0.097 mPa at 20°C	40 mg l ⁻¹ in water, 20°C	C ₁₂ H ₂₁ N ₂ O ₃ PS
Parathion	291.27	5 mPa at 20°C	24 mg l ⁻¹ in water, 25°C	C ₁₀ H ₁₄ NO ₅ PS
Chlorpyrifos	350.62	2.5 mPa at 25°C	2 mg l ⁻¹ in water, 25°C	C ₉ H ₁₁ Cl ₃ NO ₃ PS
Methidathion	302.33	0.13 mPa at 20°C	240 mg l ⁻¹ in water, 20°C	C ₆ H ₁₁ N ₂ O ₄ PS ₃

^aAgrochemicals Handbook, 1987.

Table 2. Use report summary of dormant spray pesticides applied in Stanislaus County, 1985-1987

Use Period		Parathion	Diazinon	Chlorpyrifos	Methidathion
------(active ingredient, kg)-----					
1985	December	102	102	152	1330
1986	January	<u>18099</u>	<u>709</u>	<u>1497</u>	<u>2676</u>
Total Winter Use		18201	811	1649	4006
1986	December	1633	458	227	3900
1987	January	<u>16845</u>	<u>1704</u>	<u>1017</u>	<u>10475</u>
Total Winter Use		18478	2162	1244	14375
1987	December	5998	438	1832	1287
1988	January	<u>20862</u>	<u>4795</u>	<u>3763</u>	<u>3697</u>
Total Winter Use		26860	5233	5595	4984

Total 1985 Use		21810	5816	9528	7547
Almond Use (%) ^a		2335 (11)	1766 (30)	3222 (34)	4512 (60)
Total 1986 Use		25098	7323	10817	7548
Almond Use (%)		16881 (67)	2211 (30)	3508 (32)	3981 (53)
Total 1987 Use		30172	8309	15340	12949
Almond Use (%)		17574 (58)	2627 (32)	3402 (22)	9510 (73)

^aPercent of active ingredient applied to almonds.

METHODS

Study Area and Experimental Sites

The investigation took place in north central Stanislaus County, an agricultural community within the San Joaquin Valley containing numerous orchards averaging 4 to 40 ha interspersed with dairy farms, alfalfa fields, vineyards and row crops. The experimental sites were chosen to conform to three criteria: 1) the sites were enclosed by orchards on at least two sides; 2) all sites were similar in size; and 3) the sites had not been sprayed with diazinon, parathion, chlorpyrifos or methidathion during the preceding year. The sites were separated by at least 2.4 km to enhance variability in observable pesticide deposition, but by no more than 4.8 km to maintain climatic similarities.

Site 1 (14.2 ha) was a cultivated field containing row crop vegetables such as bok choy, mustard, kale and other leafy produce. Monitoring by CDFA's Pesticide Use Enforcement Branch during the three preceding winter seasons revealed that several crops had been contaminated by pesticide residues for which they had no established tolerances. Almond orchards bordered the west, south and east sides while an open field and vineyard were due north.

Site 2 (10.5 ha) was a plowed field, fallow with the exception of several rows of cabbage, with almond orchards on the west, south and half of the east side, and a walnut orchard on the north side. The remaining half of the east side was an open field.

Site 3 (16.2 ha) was a vineyard surrounded on the west and south sides by almond and peach orchards, and on the east and north sides by additional vineyards.

Experimental Design

The study began in January 1989 based on dormant spray pesticide use report information from 1985, 1986, and 1987. These data indicated that January pesticide applications were 2 to 10 times higher than December applications for the four pesticides of interest (Table 2). Two of these OP's, parathion and methidathion, were regulated as restricted materials under Section 6400 of Title 3 of the California Code of Regulations. Users were required to obtain a permit to possess and use them. Also, a notice of intent prior to application and a pesticide use report after application was required by law to be filed with the County Agricultural Commissioner.

Local and Regional Transport of Pesticide

Local transport was defined as transport of pesticide from a source within 0.4 km of the boundaries of a study site. The 0.4 km distance was chosen to minimize the number of orchards within the area, thus making it possible to determine the actual source of pesticide. Regional transport, therefore, was defined as transport of pesticides from outside the 0.4 km distance. Parathion was chosen as the local/regional transport test pesticide because of its high use in orchards and its restricted material status. Sites 1 and 2 were assigned 0.4 km buffer zones surrounding their perimeters within which the use of parathion was prohibited during the study. No buffer zone was established at site 3 (the "control" site) and application of parathion was

permitted as usual during the study. No application restrictions were assigned to diazinon, chlorpyrifos or methidathion during the study.

Pesticide Transport in Fog

Two replicate fog water samples were collected at each site whenever fog events occurred during January (except for January 3 when only 1 fog sample was collected at each of sites 1 and 2). Sampling periods were five hours even though some fog events dissipated before the sampling period ended. The approximate duration of each fog event was noted.

Cumulative Pesticide Deposition on Vegetation

Dill plants were used over the 30-day study period to measure cumulative pesticide deposition from wet and dry sources. Composite samples were collected every three days during the month for a total of 10 samples per site (except site 3, at which only 9 samples were collected).

Wet and Dry Deposition of Pesticides

Composite fallout card samples for parathion analysis were collected during fog and non-fog days from each site. Five-hour samples were collected during fog events so that if parathion was found in the fog, then parathion deposition on the fallout cards might also be measurable. The same procedures were used on dry, non-fog days to measure possible dry deposition of particulate parathion during 4-hour sampling periods.

Sampling Methods

Fog

Fog water was collected by an active cloudwater collector designed by Bruce C. Daube et al. (1987) and built to patent specifications. The collector's sampling efficiency for air was 86% and the 50% efficiency size cut based on droplet diameter size was 3.5 μm (Hoffman 1989). Two co-located collectors were placed near the center of each site 75 cm above ground level. Teflon[®] monofilament was used to intercept liquid fog as the individual droplets were drawn into the collector. The droplets would coalesce and drain into a Teflon basin, eventually flowing through Teflon tubing into a 500 ml amber glass bottle. The fog collectors were powered by 12-volt direct current batteries. During some fog events, more than one bottle was used to collect the liquid fog sample due to high water content of the fog. At the end of the sampling period, the fog water samples were refrigerated until analysis.

Vegetation

The dill weed used in this study was grown in Stanislaus County and transplanted into large pulp pots 2 weeks before the study started. Each pot contained a minimum of 20 plants. Samples to determine background levels of OP pesticides were collected on December 29, 1988 preceding the transfer of the potted dill weed to the study area. At each site, ten pots were placed at regular intervals 3 m inside the borders. Plants were placed near the borders to be able to detect any pesticide entering the field. The dill plants were sampled every three days during January. Fifteen-gram subsamples were collected from each pot using clean scissors to cut individual stems from the crown as close to the soil surface as possible. The ten subsamples were

composited into one 1-liter glass wide-mouth jar with as little disturbance as possible. If fog water or condensation was present on the dill, it was also collected. Samples were frozen until analysis.

Fallout Samples

A fallout card consisted of a rectangular 0.093 m² plastic-backed absorbent paper towel attached to plastic-covered cardboard for support. Ten fallout cards were placed around the border of each site. Each card was positioned on the soil surface within 3 m of a potted dill plant. During fog event sampling, fallout cards were placed at each site immediately after fog collectors were turned on and were collected immediately after the sampling period ended. On dry sampling days, fallout samples were set out for a period of four hours, from the morning to early afternoon. After the sampling period ended, the cards at each site were composited into one sample and frozen until analysis.

All samples were logged and tracked by chain-of-custody records from sample container preparation to analysis.

Pesticide Use Information and Weather Data

Local pesticide applications were recorded during the study period within the study area by county agricultural inspectors. Orchard growers within 0.4 km of any site who applied any of the four OP's during the study period were asked to fill out forms to indicate pesticide type and quantity applied, type of equipment used, commodity and number of hectares treated, and location of application (Table 3).

Table 3. Dormant spray pesticide applications within 0.4 km of study sites in Stanislaus County, January 1989

Application date/location ^a	Parathion (kg ai)(ha)		Diazinon (kg ai) (ha)		Chlorpyrifos (kg ai) (ha)		Methidathion (kg ai) (ha)	
<u>Site 1</u>								
Jan 15 / E-SE	0	0	0	0	31	14	0	0
<u>Site 2</u>								
Jan 28 / E	0	0	16	8	0	0	0	0
Jan 24-Jan 31 / NW	<u>0</u>	<u>0</u>	<u>8</u>	<u>4</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total:	0	0	24	12	0	0	0	0
<u>Site 3</u>								
Jan 9 / E-SE	17	11	11	5	0	0	0	0
Jan 12 / E	3	2	0	0	0	0	0	0
Jan 13-Jan 16 / W-NW	0	0	90	32	0	0	0	0
Jan 17-Jan 18 / S-SW	<u>17</u>	<u>10</u>	<u>0</u>	<u>0</u>	<u>7</u>	<u>2</u>	<u>0</u>	<u>0</u>
Total:	37	23	101	37	7	2	0	0

^aLocation of application in reference to site. Almonds were the only commodity treated. All spraying was done by high volume (airblast) equipment.

In addition, a pesticide use report survey for methidathion applications during the study period was conducted by EHAP personnel for approximately 325 square kilometers (200 square miles) surrounding our study sites. These data were used to support field samples in interpreting study results (Appendix I).

Meteorological data were measured at 1-minute intervals by Met-1[®] weather stations located at each site. Average wind speed, instantaneous wind direction, average temperature, and average relative humidity were then recorded in 15-minute intervals by Campbell CR21 data loggers at each site for the entire study period. Windroses were created to help visualize wind speed and direction for each site for each day (Appendix II).

Chemical Analysis

CDFA's Chemistry Lab Services, Sacramento, Ca. developed methods and conducted chemical analysis for parathion, diazinon, chlorpyrifos and methidathion in water, dill and fallout card samples. Parathion, diazinon, chlorpyrifos and methidathion were quantified in fog water by extraction with methylene chloride and analyzed by GC using a flame photometric detector (FPD). The compounds were quantified in dill by acetonitrile extraction of the entire plant sample and were analyzed by gas chromatograph (GC) using an FPD. Ethyl acetate was used to extract the compounds from fallout cards which were then filtered through florisil sep-paks and analyzed by GC/FPD. Extraction procedures and operating conditions for the gas chromatograph (GC) methods are included in Appendix III.

Quality Control Procedures

Three dill samples were randomly selected and prepared as interlaboratory control samples. Samples were split and analyzed by both CDFA and Enseco-Cal Laboratories. For continuous quality control during analysis, one blank matrix and blank matrix spike were analyzed with each extraction set for each matrix. All quality control results are tabulated and presented in Appendix IV.

Statistical Analysis

Except in a few instances explained in the Results and Discussion sections, analyses of statistical significance were not performed.

There were several reasons for this. Some of the principal questions addressed by the study involved comparisons of site 3, where parathion application was permitted within the buffer zone, to sites 1 and 2, where it was not. Since the control treatment was unreplicated, using inferential statistics to conclude a treatment effect would be misleading. Furthermore, in many cases our interest was in whether no difference existed between "treatments"; due to the small amount of data and large variability, the power of statistical comparisons would have been very low, and it would have been misleading to conclude that no difference existed on that basis. Finally, while the mean concentration of pesticide in fog water over all fog events (for one example) is useful to a degree, we were more interested in relationships between individual fog events and other events, such as pesticide applications and vegetation residue detections. The large number of variables and small number of data points precluded statistical analysis of

these relationships, which have instead been analyzed graphically and subjectively.

Because the conclusions presented here have not been statistically confirmed, they should be treated as tentative hypotheses to be tested in future studies. The reader is cautioned that simply omitting a test of statistical significance does not make a conclusion based on small numbers more valid. Any of the results observed in this study might fail to appear if the study were repeated.

RESULTS AND DISCUSSION

Fog Transport of Pesticides

The pesticide residues found by CDFA Pesticide Use Enforcement specialists during routine monitoring of market and pre-market produce were thought to be inadvertent residues unrelated to illegal applications of OP pesticides. Although the mode of deposition on crops was unknown, fog was considered as a transport mechanism after Glotfelty et al. (1987) reported nine pesticides, including those monitored in our study, in fog water samples collected at 3 locations in California's central valley region.

Radiation fogs commonly develop in the Central Valley during the winter months. The fogs form during conditions which include calm or light winds ($<10 \text{ km hr}^{-1}$) (Barrie et al. 1986), relative humidity approaching 100 percent, and cooling surface temperatures (Gerber 1980). During the study period, radiation fogs usually began developing shortly before sunrise and lasted no

more than 8 hours, with most lasting less than 5 hours. On some early afternoons, the fog would dissipate to haze for the rest of the day. No long-term inversion fogs (>24-hours) occurred. Calm or low wind speeds were observed and temperatures ranged from approximately 0 - 12°C during fog events (Appendix II). The average liquid water content (LWC) of air (fog density) during a fog event was calculated as the mass of water collected per air sampling volume (g m^{-3}). Eliminating the LWC for sites 1 and 2 on January 3 because site 3 was not sampled, the LWC of air during fogs averaged 0.09, 0.09 and 0.08 g m^{-3} at sites 1, 2 and 3, respectively. The similar fog density measurements eliminated LWC as a contributing factor to differences in pesticide concentrations among sites over the study period. Similarly, mean duration of fog events did not differ significantly between sites. Mean duration was 205, 188 and 210 minutes at sites 1, 2 and 3, respectively. Site 1 did, however, have an additional fog event that did not occur at the other two sites. With that exception, fogs occurred on the same days at all three sites, and tended to be similar in density and duration at all three sites on a given day (Table 4). The density and duration of fog events were not significantly correlated at any site. There were no significant correlations found between fog density and concentration of pesticide in fog water, with the exceptions of chlorpyrifos, which was positively correlated with fog density at sites 1 and 2, while parathion concentration was positively correlated with fog density at site 3. This means that, with the exceptions noted, dense fogs were no more or less likely than low density fogs to have high concentrations of pesticides in the fog water. However, within an individual fog event, it appears that as fog density declined over time, the pesticide concentration increased. For three fog events dense enough to

Table 4. Mean parathion, diazinon, chlorpyrifos and methidathion concentrations in fog water in air at three sites in Stanislaus County, January 1989.

Date	Liquid Water Content (g m ⁻³)	Fog Event Duration (min)	Concentration in fog water				Concentration in fog water in air ^a			
			Parathion	Diazinon	Chlorpyrifos	Methidathion	Parathion	Diazinon	Chlorpyrifos	Methidathion
			------(μg kg ⁻¹)-----				------(ng m ⁻³)-----			
<u>Site 1</u>										
3	0.03	280	2.4	2.8	1.5	ND ^b	0.07	0.08	0.04	ND
4	0.01	170	2.4	4.5	0.6	ND	0.02	0.04	0.005	ND
19	0.14	200	14.3	58.8	9.6	0.7	2.06	8.50	1.39	0.11
20	0.15	300	12.4	67.8	7.2	1.7	1.79	9.83	1.05	0.24
21	0.08	260	25.9	124.2	6.0	2.9	2.18	10.46	0.51	0.24
22	0.09	250	26.0	56.7	6.1	3.6	2.41	5.24	0.56	0.33
26	0.08	160	14.9	43.9	5.1	1.4	1.18	3.47	0.41	0.11
27	0.02	140	33.7	176.1	4.2	11.3	0.59	3.10	0.07	0.20
28	0.11	200	3.3	19.5	1.9	1.6	0.35	2.12	0.20	0.18
31	0.10	170	3.9	35.0	3.0	2.0	0.40	3.58	0.31	0.21
		Mean =	13.9	58.9	4.5	2.6	1.11	4.64	0.45	0.16
<u>Site 2</u>										
3	0.03	360	1.5	1.1	1.4	6.7	0.04	0.03	0.04	0.17
4	0.04	70	5.4	0.7	1.1	ND	0.21	0.03	0.04	ND
19	0.11	270	12.8	12.6	3.9	1.0	1.38	1.35	0.42	0.11
20	0.13	280	9.2	28.1	6.9	1.2	1.19	3.62	0.89	0.15
21	0.11	240	17.8	86.7	5.7	3.8	1.88	9.18	0.61	0.40
22	0.07	260	33.4	56.9	5.2	1.2	2.25	3.83	0.35	0.08
26	0.07	140	13.4	32.8	7.0	1.3	0.91	2.22	0.47	0.09
28	0.11	150	4.5	27.4	4.3	1.4	0.47	2.88	0.45	0.14
31	0.10	110	9.5	164.5	5.6	2.8	0.94	16.16	0.55	0.28
		Mean =	11.9	45.6	4.6	2.2	1.03	4.37	0.43	0.16
<u>Site 3</u>										
4	0.01	210	2.0	1.6	ND	ND	0.02	0.01	ND	ND
19	0.11	240	19.5	120.0	4.0	0.8	2.19	13.49	0.45	0.09
20	0.15	300	23.6	151.2	4.7	6.5	3.56	22.82	0.72	0.97
21	0.09	270	17.5	208.9	3.2	2.7	1.62	19.24	0.29	0.25
22	0.09	240	15.4	144.2	3.8	3.1	1.44	13.48	0.35	0.29
26	0.05	130	7.9	71.1	3.2	2.2	0.43	3.87	0.17	0.12
28	0.08	180	4.2	25.0	1.3	1.6	0.32	1.91	0.10	0.12
31	0.05	120	16.9	237.1	5.5	8.7	0.94	0.76	0.25	0.39
		Mean =	13.4	119.9	3.2	3.2	1.29	10.69	0.29	0.28

^aConcentrations are computed using an air sampling flow rate of 21.4 m³ min⁻¹ for the duration of fog event.

^bNot detected. Minimum detection level was 1 μg kg⁻¹ for all pesticides.

produce two sample bottles of fog water at each site, the first and second bottles were analyzed separately. At each site, mean fog density measured by the second bottle was lower than by the first. For the three sites combined, mean density was 0.15 g m^{-3} for bottle 1, and 0.07 g m^{-3} for bottle 2. At the same time, mean pesticide concentration was higher in the second bottle. This was true for all four pesticides at all sites. For three sites combined, mean parathion concentration increased from $14 \text{ } \mu\text{g kg}^{-1}$ in bottle 1 to $24 \text{ } \mu\text{g kg}^{-1}$ in bottle 2, while diazinon increased from 81 to $106 \text{ } \mu\text{g kg}^{-1}$, chlorpyrifos from 5.2 to $7.7 \text{ } \mu\text{g kg}^{-1}$, and methidathion from 2.6 to $3.4 \text{ } \mu\text{g kg}^{-1}$. These observations suggest that when fog dissipates, individual droplets of fog water become smaller through evaporation, while retaining much of their pesticide content.

Fog water samples contained measurable concentrations of parathion and diazinon on all sampling days. During the first fog event sampled, chlorpyrifos was not measurable at site 3 and methidathion was not found at sites 1 or 3 (Table 4). Results are presented as mass of pesticide per mass of fog water ($\mu\text{g kg}^{-1}$) for comparisons with other published results, for comparisons among sites, and to relate to the water-holding capacity of our vegetation samples. Data are also presented as mass of pesticide in droplets per cubic meter of air for the duration of fog event within the 5-hr sampling period for comparison with non-fog ambient levels of pesticides.

Parathion concentrations in fog water were similar at all sites and shared the same range as Glotfelty's (1987) samples from the Central Valley. The lowest

concentrations at each site (ranging from 1.5 to 2.4 $\mu\text{g kg}^{-1}$) were collected on January 3 and January 4, at the beginning of the study. The limited application of parathion during the preceding month (Table 2) was the likely cause for low levels found early in January. During the remainder of the study period, parathion applications within site 3's buffer zone totalling 37 kg had little effect on increasing fog water concentrations at that site over concentrations found at sites 1 and 2. The highest parathion concentrations recorded during fog sampling was 33.7 $\mu\text{g kg}^{-1}$ on January 27 at site 1 and 33.4 $\mu\text{g kg}^{-1}$ on January 22 at site 2.

Concentrations of parathion in fog water in air ranged from 0.02 to 3.56 ng m^{-3} during the study. These values were low when compared to concentrations in air measured during a 1986 Air Resources Board study in the northern San Joaquin Valley (in Oudiz and Klein, 1988). A mean 24-hr value of 170 ng m^{-3} for six sites was recorded during the 23-day ARB study (January 6 - February 14, 1986). The difference in magnitude between the ARB study results and these data were not analyzed because of unknown differences in sampling methods and conditions between the two studies.

Concentrations of diazinon in fog water ranged from 1.1 to 237.1 $\mu\text{g kg}^{-1}$ over the study period. Application of diazinon within the 0.4 km buffer zones of site 2 and 3 was recorded as 24 and 101 kg, respectively (Table 3). Site 3 fog samples contained over twice as much diazinon, on the average, as site 1 or 2 samples. The application of 90 kg diazinon northwest and adjacent to site 3 preceded the large increase in fog water concentrations. Despite the lack of

diazinon applications within site 1's buffer zone, the average concentration within fog water was higher here than at site 2.

Chlorpyrifos concentrations in fog water were much lower than diazinon or parathion concentrations. All sites were similar, ranging from none detected to $9.6 \mu\text{g kg}^{-1}$. Thirty-one kg of chlorpyrifos was applied within site 1's buffer zone on January 15 and the peak concentration in fog water ($9.6 \mu\text{g kg}^{-1}$) occurred at this site on January 19. Site 3, which had 7 kg applied within 0.4 km, had the lowest average concentration ($3.26 \mu\text{g km}^{-1}$) of any site. Site 2 had a higher average concentration in fog water than site 3, even though no pesticide was applied within 0.4 km there.

The least found pesticide in fog water at all sites was methidathion. Although the highest single concentration was observed at site 1 ($11.3 \mu\text{g kg}^{-1}$), site 3 had the highest average concentration ($3.2 \mu\text{g kg}^{-1}$) over the study period. Methidathion was not applied within 0.4 km of any site.

The presence of pesticides in fog water sampled at sites which had no pesticides applied within their 0.4 km buffer zone supports the idea of a regional source of pesticide in fog. Additionally, no appreciable differences in average concentration were seen among sites for parathion, chlorpyrifos and methidathion even though applications within buffer zones differed for two of these pesticides. Diazinon, however, was twice as high at site 3 than at either site 1 or 2. It is reasonable to assume that this difference was due to the local presence or transport of an abundant nearby source of diazinon.

The large amount of diazinon applied adjacent to the site only days before fog water samples were collected was the most likely source.

The airborne vapor and particulate fraction of pesticides produced by high-volume spraying activities contribute to the total organic content of atmospheric aerosols in California. Jaenicke (1978) estimated that condensation nuclei in air consisted of up to 25 percent organic particulate. Although he considered plant debris, pollen, spores and fly ash from combustion of fossil fuel as primary organic sources, it is reasonable to suggest that some airborne pesticides may also be an available source of condensation nuclei during high pesticide use periods. Fog droplets condensing around these nuclei scavenge additional particulate and vapor-phase pesticide during coagulation and growth. The distance a pesticide may travel in fog and length of time it resides in air depend on fog droplet size and atmospheric turbulence. During fog events in January, wind speeds averaged 0.63 m s^{-1} (1.4 mph) at all sites. The average period of time wind travelled in one direction during a fog event was 95 minutes (the maximum time was 195 minutes). Thus, the average distance fog would move in one direction was 3.5 km (2.2 mi).

As fog density increases, fog deposition volume increases. Impaction or sedimentation occurs and is enhanced by taller, non-uniform vegetated surfaces (Lovett 1984 and Wattle et al. 1984). As the fog dissipates, pesticides in fog which have not already been deposited on available surfaces will remain in the atmosphere until dry deposition occurs downwind, either locally or regionally.

The presence of regionally transported vapor-phase or particulate pesticides in air at a site before fog development occurs may also explain pesticide concentrations found in fog water. If fog droplets scavenge airborne pesticides locally, although not responsible for regional translocation of the pesticide, the fog might still play a role in increased deposition of the pesticide locally. In our study, methidathion was airborne in fog or air for a distance of at least 0.4 km to appear in fog at each site.

Pesticide Deposition on Vegetation

All four pesticides were found on vegetation at all three sites. Accumulated pesticide concentrations in dill weed increased most notably during the second half of the study period (Figures 1, 2 3 and 4; data tabulated in Appendix V). On the first day of sampling, January 3, no pesticides were measurable at any site, but by January 6, parathion was found at site 1 and diazinon was found at sites 1 and 2, although at very low concentrations. By January 15, all pesticides had accumulated in dill samples at all sites with the exception of methidathion at site 1. Its presence was not recorded quantitatively at site 1 until January 27.

Residues on vegetation clearly have sources outside the immediate local area. No parathion was applied within 0.4 km of sites 1 or 2, no diazinon within 0.4 km of site 1, no chlorpyrifos within 0.4 km of site 2, and no methidathion within 0.4 km of any site, yet the pesticides were found in vegetation at every site.

Of the measures obtained in this study, the best measure for reflecting the amount of pesticide in fog available for deposition on our dill samples was

Figure 1. Parathion concentration in dill samples at three sites in Stanislaus County, January 1989.

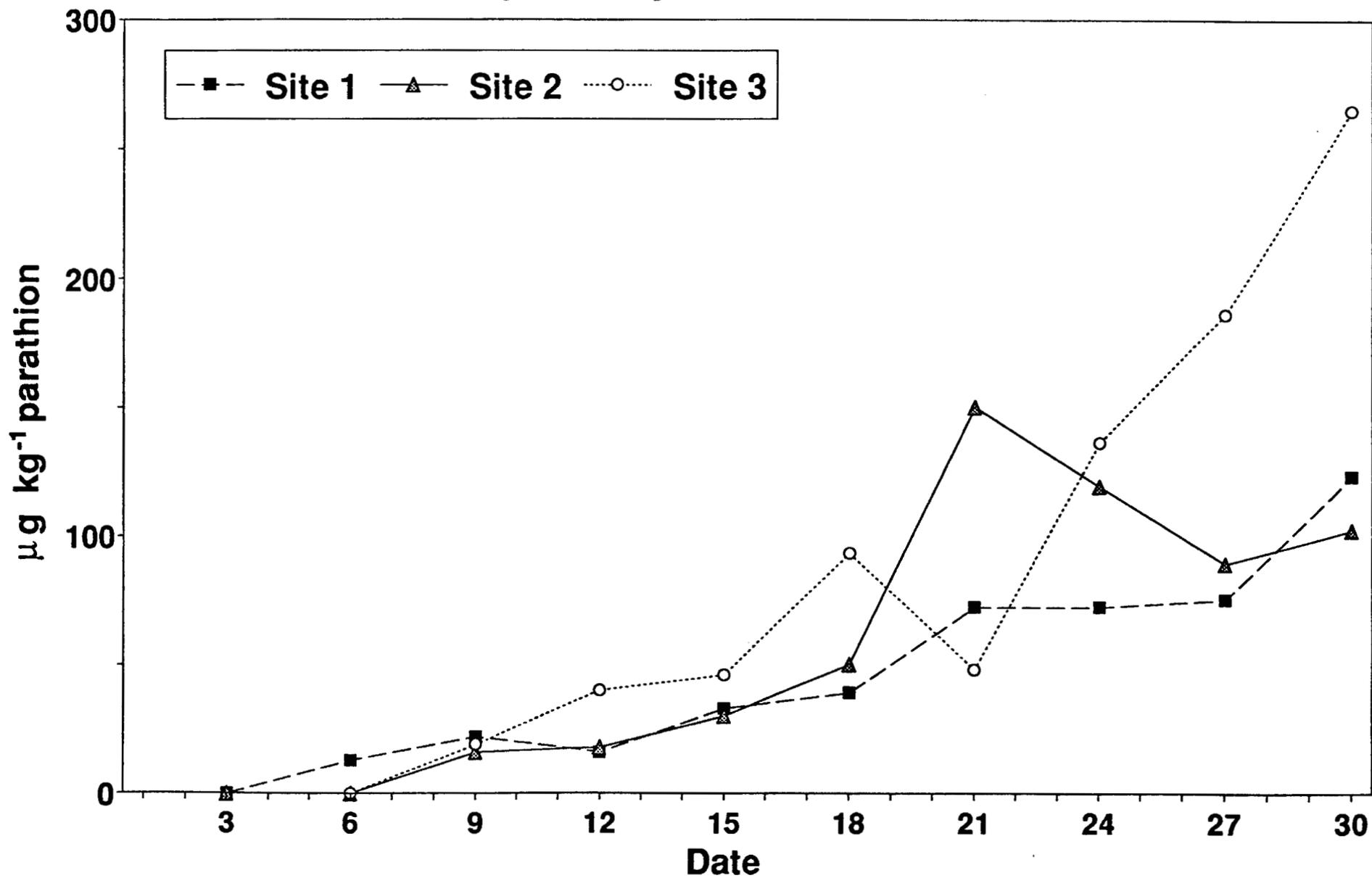


Figure 2. Diazinon concentration in dill samples at three sites in Stanislaus County, January 1989.

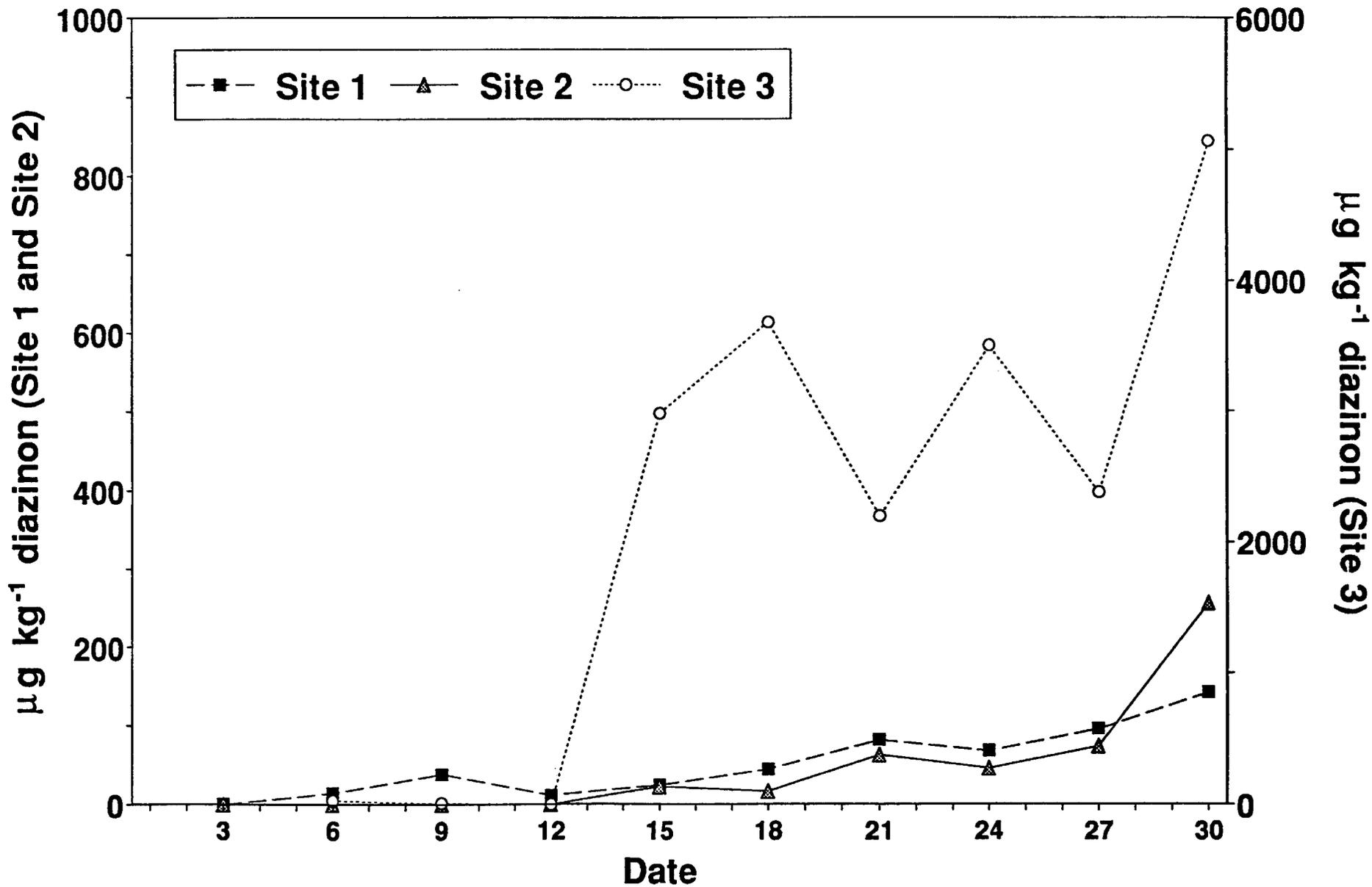


Figure 3. Chlorpyrifos concentration in dill samples at three sites in Stanislaus County, January 1989.

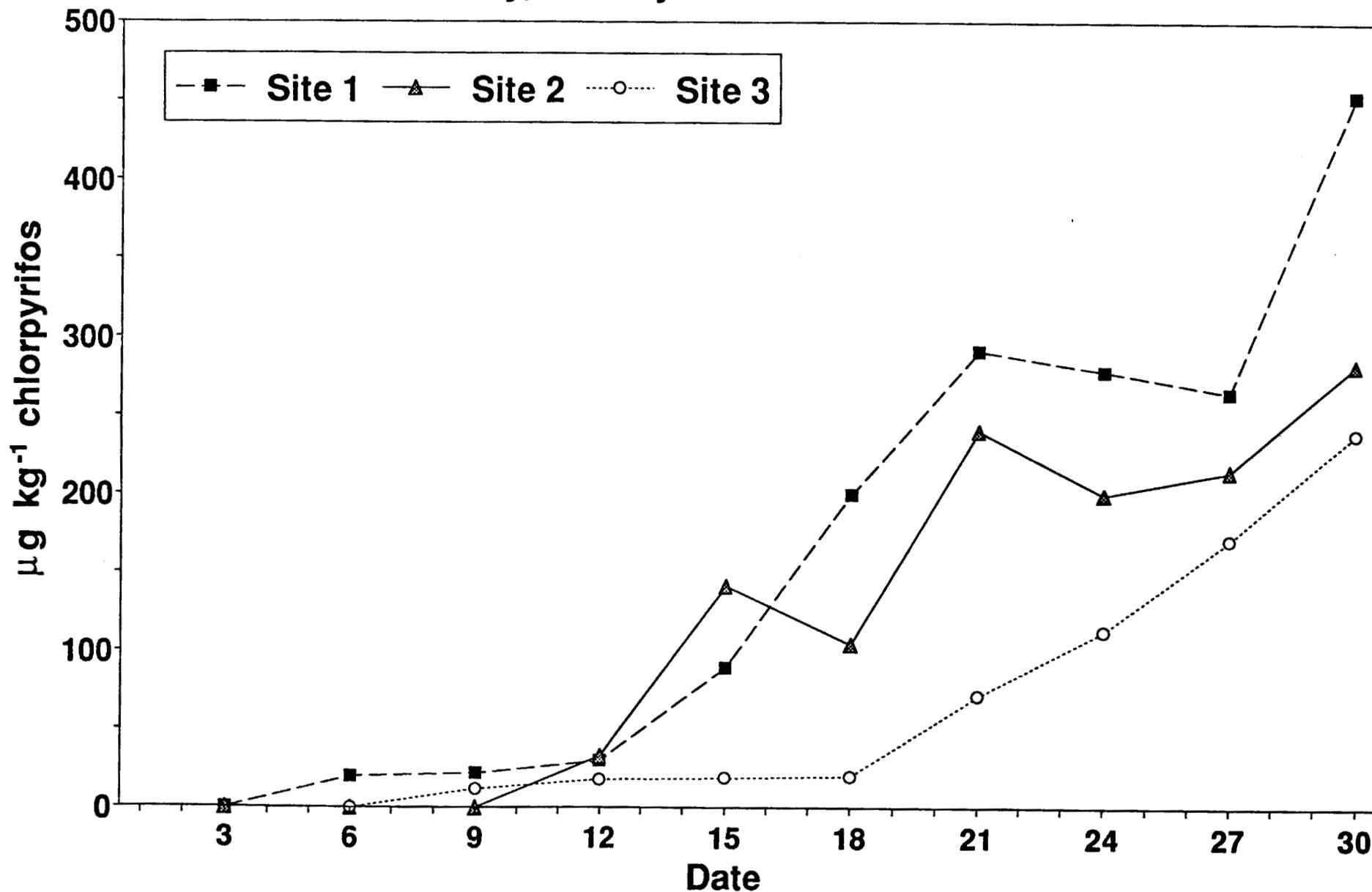
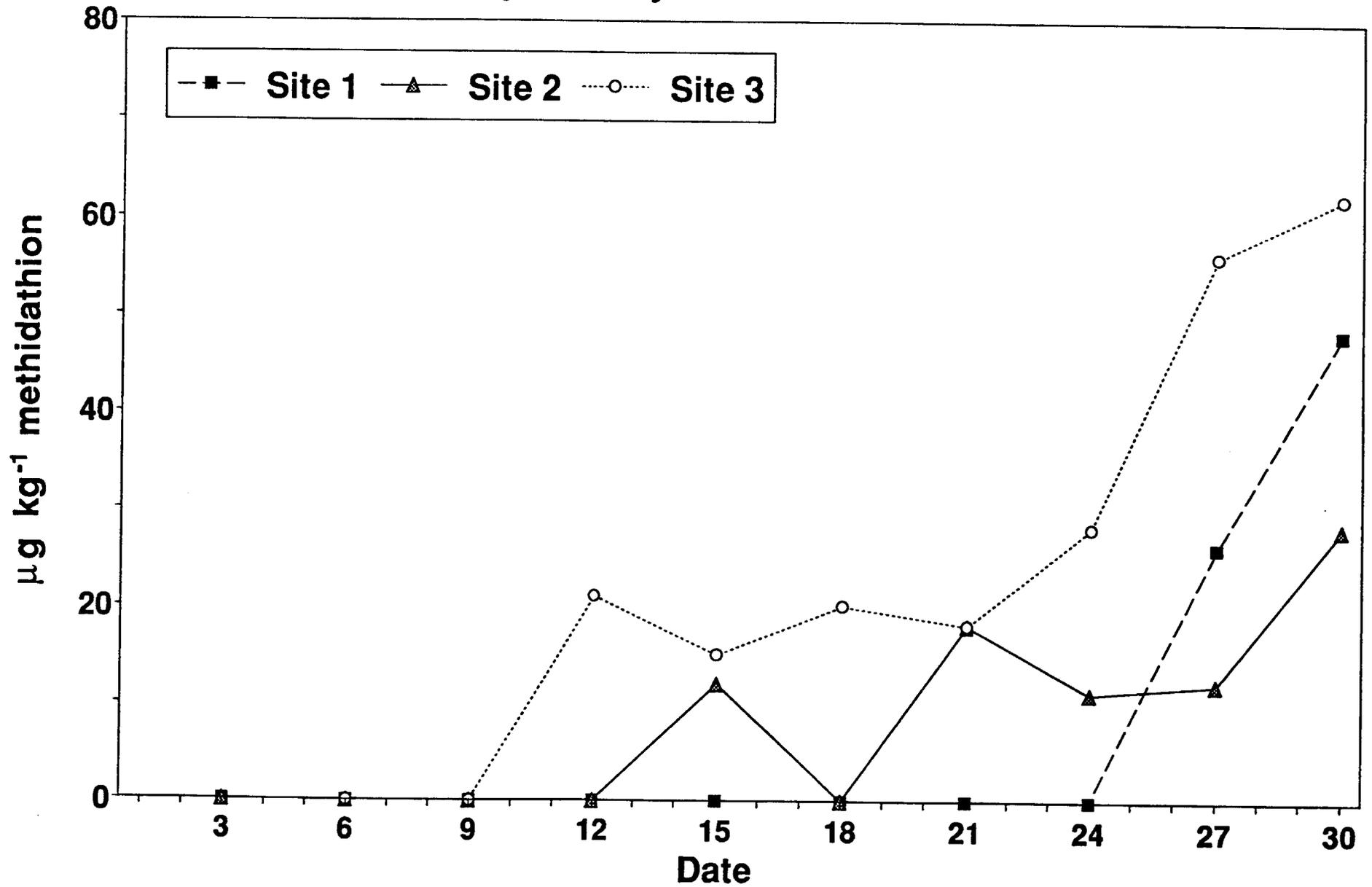


Figure 4. Methidathion concentration in dill samples at three sites in Stanislaus County, January 1989.



the total μg of pesticide found during the whole fog event. This reflects simultaneously the duration and density of the fog, and the concentration of pesticide in the fog water. Table 5 presents, for each site, the total amount of pesticide in fog water for all fog events, total pesticide applied within 0.4 km, and final dill residue concentrations. Data from January 3 was omitted since vegetation was not sampled at site 3 on that day; January 31 was omitted since that fog event occurred after the final vegetation sample was collected. The greatest amount of diazinon in fog occurred at site 3, which also had the greatest final dill residue. For parathion, chlorpyrifos and methidathion, sites ranked the same on total μg in fog and final dill residue concentration. Looking at the data day by day suggests that a two-fold increase in dill accumulation of parathion at site 3 over sites 1 and 2 followed local applications near site 3. This indicates that the airborne concentration of locally applied pesticide, while not affecting local fog concentration, may affect local dry deposition processes.

The appearance and accumulation of pesticide residues in dill during four sampling intervals with no fog events (January 9, 12, 15, and 18) can only be attributed to dry deposition of airborne particulate pesticide or to absorption of vapor phase pesticide by plant tissue. Residues in dill also increased during sampling intervals containing fog, so fog may also play a role in deposition.

The residues found in dill during the period from January 21 through January 30 were deposited during 3-day sampling intervals containing anywhere from 1 to 3 fog events. Table 6 shows the mean incremental increase in residues during intervals with and without fog events for each site. At site 1, the

Table 5. Total fog water residues, final dill concentrations, and total pesticide applied within 0.4 km of three sites in Stanislaus County, January 1989

Site	Parameter	Parathion	Diazinon	Chlorpyrifos	Methidathion
1	Fog, total μg ^a	52.4	214	20.8	6.88
	Dill, $\mu\text{g kg}^{-1}$	123	141	453	48
	Applied, kg	0	0	31	0
2	Fog, total μg	41.3	112	15.7	4.79
	Dill, $\mu\text{g kg}^{-1}$	102	255	282	28
	Applied, kg	0	24	0	0
3	Fog, total μg	53.3	414	11.3	10.4
	Dill, $\mu\text{g kg}^{-1}$	265	5060	238	62
	Applied, kg	37	101	7	0

^aFog samples used for this analysis did not include those collected on 1/3/89 because site 3 was not sampled, and 1/31/89 since no dill samples were collected after this date.

Table 6. Comparison of dill sampling intervals with and without fog at three sites in Stanislaus County, January 1989

Site	Type of Sampling Interval ^a	Number of Intervals	Mean residue increase in dill			
			Parathion	Diazinon	Chlorpyrifos	Methodathion
			-----($\mu\text{g kg}^{-1}$)-----			
1	NF	4	6.50	7.50	44.75	0
	F	5	18.40	21.20	53.80	8.60
2	NF	4	11.25	2.75	24.75	0
	F	5	10.40	47.80	35.60	4.60
3	NF	4	22.00	912.75	3.75	3.75
	F	5	34.40	281.60	43.60	8.40

^aNF was a 3-day dill sampling interval ending at noon on the day of sampling which contained no fog events. F was a 3-day dill sampling interval ending at noon on the day of sampling which contained 1 to 3 fog events.

mean incremental increase in residues for each pesticide was greater during intervals containing fog events than in intervals without fog (Table 6). The same was true at site 2 for diazinon, chlorpyrifos and methidathion. Parathion at site 2, however, increased slightly less in fog than in dry weather. At site 3, diazinon residue increases were much greater during dry intervals than in intervals containing fog, but the other pesticides increased more during fog intervals.

The generally greater incremental increase in residue accumulation seen in dill during fog-containing sampling intervals may be caused by sedimentation or impaction of fog droplets on vegetation or by other factors not accounted for such as dry deposition between fog events. Dry deposition of pesticide between fog events during these dill sampling intervals could have increased because of additional pesticide applications in the surrounding area during this period. Only applications within 0.4 km were monitored. Wind direction and velocity in relation to pesticide application may have caused depositional differences as well. In general there were twice as many periods of wind less than 13.4 m s^{-1} (<3 mph) during dill sampling intervals containing fog than in non-fog intervals.

The large mean incremental increase in diazinon residues at site 3 during non-fog intervals may be attributable to the diazinon application mentioned earlier. The application took place from January 13 to January 16. These dates included 2 dill sampling intervals with no fog events. Residue levels of diazinon in dill, which were not detected on January 12, increased

dramatically to 2.982 mg kg^{-1} on January 15 and reached 3.680 mg kg^{-1} by January 18.

Predicted Pesticide Deposition on Dill

An estimate of the water-holding capacity of the vegetation samples was obtained by subtracting the weights of 5 dry samples from their weights after being misted to the point of dripping. It was calculated that a 150 g sample of dill could hold, on the average, 40 g of water before throughfall began. The water-holding capacity of the dill samples apparently was never exceeded during fog sampling events during the study period as no throughfall was observed. The predicted concentration increase in dill due to fog was calculated for each 3-day interval using the concentrations in fog water for all fog events in the interval, assuming that the maximum amount of water (40 g) was accumulated during each event. It was further assumed that all pesticide deposited on dill in fog water remained on the plant. Thus, these predictions should represent maximum amounts that could be deposited by fog. At site 1, predicted parathion deposition due to fog could have accounted for more than all of the increase seen on vegetation measured during the January 27 interval (Table V-2, Figure 5). The actual increase at site 1 during this interval was only $3 \text{ } \mu\text{g kg}^{-1}$. At the same site, the predicted increase in parathion for the January 30 interval was only 2% of the actual increase of $48 \text{ } \mu\text{g kg}^{-1}$.

Cumulative predicted parathion deposition due to fog and actual deposition are compared in Figures 5, 6, and 7 for sites 1, 2 and 3. The remaining pesticide comparisons are graphed in Appendix V. These comparisons reveal that while

fog may be responsible for some portion of the pesticide residues in dill, other sources, including dry deposition, must also be involved.

Figure 5. Comparison of actual and predicted parathion concentration in dill samples
Site 1

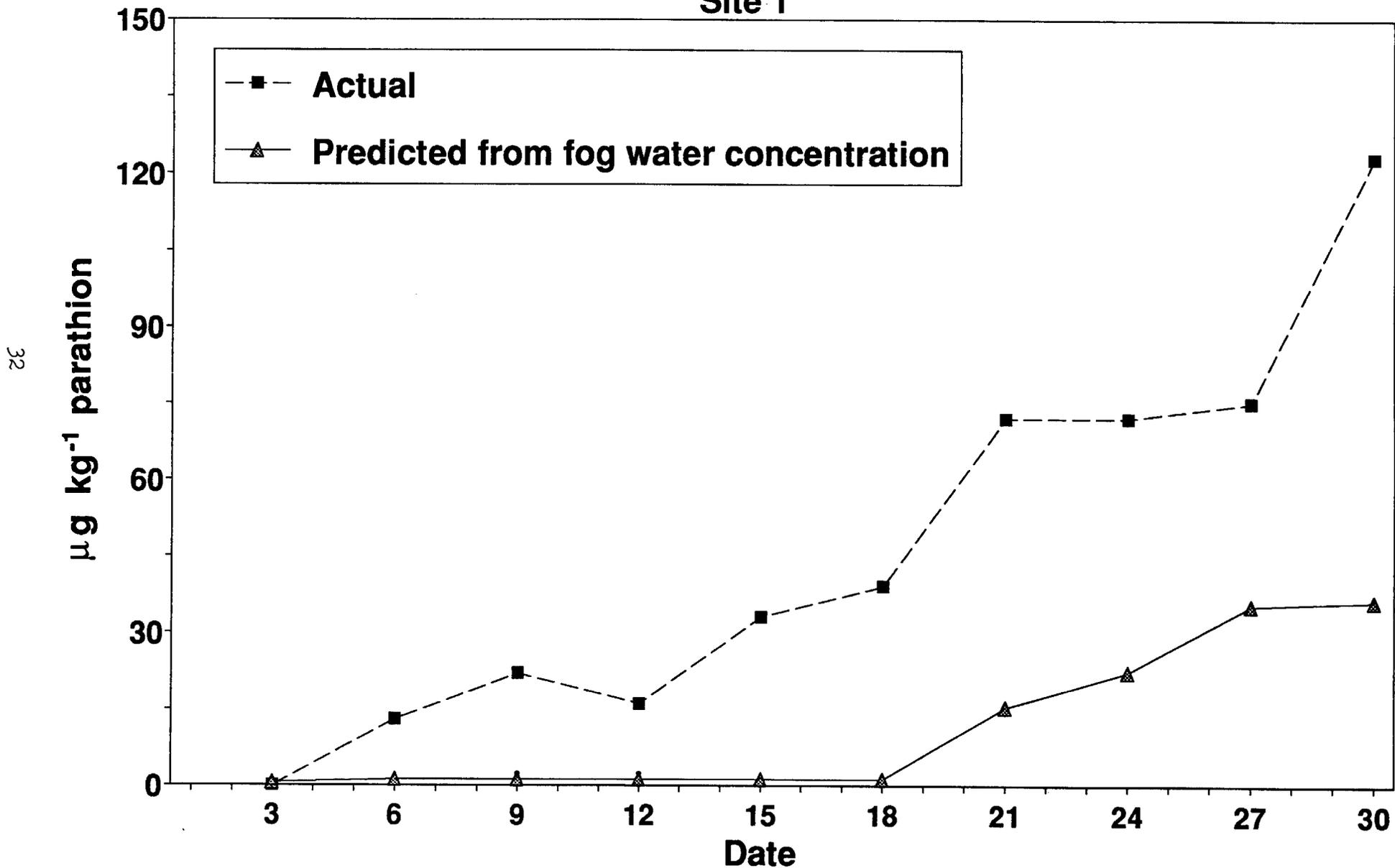


Figure 6. Comparison of actual and predicted parathion concentration in dill samples
Site 2

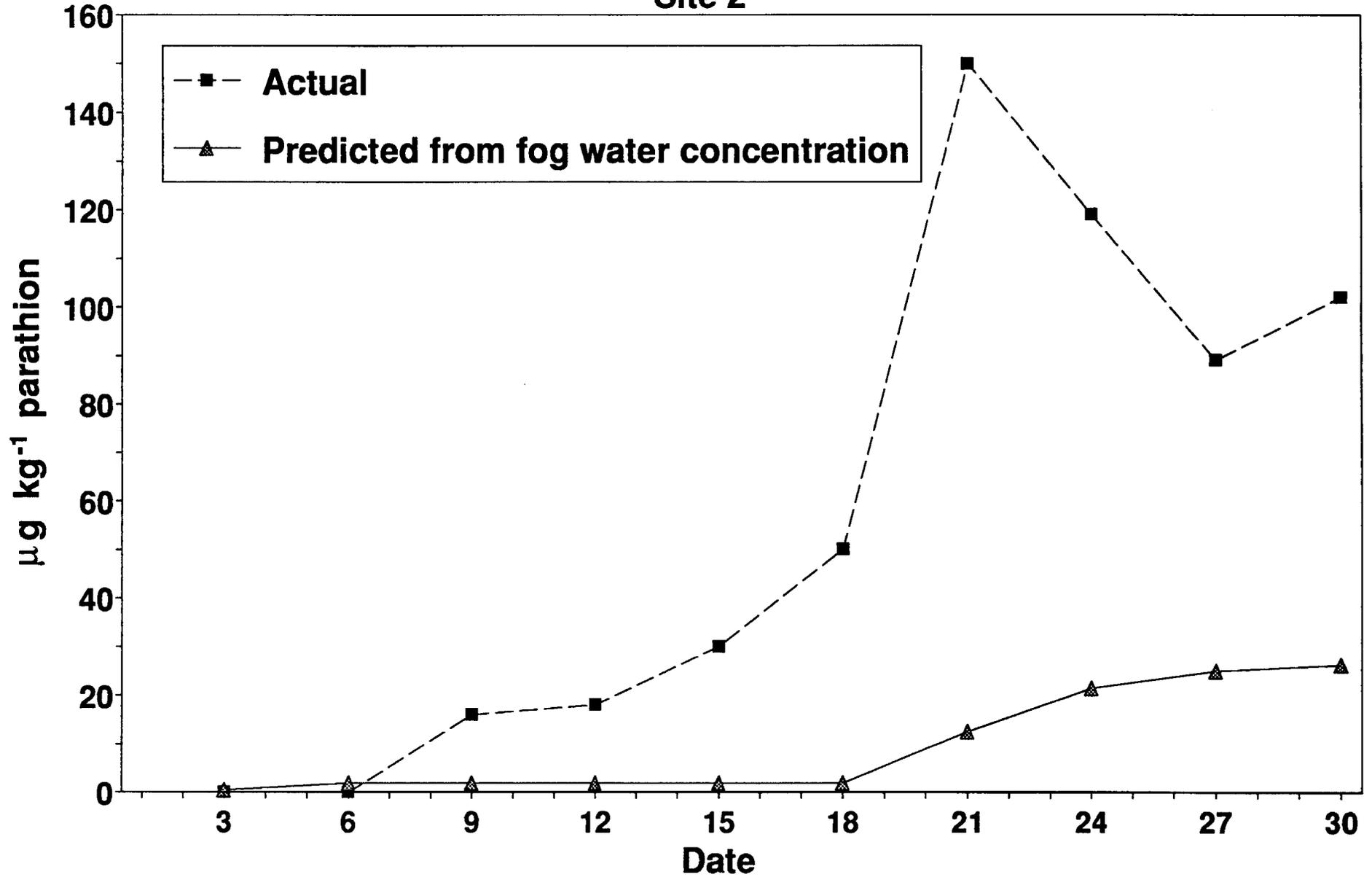
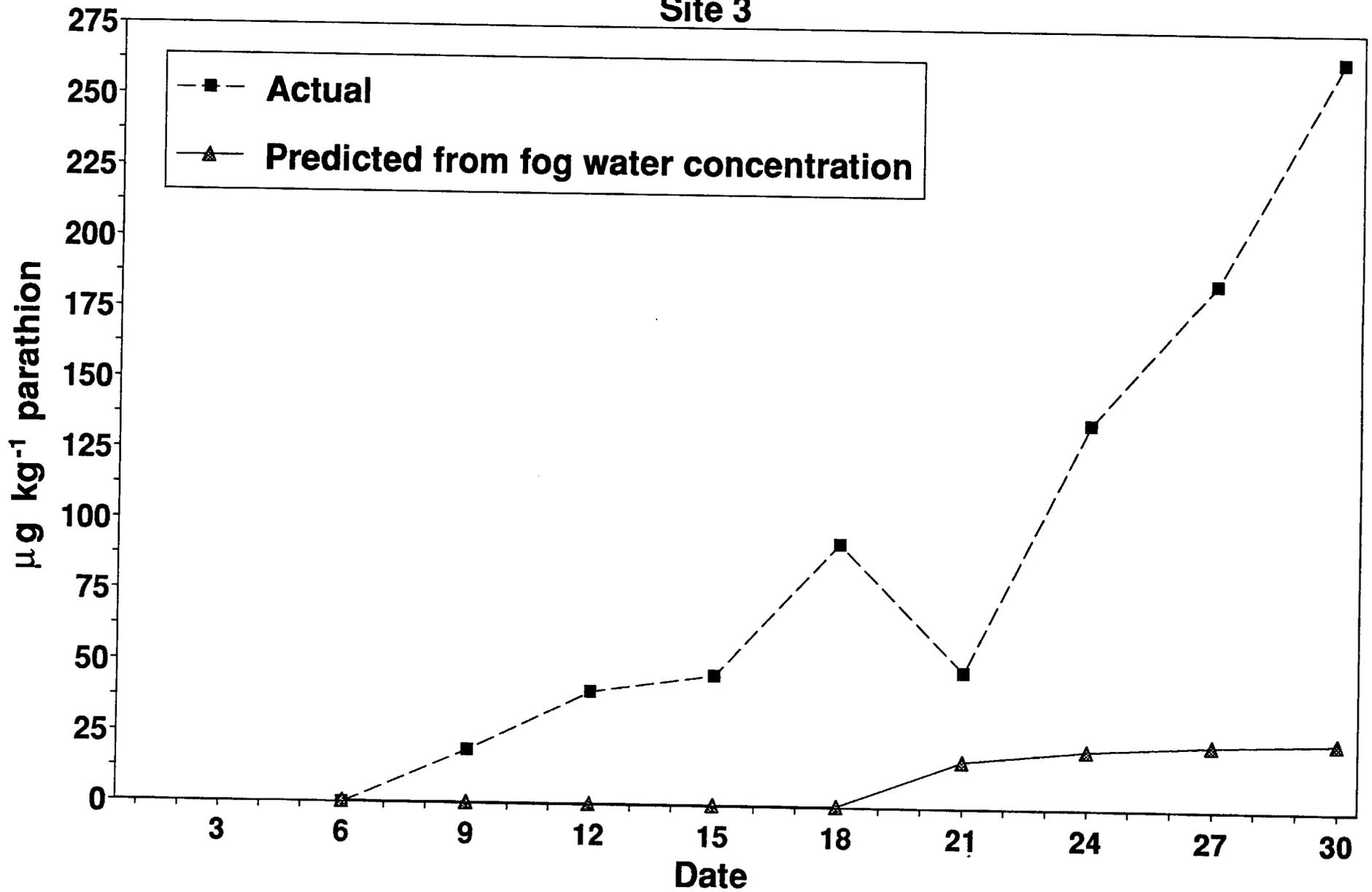


Figure 7. Comparison of actual and predicted parathion concentration in dill samples

Site 3



Wet and Dry Fallout Card Measurements

Fallout cards used to measure wet and dry deposition of parathion during fog and non-fog periods were of limited value in assessing these processes due to the small number of quantifiable positive samples. During a total of 27 5-hour fog sampling periods for all sites, ten wet deposition samples showed positive concentrations of parathion, of which only two were quantifiable (Table 7). In order to examine whether the low deposition values were reasonable, the potential fog water deposition rate on a fallout card for a given fog event was estimated using Wattle's (1984) model for fog water deposition rates on standard flat plates. In that field study, fog water deposition rates on standard flat plates ranging from 18 to 72 g m⁻² hr⁻¹ were related to fog density (LWC) measurements ranging from 0.5 to 0.20 g m⁻³, using a linear least squares fit. Wattle's equation was applied to fog water collection data in our study, yielding the estimated fog water deposition per fallout card sample during a fog event. The predicted concentration of parathion deposited was calculated from these figures. For the 27 wet fallout samples, 70% or 19 agreed qualitatively (positive or negative) with predicted results. Seven samples were over-predicted while only one case of under-prediction occurred (site 3, January 28). Generally, predicted values were much higher than those actually found for samples which contained parathion.

Eleven dry fallout card samples from site 1, and 12 each from sites 2 and 3 were collected and analyzed for parathion deposition (Table 7). Only 10 out of 35 samples contained parathion, 8 in quantifiable amounts. Site 3 contained three times the number of positive samples found at the other sites

Table 7. Parathion concentrations measured on fallout cards at three sites in Stanislaus County, January 1989

Sample Date	Sample Type	Parathion Residues		
		Site 1	Site 2	Site 3
------(μ g)-----				
1/3	Wet	ND ^a (<1.0) ^b	ND (<1.0)	-- ^c
1/4	Wet	ND (<1.0)	ND (<1.0)	ND (<1.0)
1/19	Wet	ND (2.5)	Tr ^d (1.7)	Tr (2.6)
1/20	Wet	ND (2.4)	Tr (1.5)	Tr (4.6)
1/21	Wet	Tr (2.6)	ND (2.4)	1.1 (1.9)
1/22	Wet	1.0 (2.8)	Tr (3.0)	Tr (1.6)
1/26	Wet	ND (1.5)	ND (1.2)	ND (<1.0)
1/27	Wet	ND (<1.0)	--	--
1/28	Wet	ND (<1.0)	ND (<1.0)	1.3 (<1.0)
1/31	Wet	ND (<1.0)	ND (<1.0)	ND (1.1)
1/6	Dry	ND	ND	ND
1/9	Dry	2.2	ND	2.0
1/12	Dry	ND	ND	1.3
1/14	Dry	ND	ND	ND
1/15	Dry	ND	ND	ND
1/16	Dry	ND	ND	ND
1/18	Dry	ND	1.1	8.8
1/24	Dry	ND	ND	ND
1/25	Dry	Tr	ND	1.0
1/27	Dry	--	2.8	1.7
1/29	Dry	ND	ND	ND
1/30	Dry	ND	ND	Tr

^aNot detected. Minimum detection limit was 1.0 μ g.

^bPredicted deposition quantity during fog periods.

^cNot sampled.

^dChemical analysis showed trace amount which was not quantifiable.

and had the highest dry deposition value, 8.8 μg , which occurred on January 18 immediately after or during application of parathion within 0.4 km.

For the purpose of statistical analysis, samples were considered either positive or negative, with trace amounts treated as positive. Chi-square tests were calculated on three different two-by-two tables constructed from this data. Site 3 had significantly more total (wet and dry) positive samples than sites 1 and 2 combined. For the three sites combined, there was no significant difference between the proportions of wet and dry positive samples. And for site 3 alone, there was also no difference between the proportions of wet and dry positives.

An analysis of the relationship between the parathion deposited on fallout card samples and the parathion accumulated on dill samples was not performed because of the lack of surface area measurements for the dill. Even if these measurements had been available, it is unlikely that a reliable comparison could have been made due to the differences between the two sampling media. Vegetation variables including leaf surface morphology, non-uniformity of canopy, height above ground, and surface wetness significantly affect dry deposition rates (Sehmel 1980). The problems associated with measuring dry deposition on artificial surfaces for useful correlation with natural surface deposition processes are comprehensively reviewed by Hicks (1986).

SUMMARY AND CONCLUSIONS

This investigation found evidence to support both regional and local transport mechanisms for inadvertent pesticide residues found on vegetation samples.

Parathion concentrations in dill, which were higher at site 3 (where local applications within a 0.4 km buffer zone were allowed) than at the other sites where it was prohibited, provide evidence of local transport effects. The high concentrations of diazinon found in dill samples at site 3 after large nearby applications (within 0.4 km) also indicates local post-application movement as the most likely cause, but regional (outside 0.4 km) sources and translocation cannot be ruled out.

Regional transport of pesticides was shown by the presence of methidathion in dill samples at all sites while no application of that pesticide occurred within the buffer zone of any site. Moreover, parathion, diazinon and chlorpyrifos were found in dill samples at sites which did not have those pesticides applied within the buffer zone. Parathion was also found on fallout cards at sites 1 and 2, and in greater amounts at site 3. Results suggest that regionally transported pesticides are deposited on dill, and that local pesticide applications within the 0.4 km buffer zone increase deposition.

Fog appears to play some role in the deposition of pesticide residues. Pesticides were found in all fog water samples collected during the study. The range in concentration was comparable to levels found in Central Valley fogs by other researchers. Compared to sites 1 and 2, the mean amount of diazinon in fog water per fog event was greatest at site 3, which also had the greatest dill residue accumulation and highest local application rate. The same was true for chlorpyrifos at site 1, in comparison to sites 2 and 3. This suggests local applications influence fog water concentrations of these two pesticides. However, virtually no differences among sites were observed

for mean parathion levels in fog water even though only site 3 had received local applications. Thus, the greater amount of parathion in dill at site 3 appears to be independent of fog concentrations. Methidathion had the lowest concentration in fog water at all sites, most likely due to the lack of local applications within the buffer zone of any site and low usage throughout the study area.

Pesticide concentrations in dill increased most notably during the later half of the investigation which contained most of the fog events. Regional application during that period could also be responsible for the increased deposition. Comparison of vegetation sampling intervals with and without fog showed generally greater mean increases in pesticide residue accumulation on dill during intervals containing fog. The major exception to this was the increased accumulation of diazinon on dill at site 3 during non-fog intervals (which, again, appeared to have come from a large local application).

The increase in pesticide residue per dill sampling interval due to fog, predicted assuming a 40 g water-holding capacity of each dill sample, accounted for part, but not all, of the observed accumulation. The remainder is believed due to dry deposition.

Dry deposition clearly contributes to vegetation residues since accumulation on vegetation was seen during the period from January 7 through January 18 when no fog events occurred. Moreover, parathion was found on fallout cards on non-fog days. Approximately equal proportions of wet and dry fallout samples were positive for parathion.

We found local (within 0.4 km) and regional (outside 0.4 km) transport of pesticides in both fog and air to be important mechanisms contributing to inadvertent pesticide deposition on vegetation. The complexity in clearly defining which process is responsible for a particular deposition episode stems from the numerous interacting variables which influence deposition. The chemical and physical properties of the pesticide, the application quantity and location relative to the site of interest, local and regional meteorological factors, and vegetation variables all contribute in determining how far and how much pesticide will be deposited.

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APPENDIX I

METHIDATHION APPLICATIONS AND WIND DATA

Table I-1. Methidathion applications within different radii of study site 1, Stanislaus County, January 1989

I-I

Date	<1.6 km NW	<3.2 km NW	<4.8 km NW	<6.4 km NW	<12.9 km NW	<1.6 km SE	<3.2 km SE	<4.8 km SE	<6.4 km SE	<12.9 km SE
------(kg ai)-----										
1/2/89 ^a								3.6	3.6	76.2
1/3/89								3.6	3.6	76.2
1/4/89										
1/5/89										
1/6/89										
1/7/89										
1/8/89										
1/9/89										11.9
1/10/89										23.8
1/11/89										23.8
1/12/89		10.2	10.2	10.2	14.7					11.9
1/13/89		20.4	20.4	20.4	24.9					
1/14/89		10.2	10.2	10.2	10.2					
1/15/89										
1/16/89					2.3					27.2
1/17/89					60.7					41.0
1/18/89					95.5					27.5
1/19/89				7.9	88.2					27.5
1/20/89				7.9	87.8			3.0	3.0	44.8
1/21/89				4.6	49.8			6.0	6.0	49.1
1/22/89				4.6	13.1			3.0	3.0	26.1
1/23/89				4.6	39.1					24.4
1/24/89				4.6	52.7					24.9
1/25/89					34.8			3.0	3.0	11.6
1/26/89					55.0		3.4	6.4	6.4	8.9
1/27/89					69.1		7.0	7.0	7.0	20.4
1/28/89					79.5		3.6	3.6	5.9	16.4
1/29/89					46.9				2.3	2.3
1/30/89					63.3					
1/31/89					86.6					5.0
Total:		40.8	40.8	75.0	974.2		14.1	39.5	44.0	581.4

^aTwenty-four period ending at noon on this date.

Table I-2. Methidathion applications within different radii of study site 2, Stanislaus County, January 1989

Date	<1.6 km NW	<3.2 km NW	<4.8 km NW	<6.4 km NW	<12.9 km NW	<1.6 km SE	<3.2 km SE	<4.8 km SE	<6.4 km SE	<12.9 km SE
	----- (kg ai) -----									
1/2/89 ^a							3.6	3.6	3.6	76.2
1/3/89							3.6	3.6	3.6	76.2
1/4/89										
1/5/89										
1/6/89										
1/7/89										
1/8/89										
1/9/89			11.9	11.9	11.9					
1/10/89			23.8	23.8	23.8					
1/11/89			23.8	23.8	23.8					
1/12/89			11.9	22.1	26.7					
1/13/89				20.4	24.9					
1/14/89				10.2	10.2					
1/15/89										
1/16/89									27.2	27.2
1/17/89					28.4				27.2	39.6
1/18/89					58.7					24.8
1/19/89					56.5					24.8
1/20/89				3.0	38.4					40.4
1/21/89				6.0	20.4					43.1
1/22/89				3.0	8.1					23.0
1/23/89					5.0					24.4
1/24/89					5.0					24.9
1/25/89				3.0	24.2					8.5
1/26/89			3.4	6.4	59.2					1.1
1/27/89			3.4	3.4	56.2		3.6	3.6	3.6	20.4
1/28/89					43.4		5.9	5.9	5.9	21.5
1/29/89					22.2		2.3	2.3	2.3	2.3
1/30/89					40.8					
1/31/89			5.0	5.0	45.8					5.0
Total:			83.3	142.3	633.7		19.1	19.1	73.5	478.6

^aTwenty-four period ending at noon on this date.

Table I-3. Methidathion applications within different radii of study site 3, Stanislaus County, January 1989

Date	<1.6 km NW	<3.2 km NW	<4.8 km NW	<6.4 km NW	<12.9 km NW	<1.6 km SE	<3.2 km SE	<4.8 km SE	<6.4 km SE	<12.9 km SE
	------(kg ai)-----									
1/2/89 ^a										76.2
1/3/89										76.2
1/4/89										
1/5/89										
1/6/89										
1/7/89										
1/8/89										
1/9/89										11.9
1/10/89										23.8
1/11/89										23.8
1/12/89					4.5	10.2	10.2	10.2	10.2	22.1
1/13/89					4.5	20.4	20.4	20.4	20.4	20.4
1/14/89					11.3	10.2	10.2	10.2	10.2	10.2
1/15/89					11.3					
1/16/89					2.3					27.2
1/17/89				5.2	50.9					33.1
1/18/89			5.2	12.5	93.7					11.7
1/19/89		7.9	13.2	33.3	119.3					11.7
1/20/89		7.9	7.9	35.8	124.5					12.2
1/21/89		5.0	5.0	14.8	101.6					9.4
1/22/89		5.0	5.0	5.0	51.3					3.0
1/23/89		5.0	5.0	5.0	54.6					
1/24/89		5.0	5.0	5.0	90.2					
1/25/89					63.5					3.0
1/26/89				10.4	84.1					8.9
1/27/89				10.4	83.8					15.4
1/28/89			10.9	22.2	100.2					11.8
1/29/89			10.9	22.2	77.6					2.3
1/30/89				40.8	87.1					
1/31/89				40.8	116.3					5.0
Total:		36.0	68.2	263.7	1332.7	40.8	40.8	40.8	40.8	419.5

I-3

^aTwenty-four period ending at noon on this date.

**Figure I-1. Methidathion concentration in dill samples and mass in fog
Site 1**

7-I

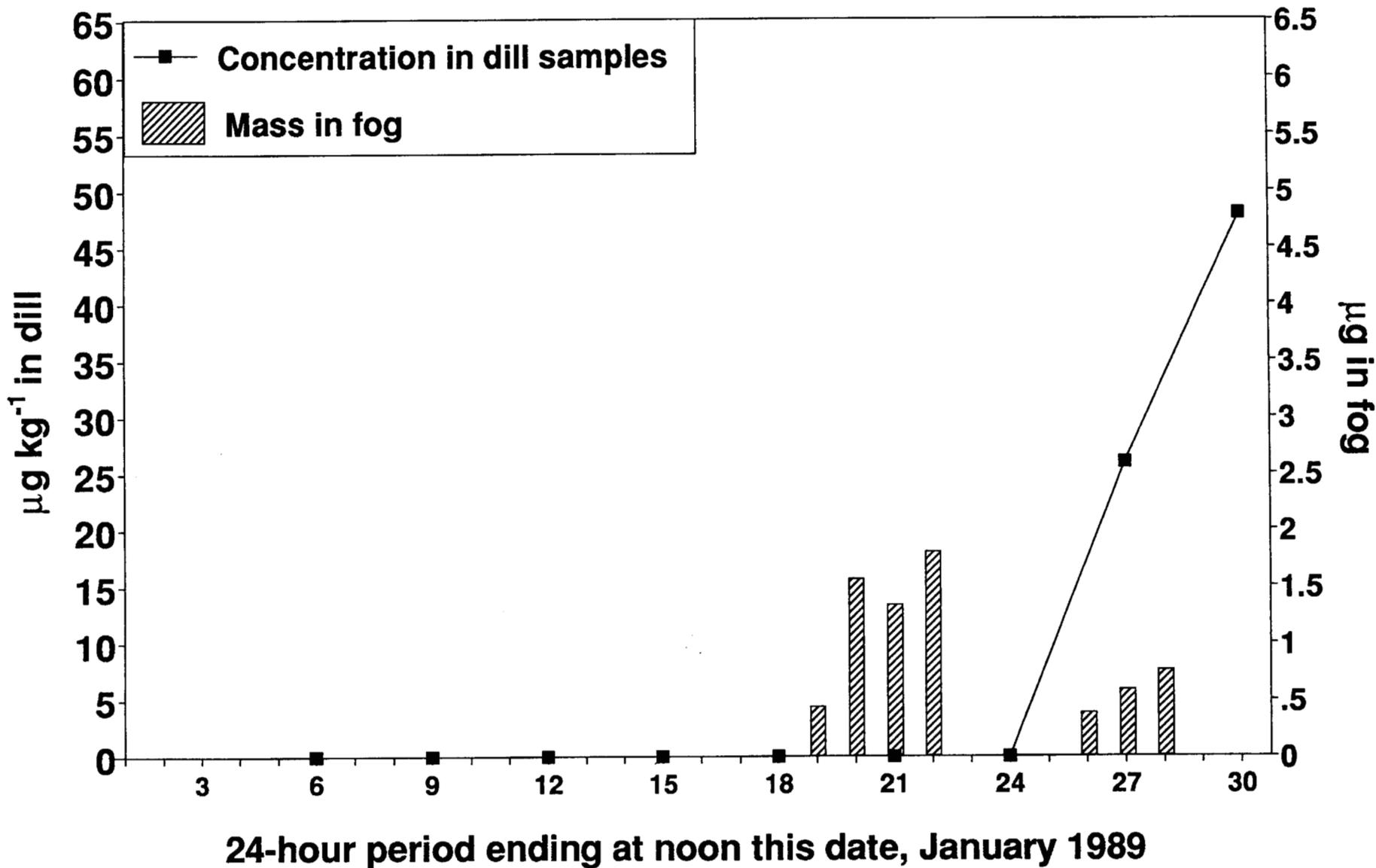


Figure I-2. Methidathion applications to the Northwest Site 1

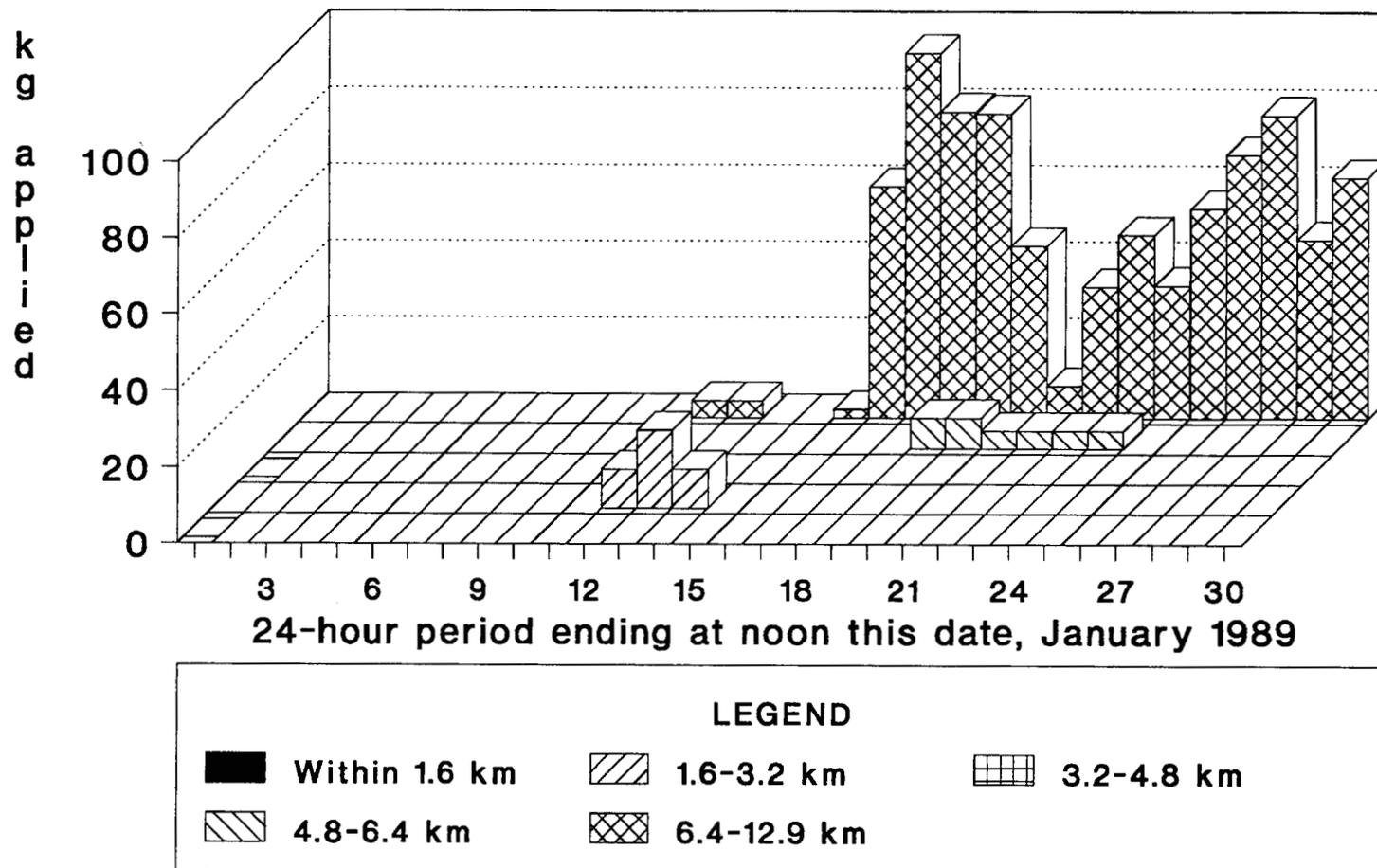
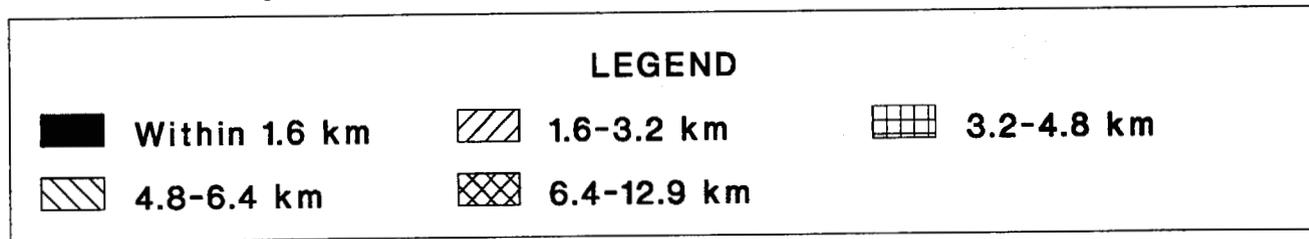
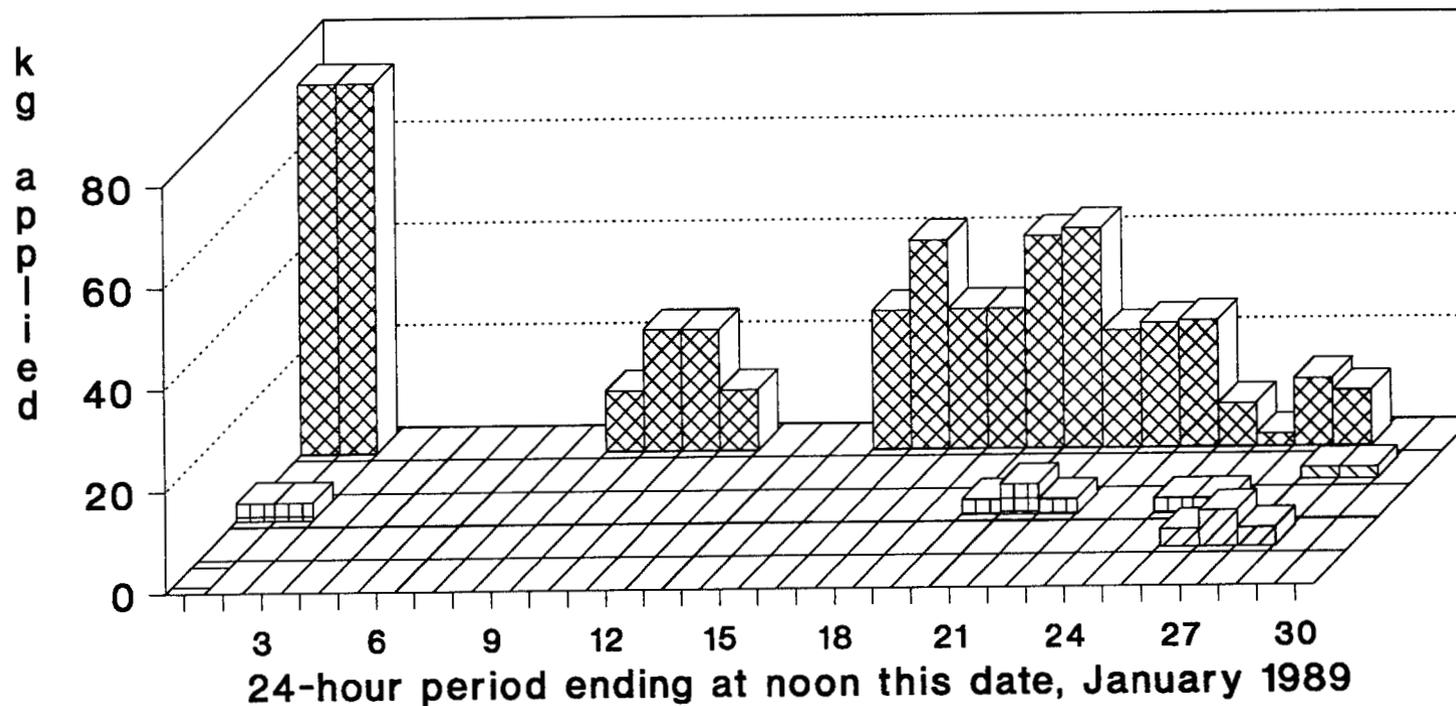


Figure I-3. Methidathion applications to the Southeast Site 1

9-I



**Figure I-4. Number of 15-minute intervals of wind from the Northwest
Site 1**

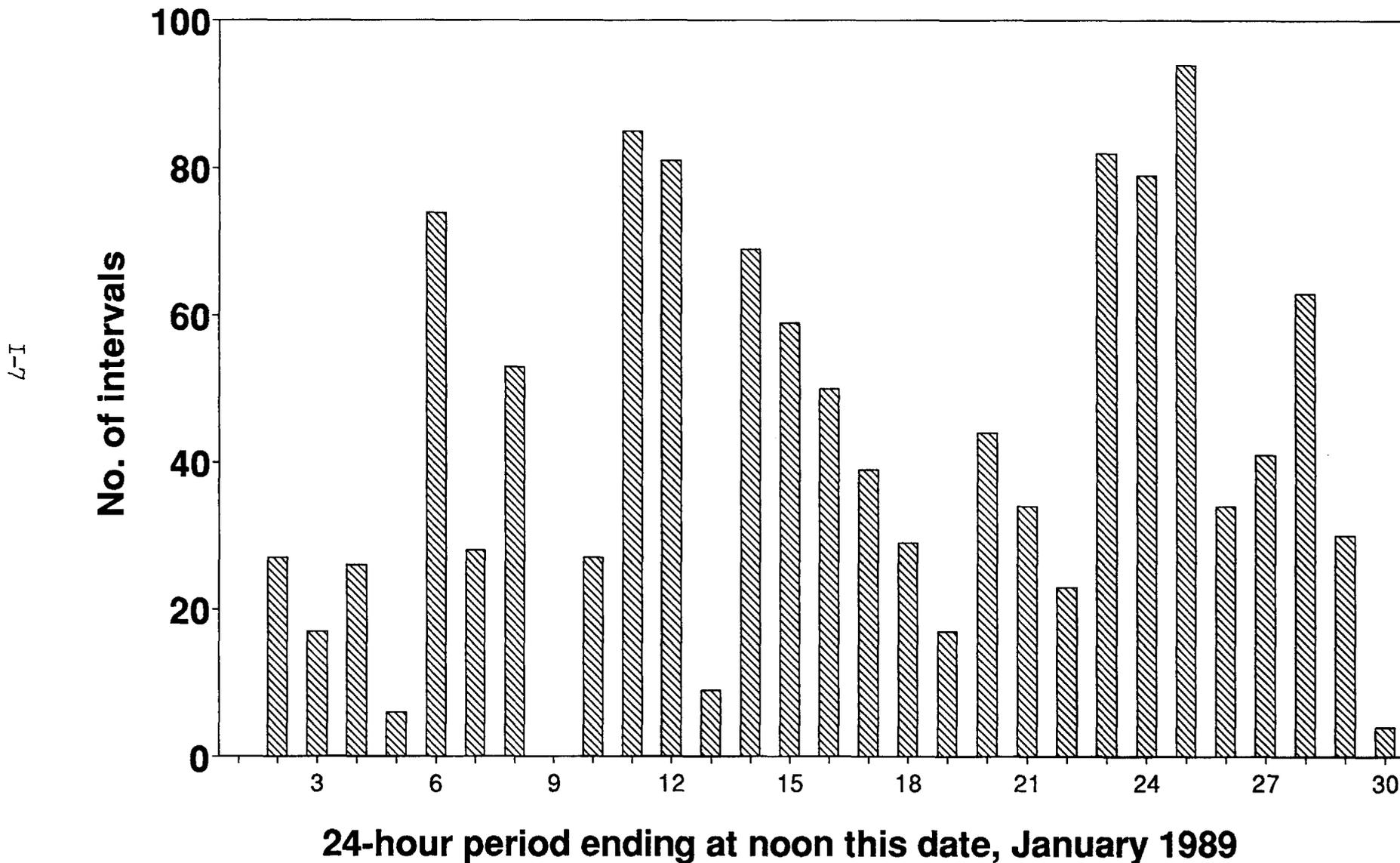


Figure I-5. Number of 15-minute intervals of wind from the Southeast Site 1

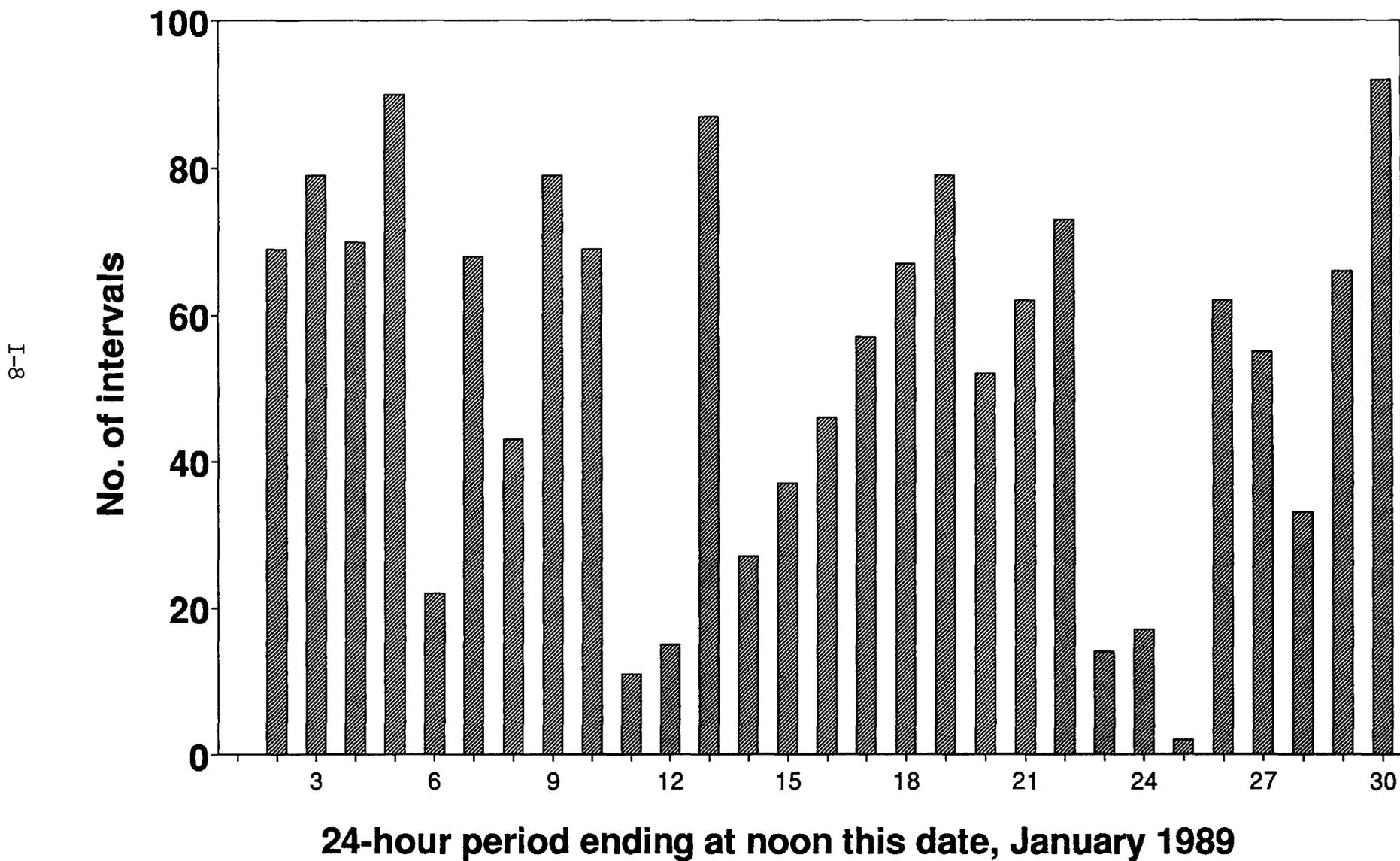


Figure I-6. Methidathion concentration in dill samples and mass in fog
Site 2

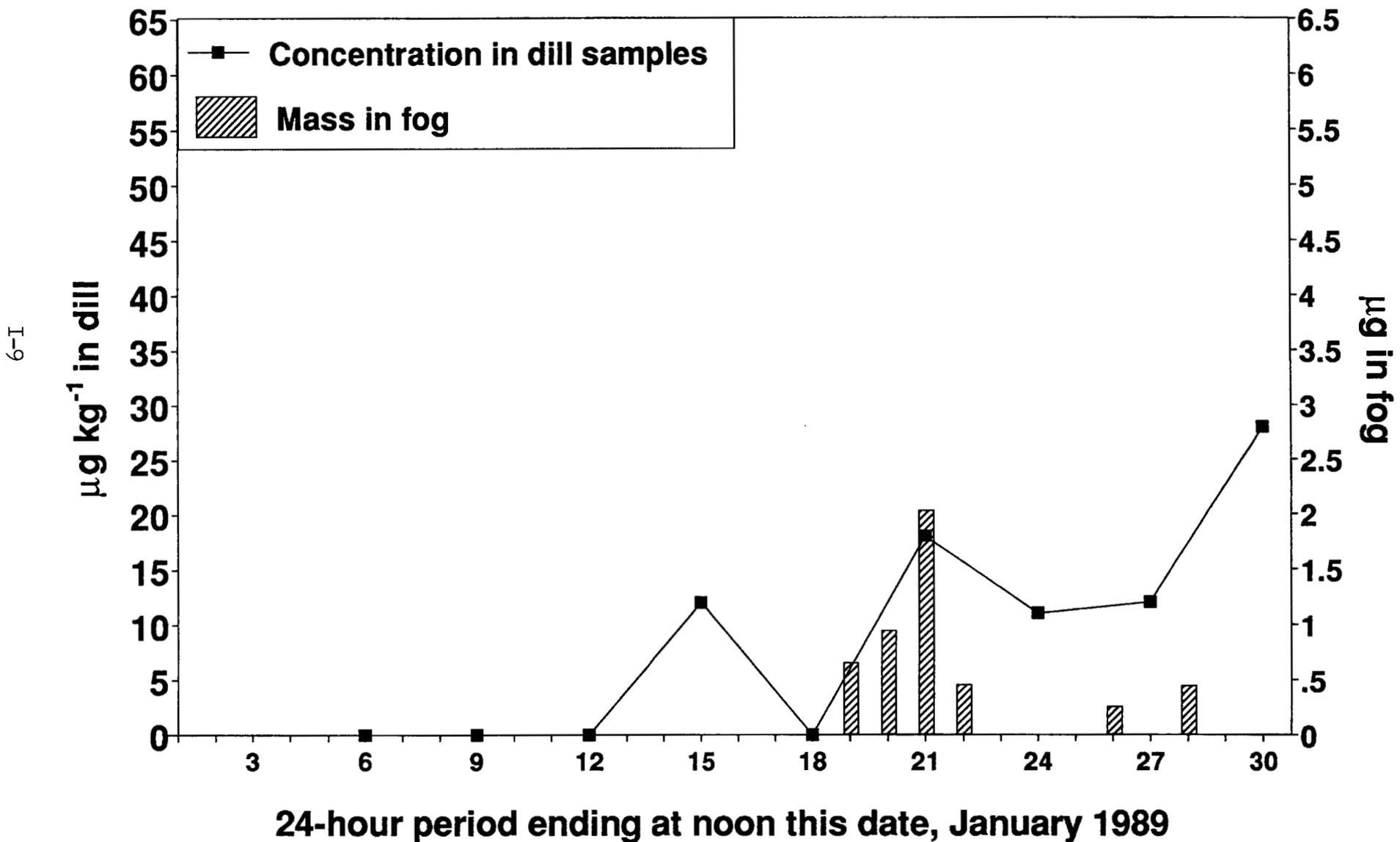


Figure I-7. Methidathion applications to the Northwest Site 2

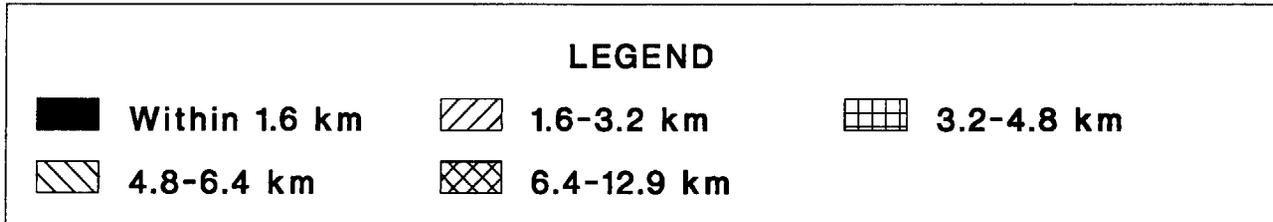
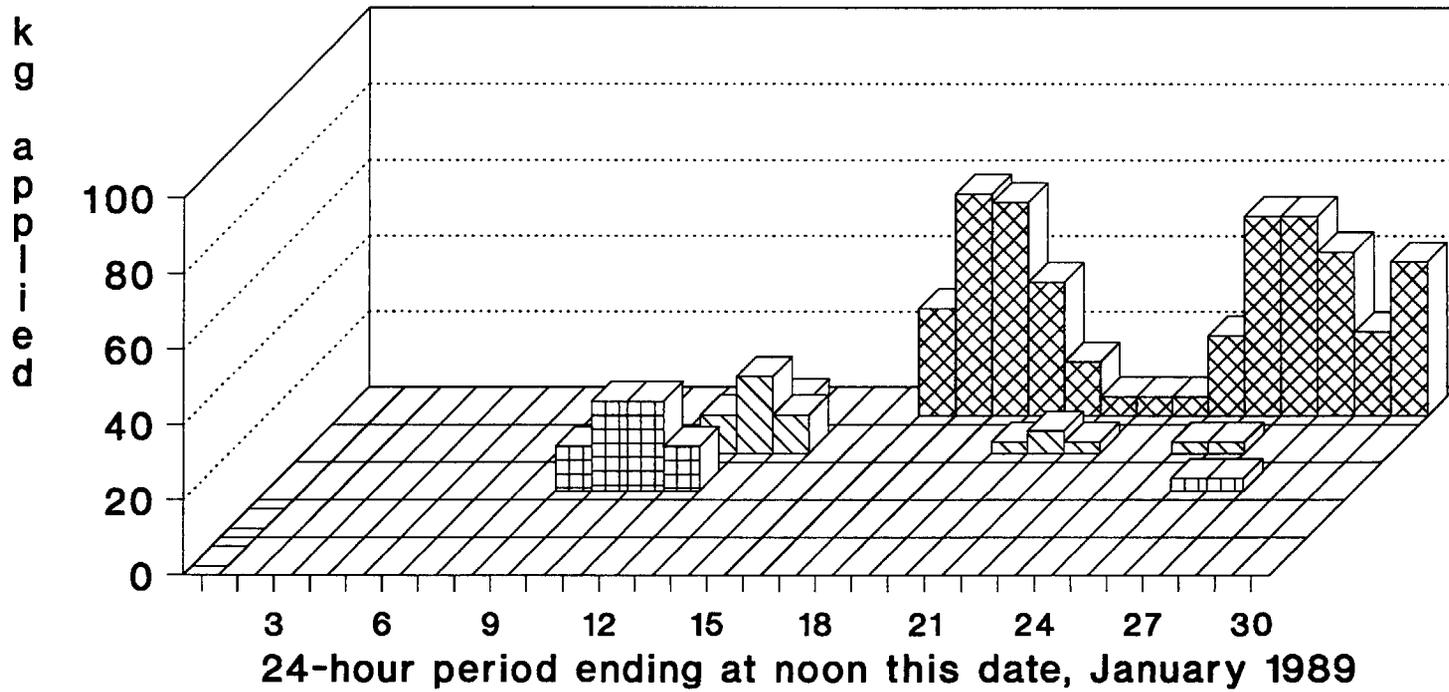
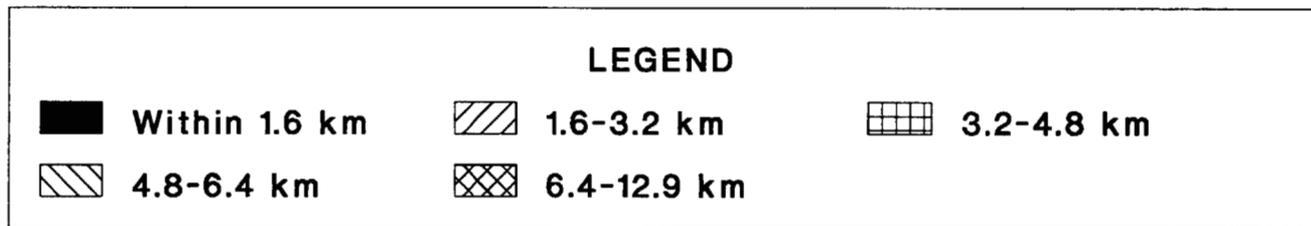
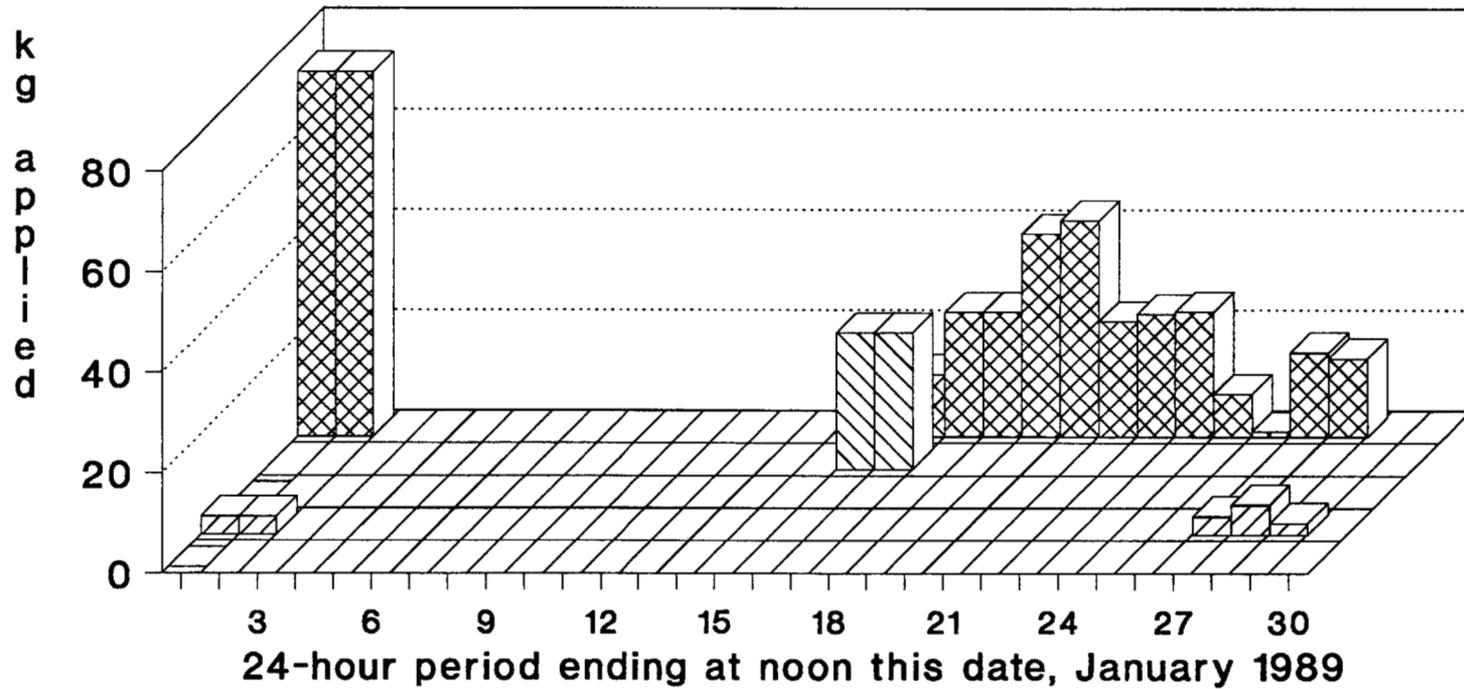


Figure I-8. Methidathion applications to the Southeast Site 2



**Figure I-9. Number of 15-minute intervals of wind from the Northwest
Site 2**

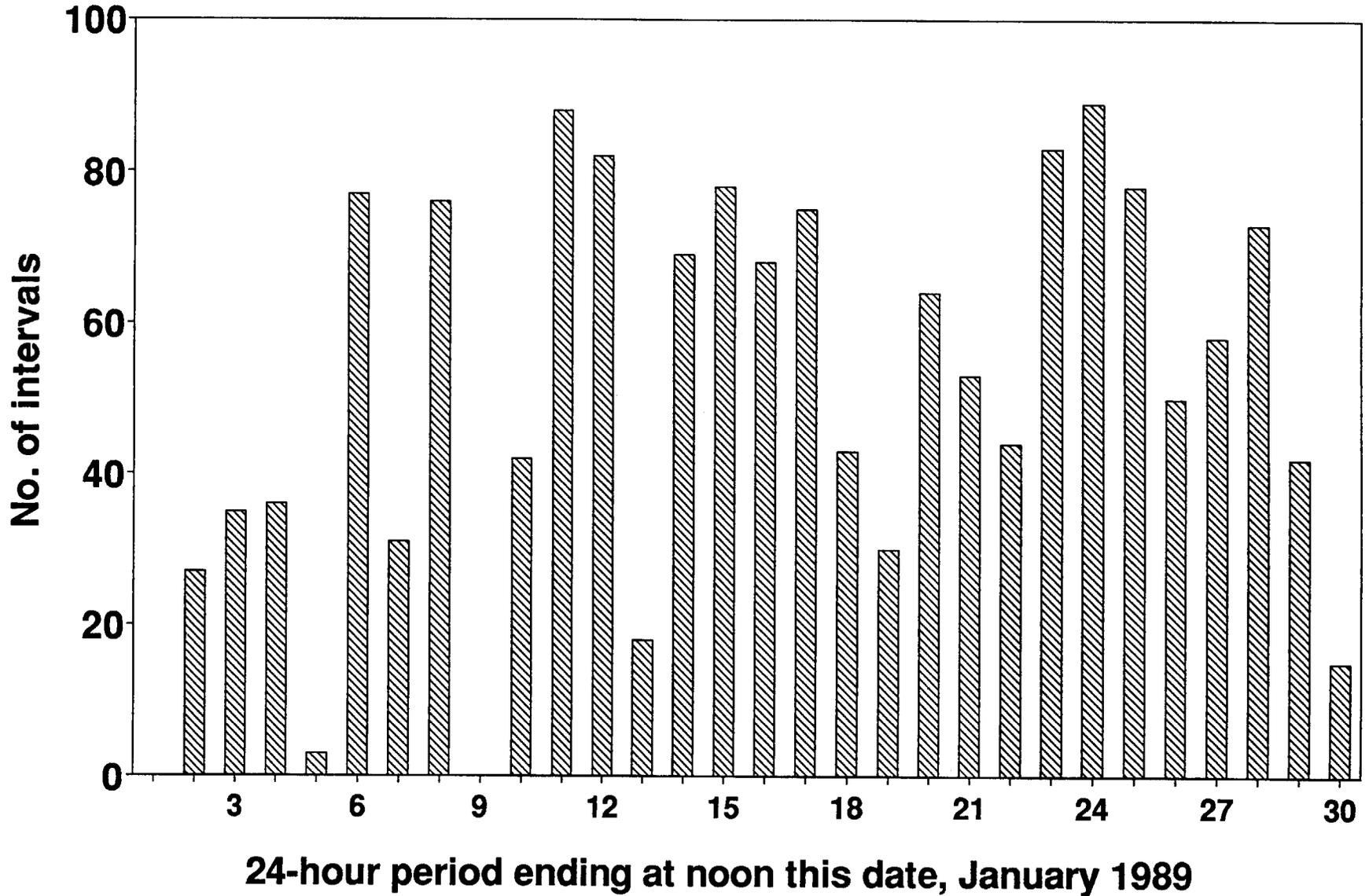
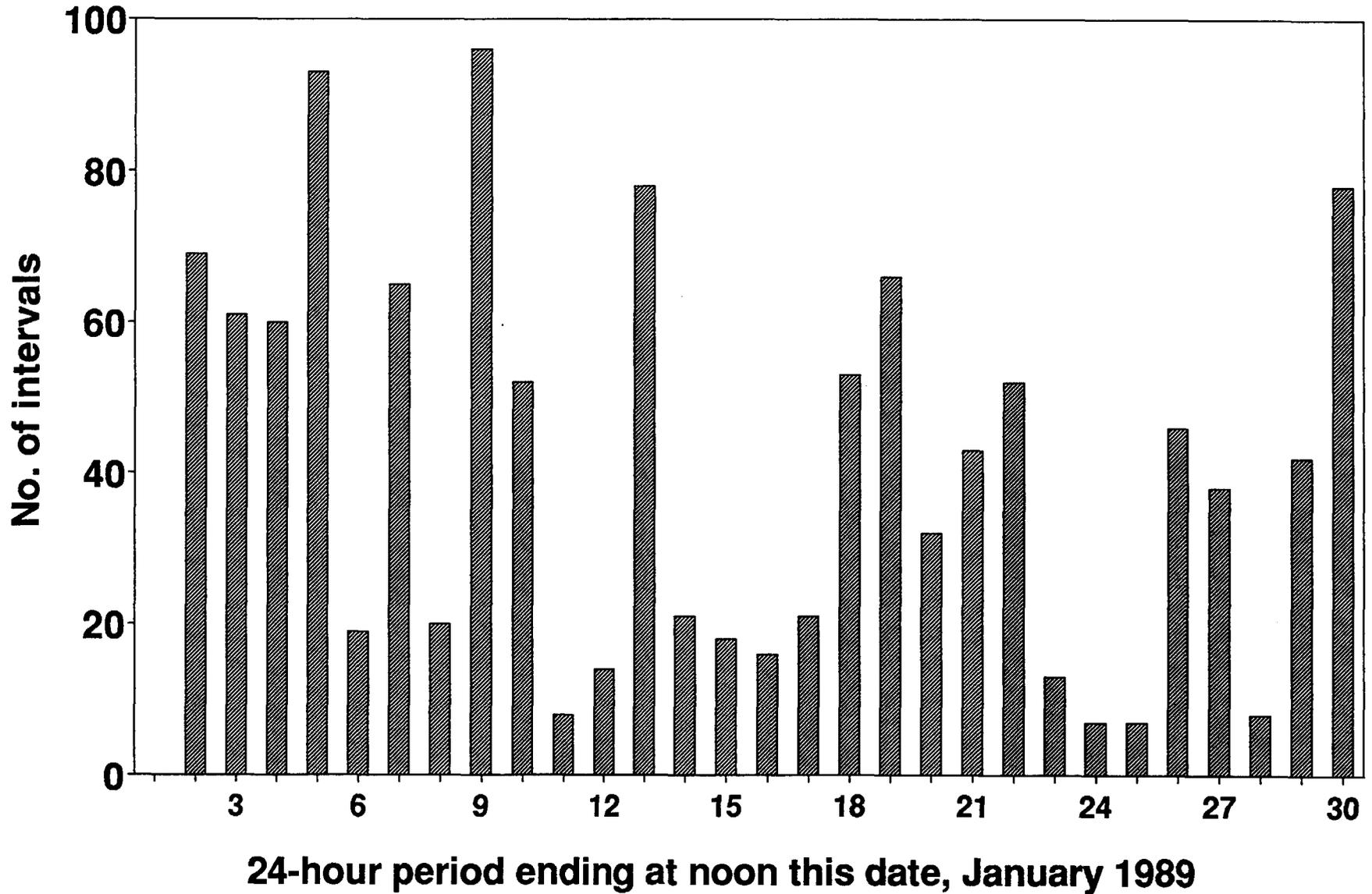


Figure I-10. Number of 15-minute intervals of wind from the Southeast Site 2



**Figure I-11. Methidathion concentration in dill samples and mass in fog
Site 3**

I-14

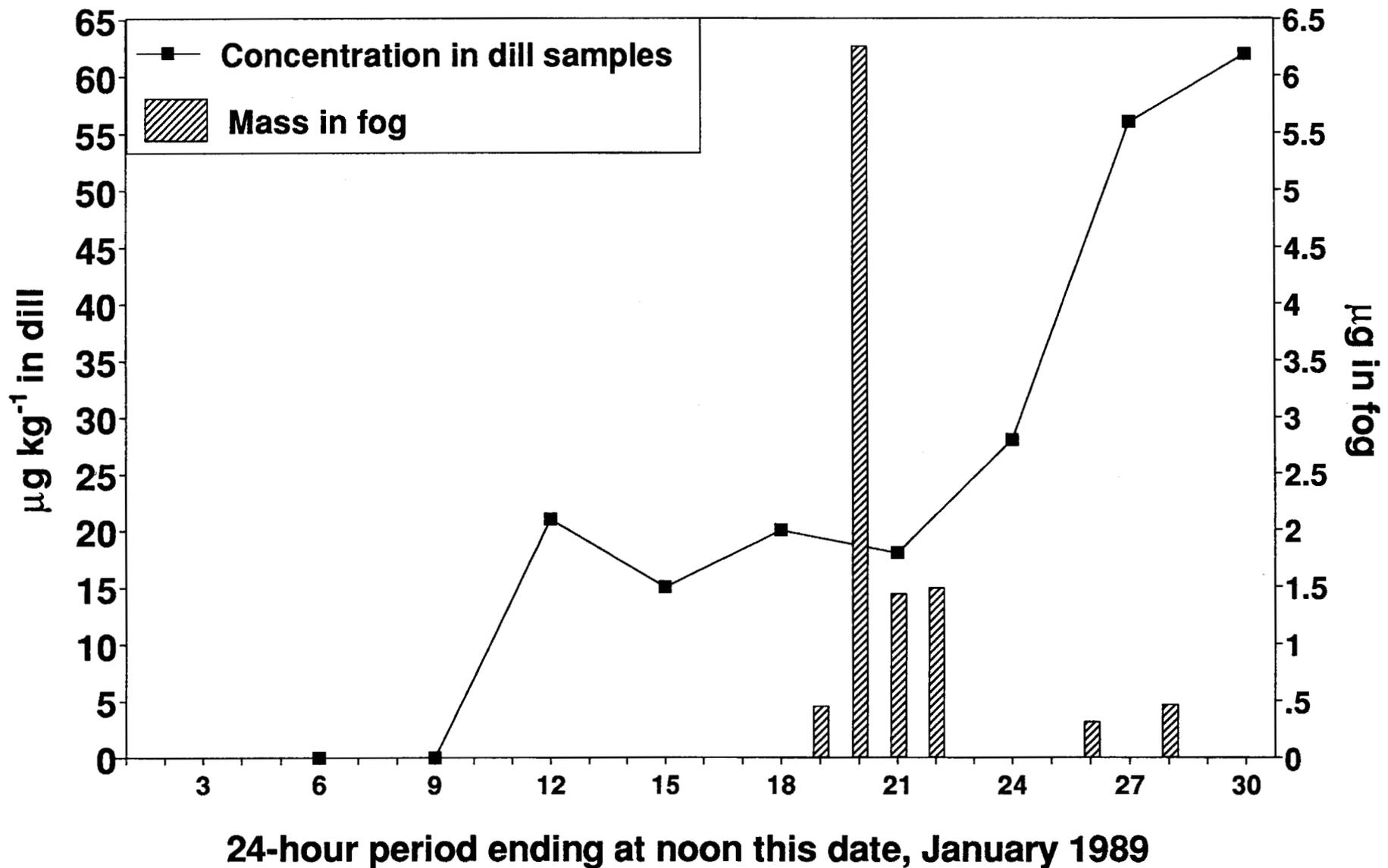


Figure I-12. Methidathion applications to the Northwest Site 3

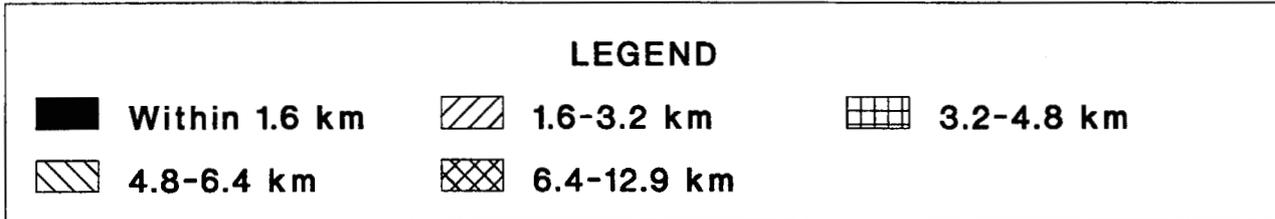
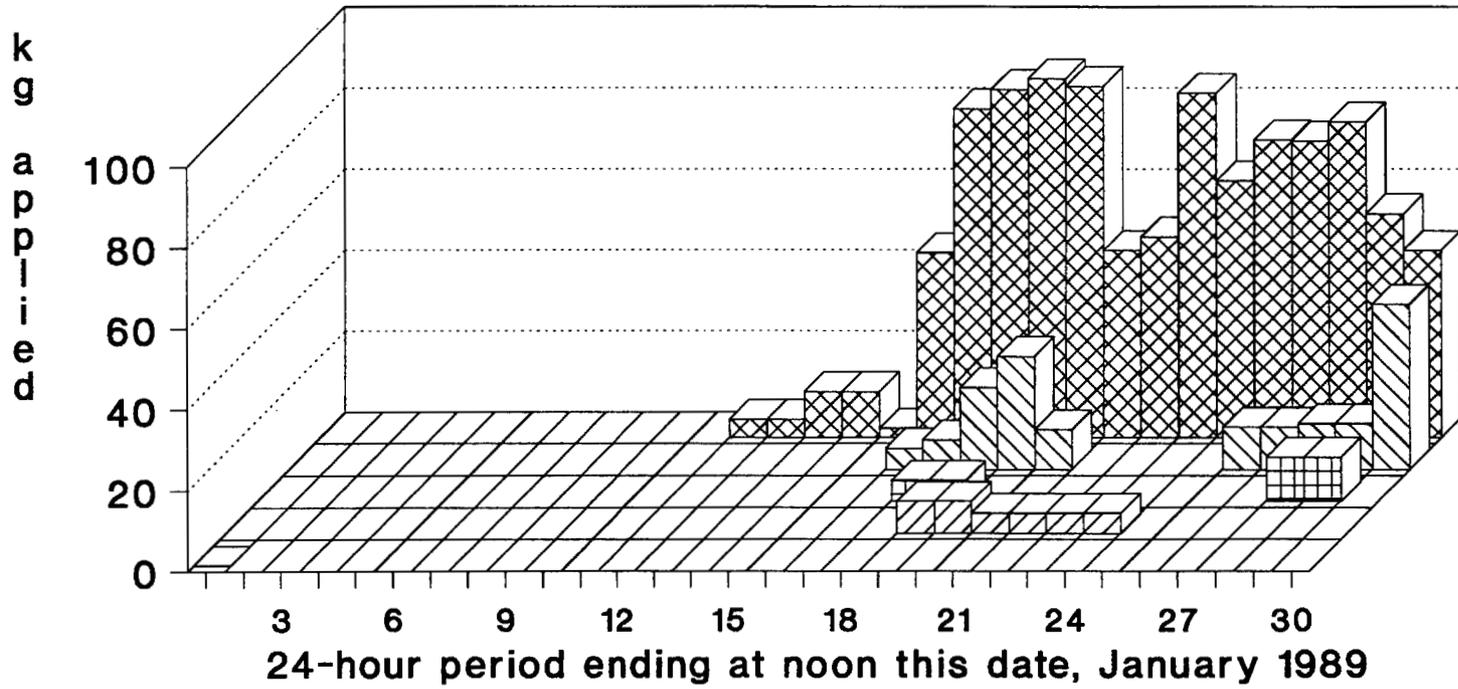
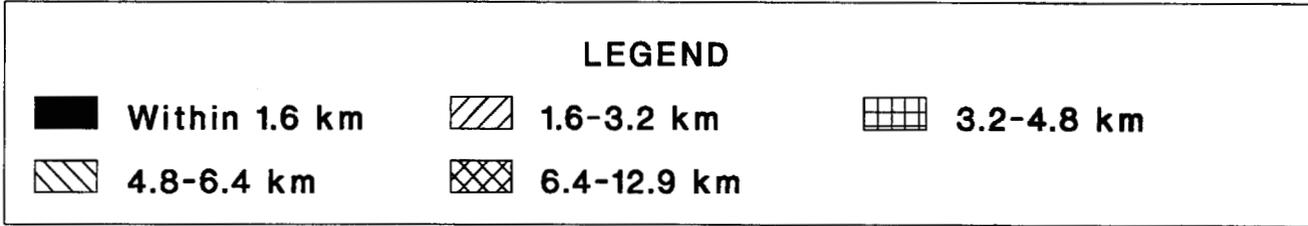
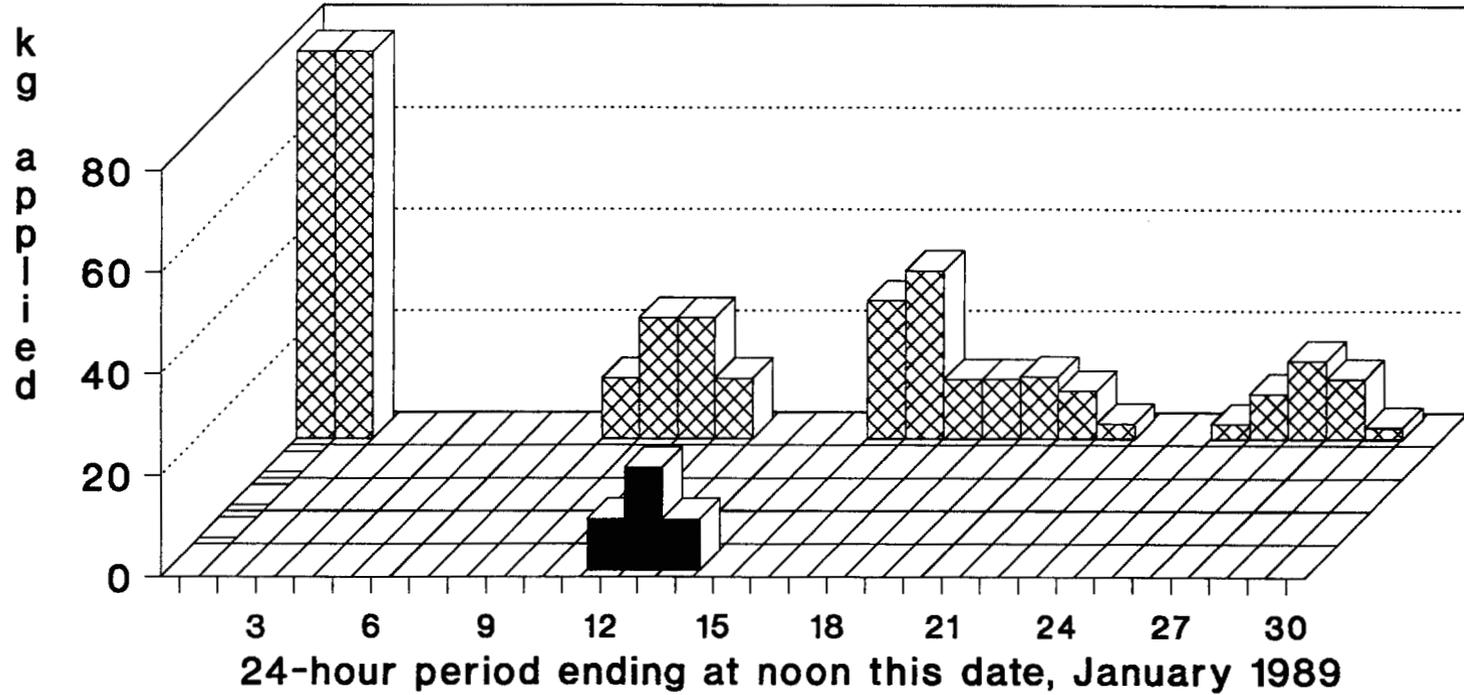


Figure I-13. Methidathion applications to the Southeast Site 3



**Figure I-14. Number of 15-minute intervals of wind from the Northwest
Site 3**

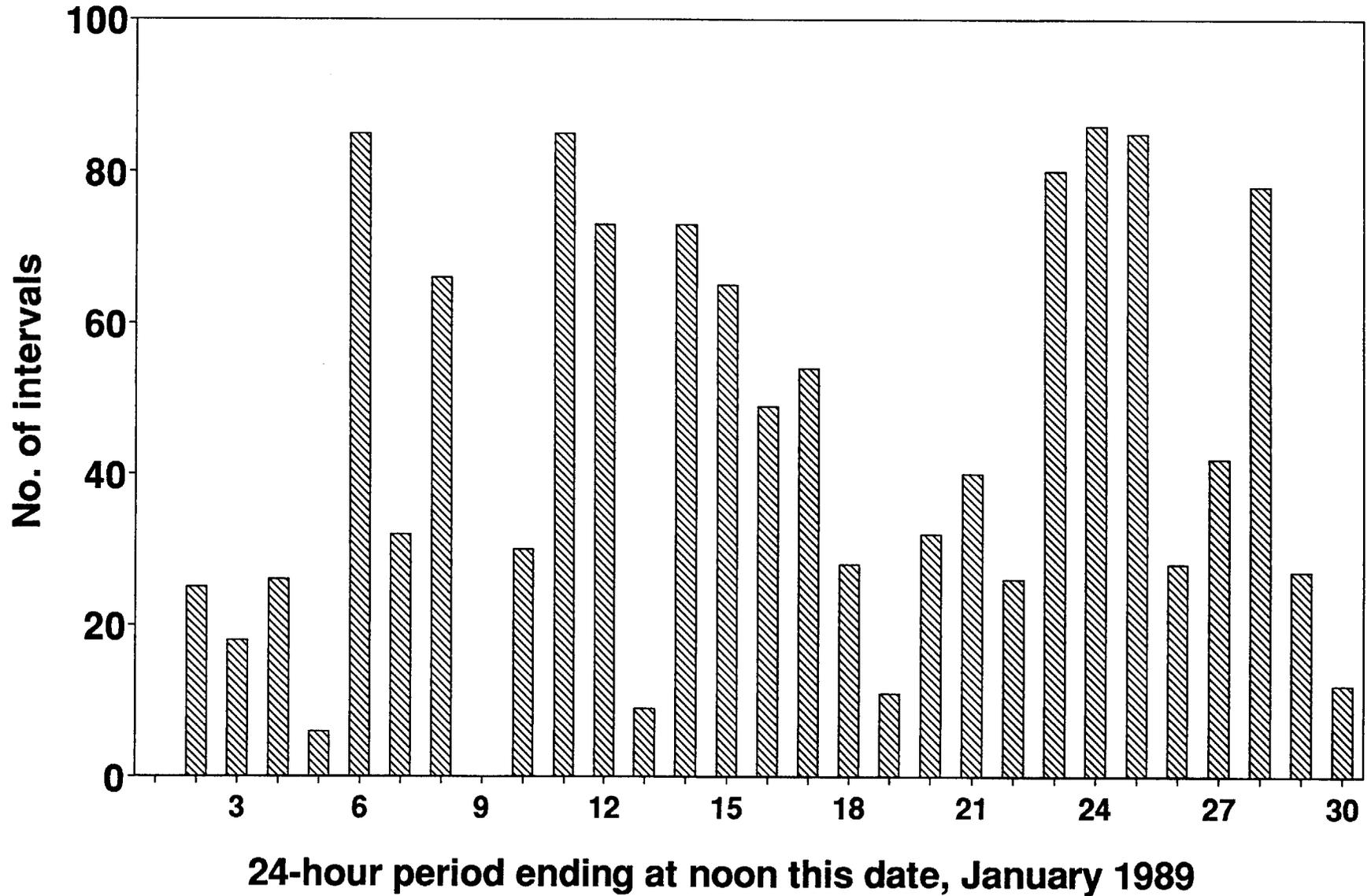
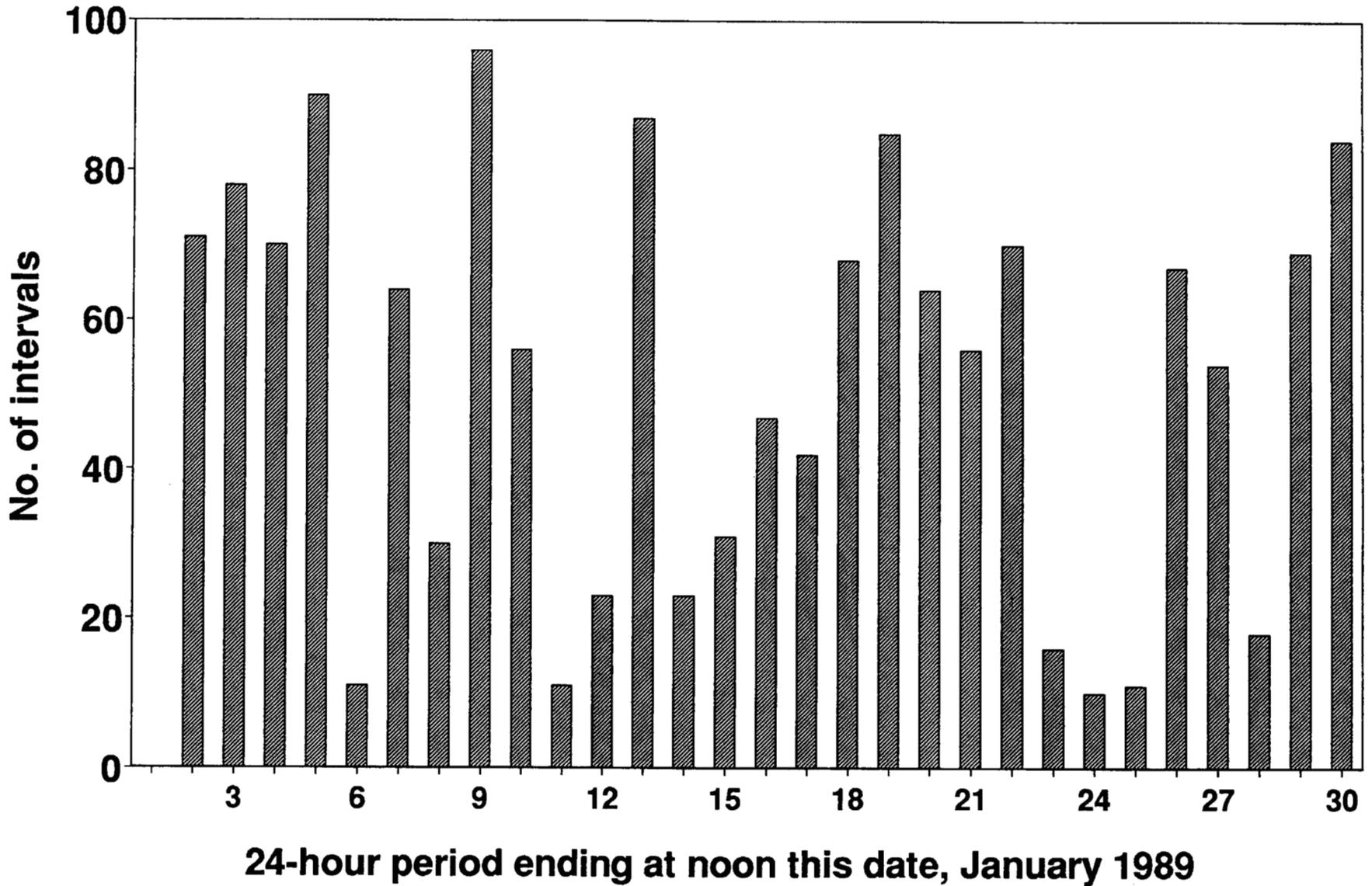


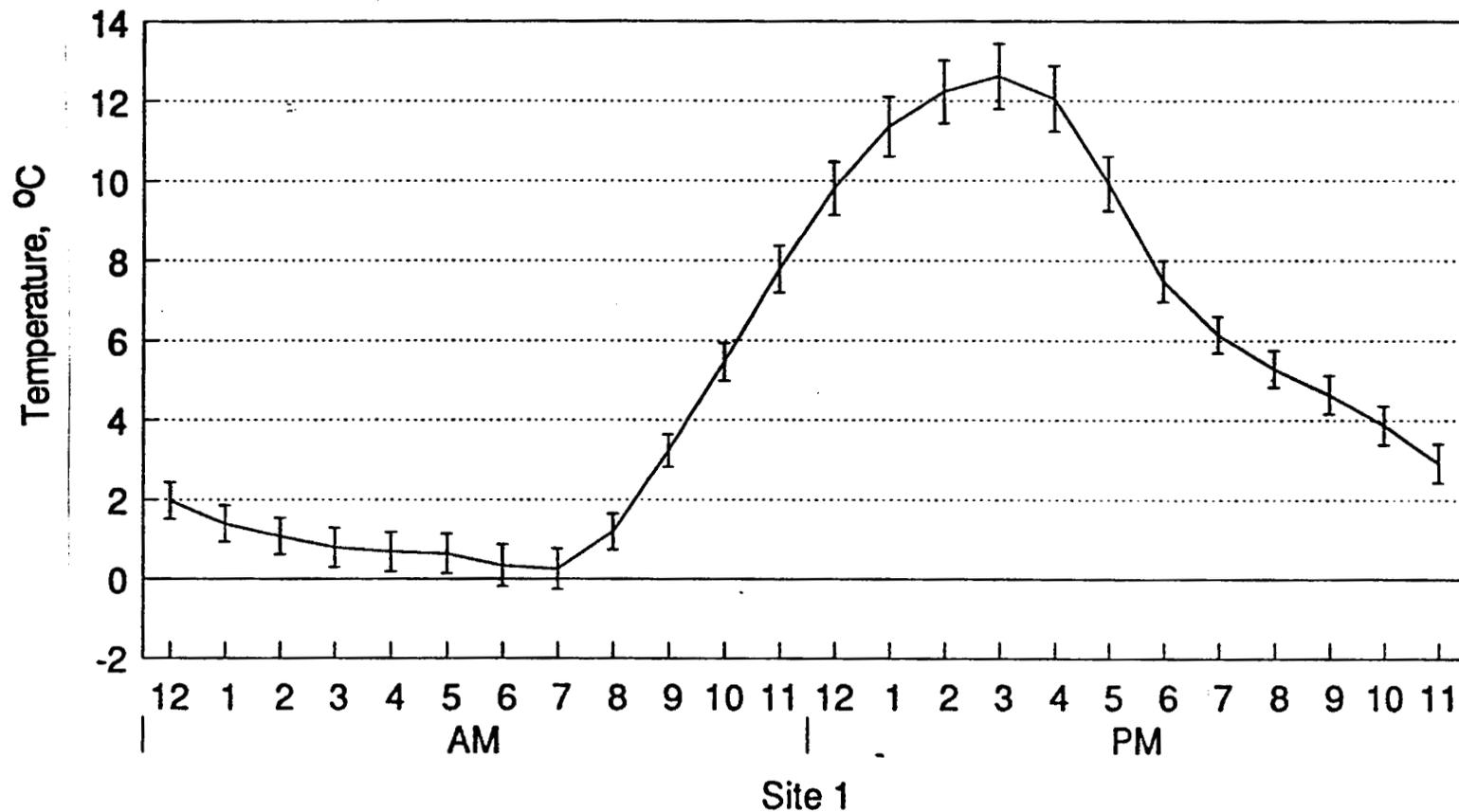
Figure I-15. Number of 15-minute intervals of wind from the Southeast Site 3



APPENDIX II

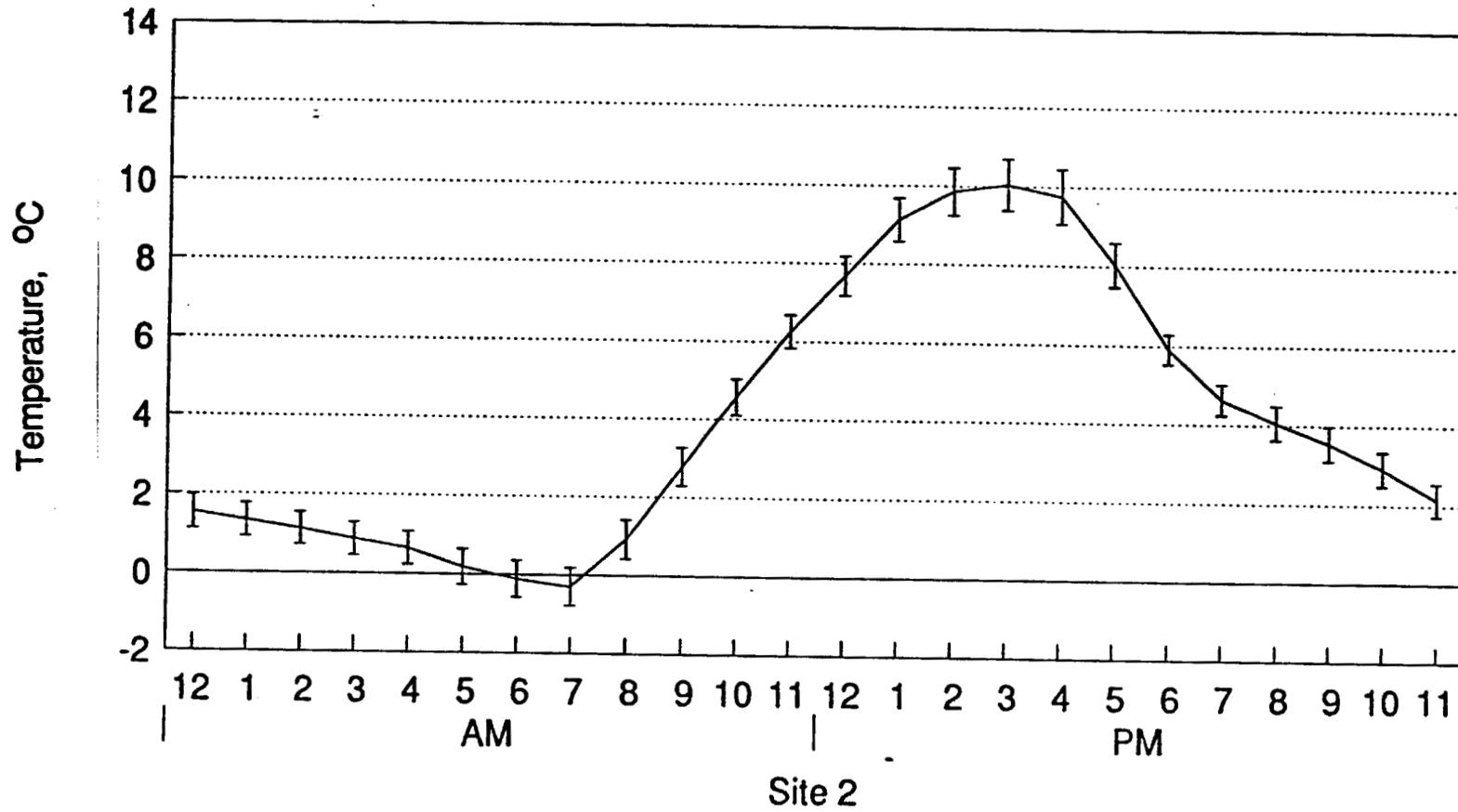
METEOROLOGICAL DATA

Figure II-1. Mean hourly temperature, Site 1, January 1989



I SE — Mean Temperature

Figure II-2. Mean hourly temperature, Site 2, January 1989



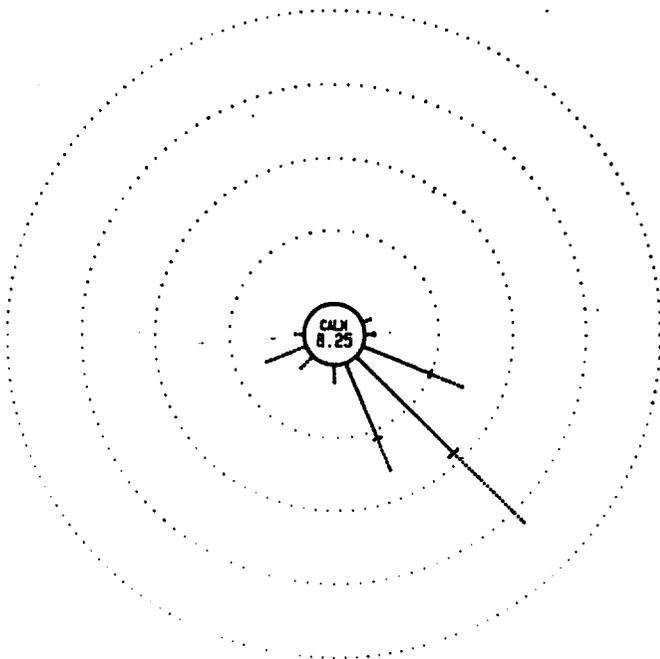
I SE — Mean Temperature

II-2

WINDROSE DATA

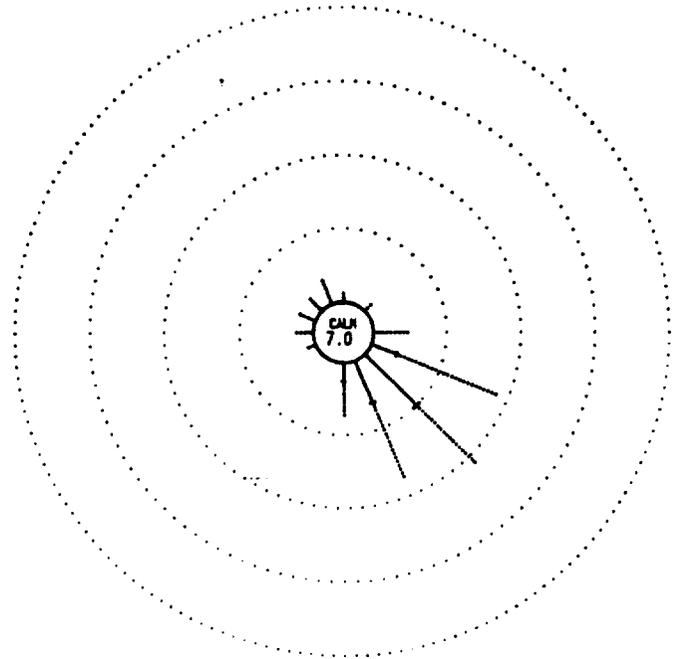
LEGEND: Each windrose represents wind speed and direction for one day during the study period. Day 1 at each site is January 2, Day 2 is January 3, and so on. Solid and dotted lengths of each vector represent wind speeds greater and less than 2.2 m s^{-1} (5 mph), respectively. Sixteen vectors represent the directions from which the wind is blowing. Each concentric ring of the windrose represents a 2-hour period, and the center circle shows the number of hours of no wind (wind less than 0.11 m s^{-1} (0.25 mph)).

Site1 day 1.



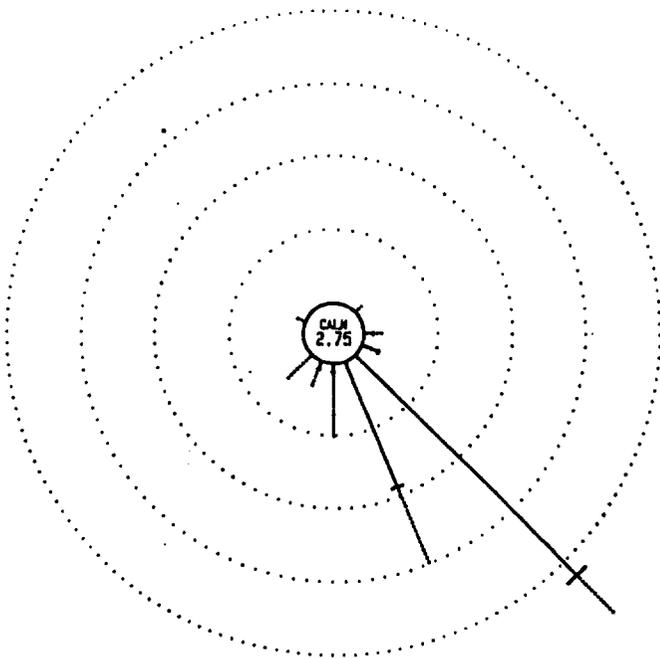
24.0 Total Hours.

Site1 day 2.



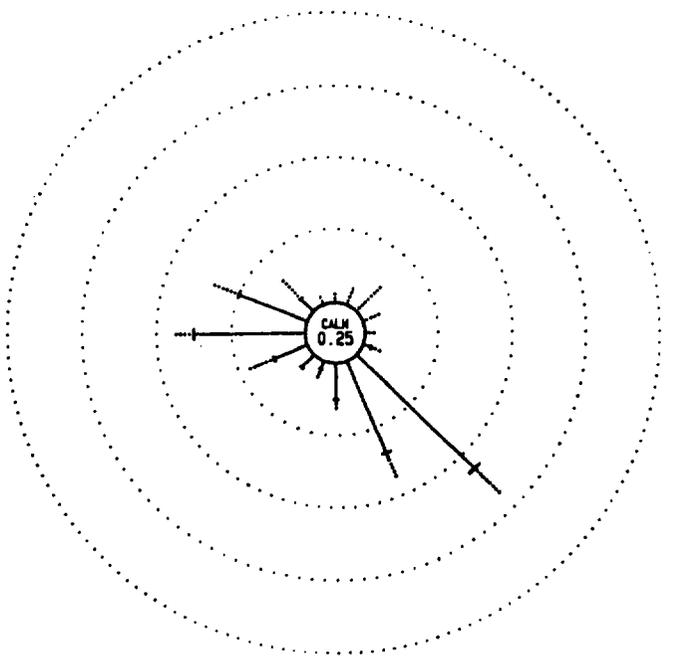
24.0 Total Hours.

Site1 day 3.



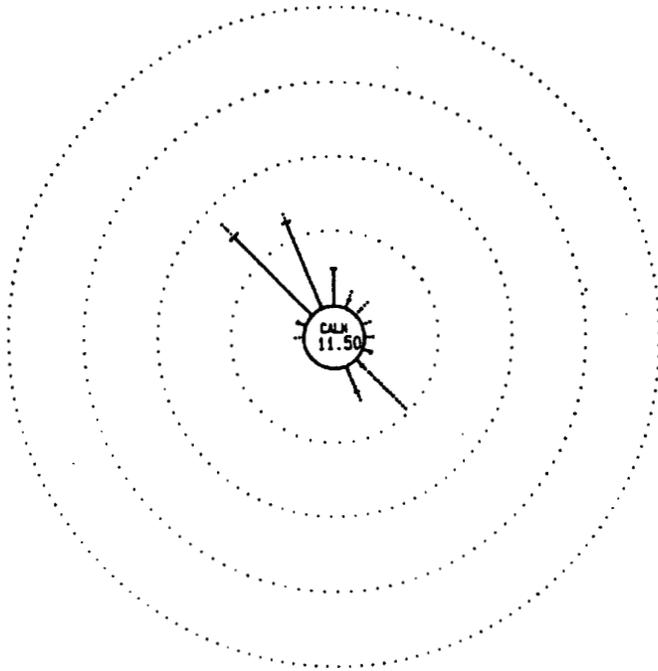
24.0 Total Hours.

Site1 day 4.



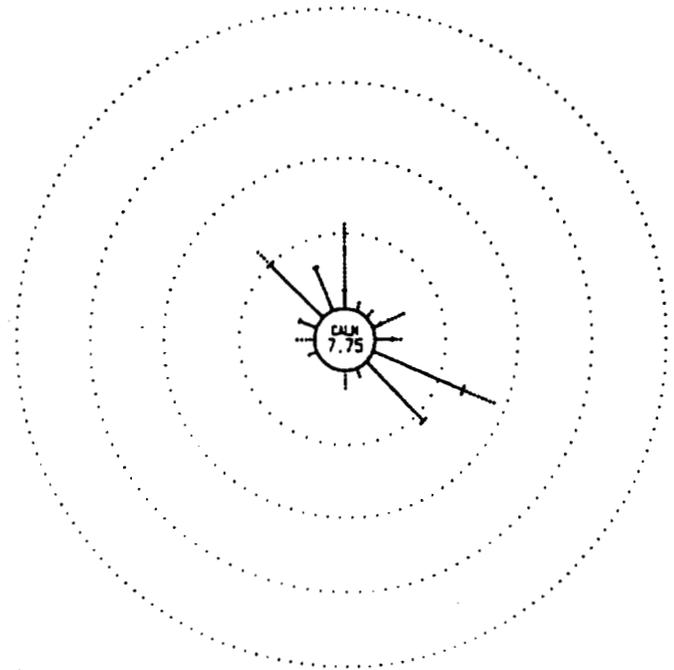
24.0 Total Hours.

Site1 day 5.



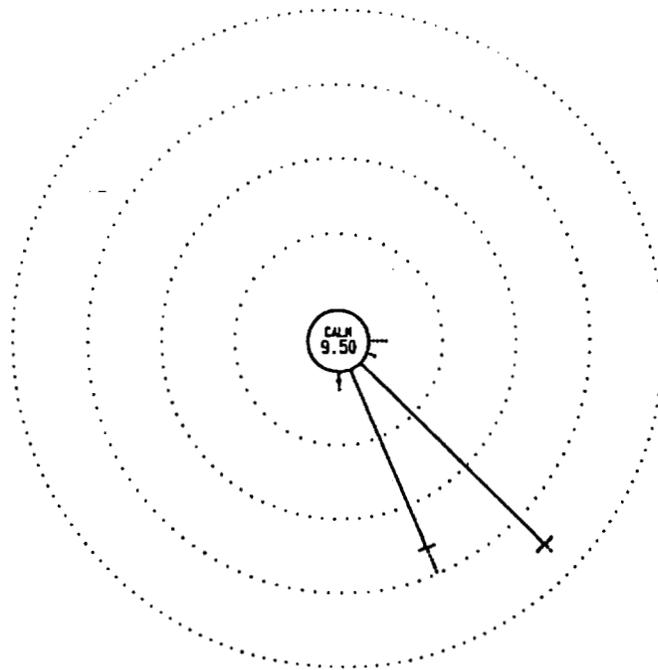
24.0 Total Hours.

Site1 day 6.



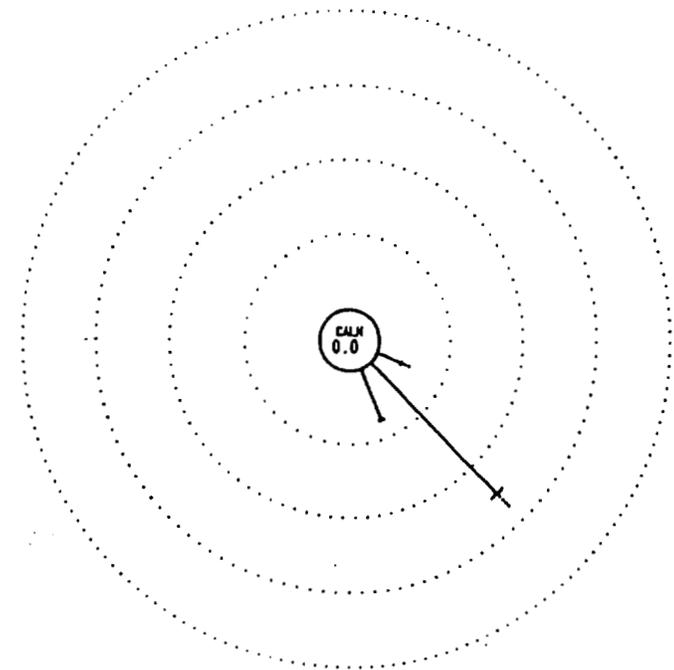
24.0 Total Hours.

Site1 day 7.



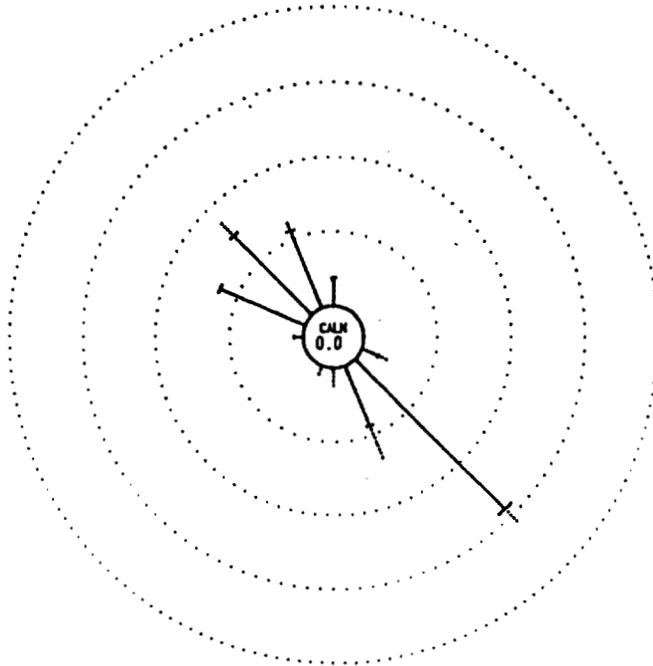
24.0 Total Hours.

Site1 day 8.



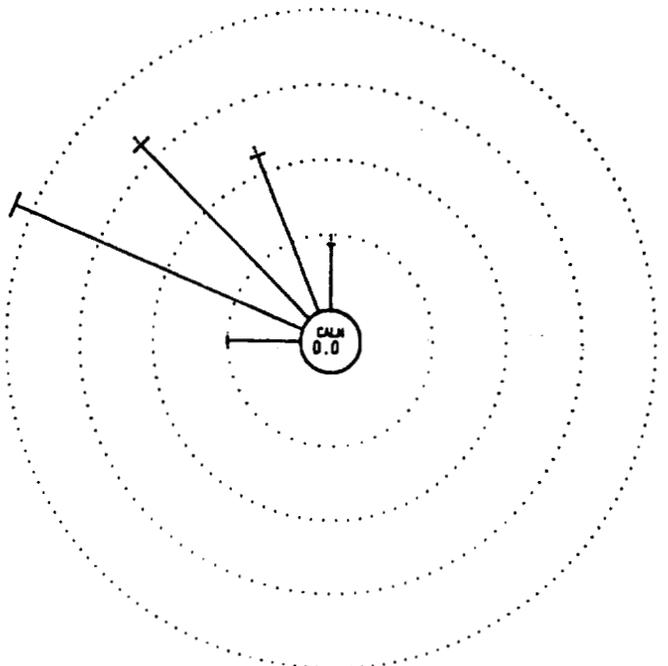
8.0 Total Hours.

Site1 day 9.



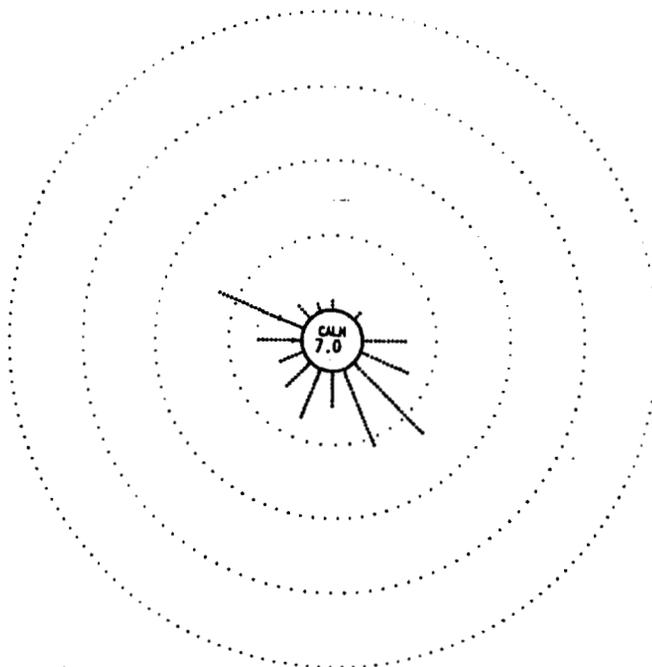
20.0 Total Hours.

Site1 day 10.



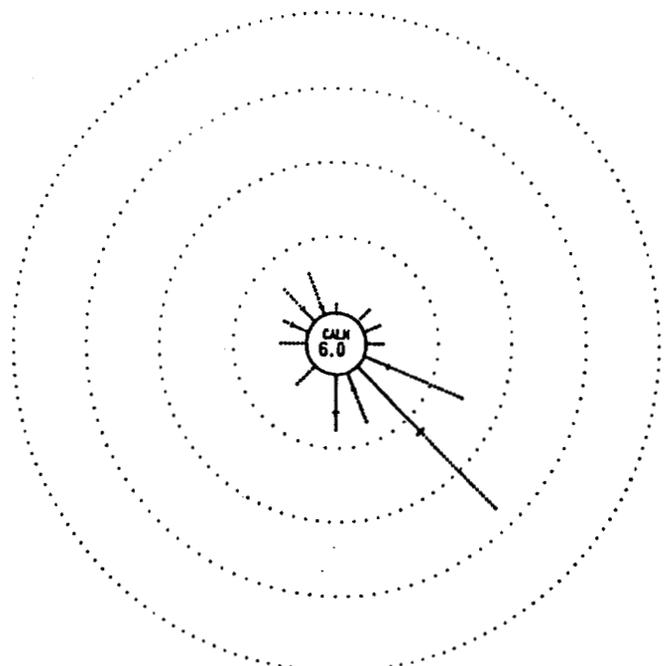
24.0 Total Hours.

Site1 day 11.



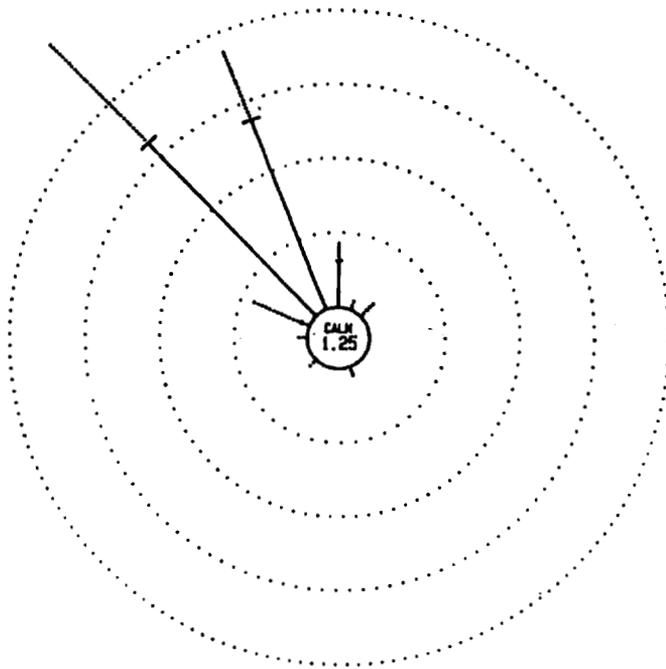
24.0 Total Hours.

Site1 day 12.



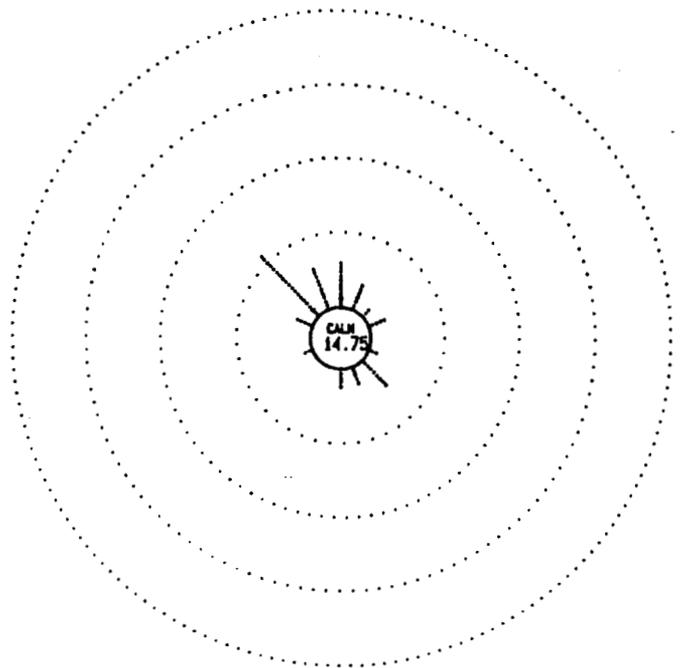
24.0 Total Hours.

Site1 day 13.



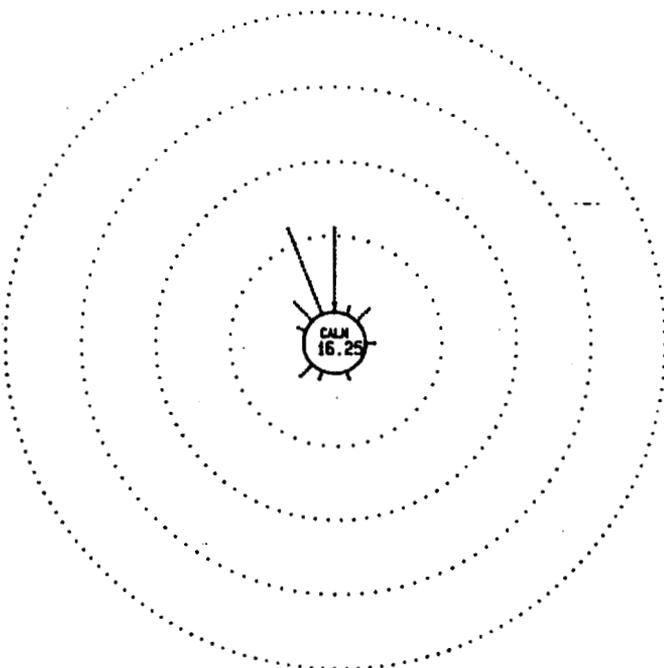
24.0 Total Hours.

Site1 day 14.



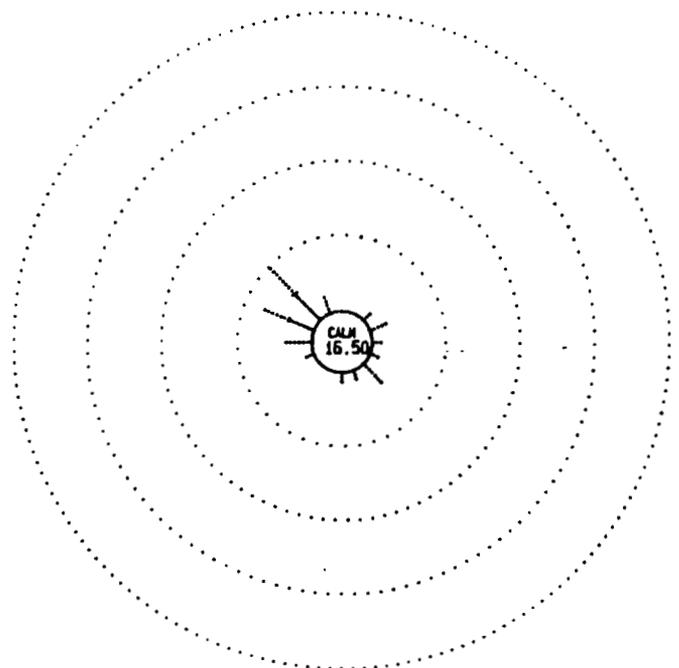
24.0 Total Hours.

Site1 day 15.



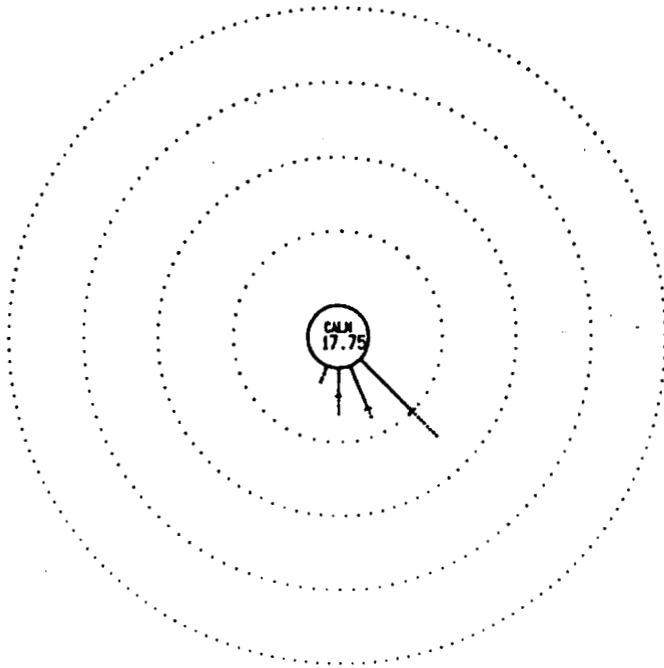
24.0 Total Hours.

Site1 day 16.



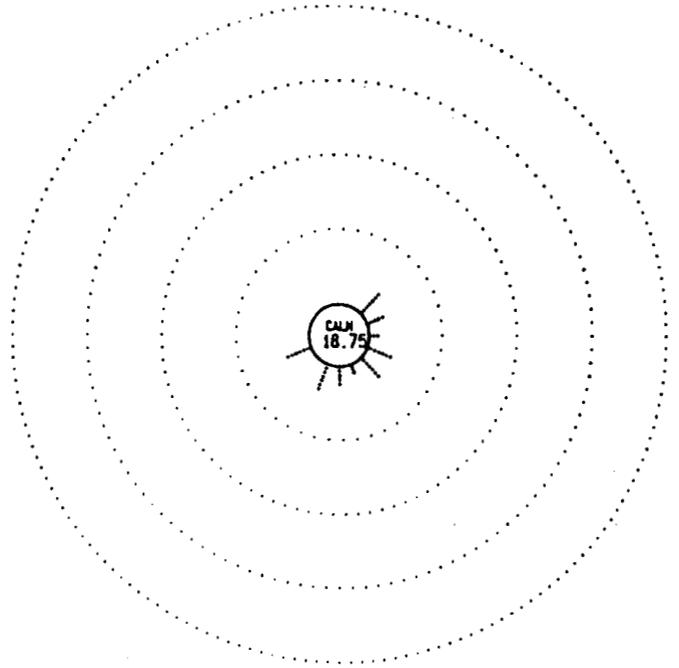
24.0 Total Hours.

Site1 day 17.



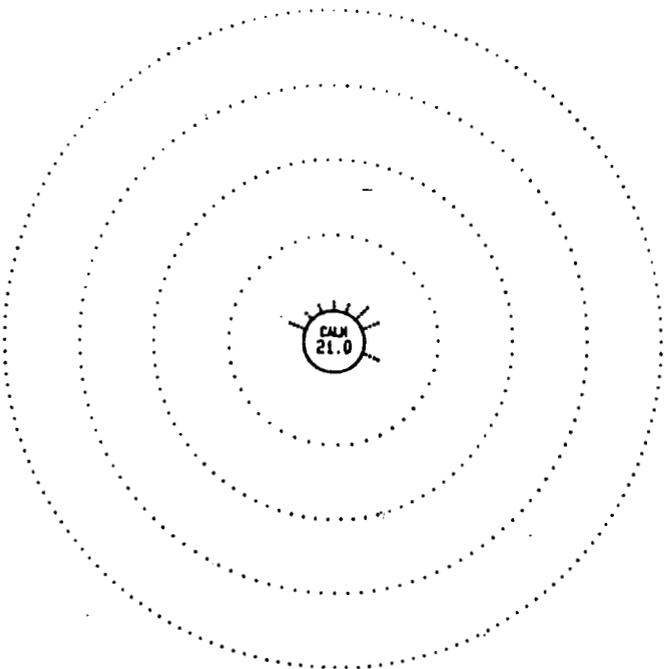
24.0 Total Hours.

Site1 day 18.



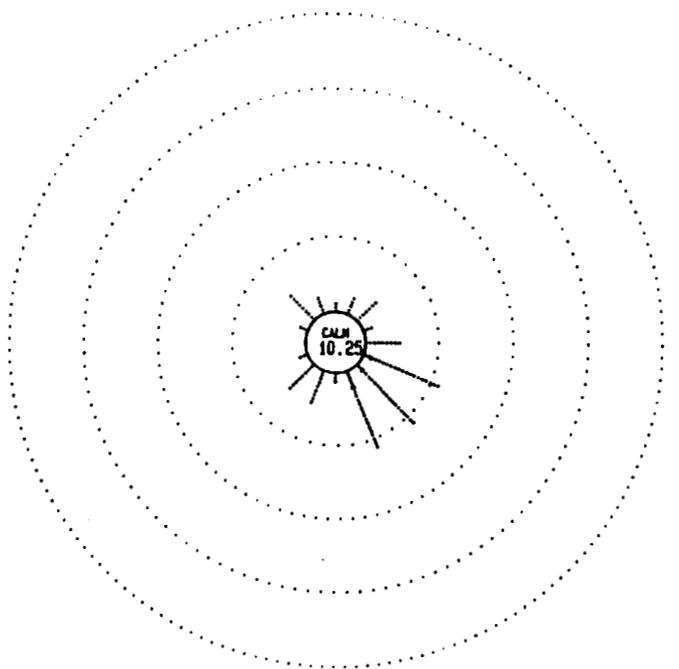
24.0 Total Hours.

Site1 day 19.



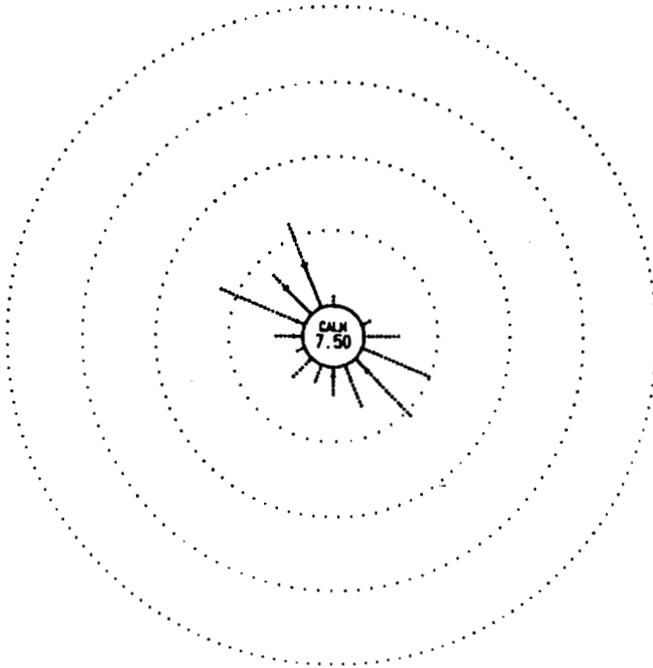
24.0 Total Hours.

Site1 day 20.



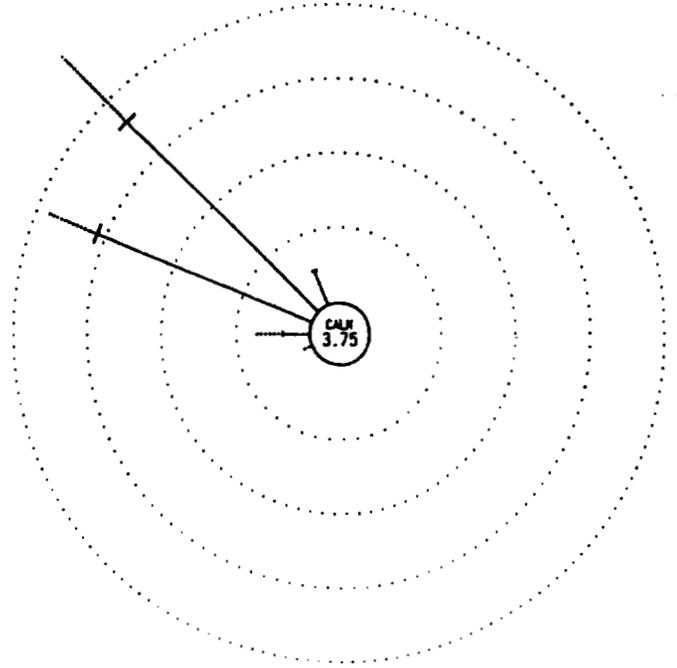
24.0 Total Hours.

Site1 day 21.



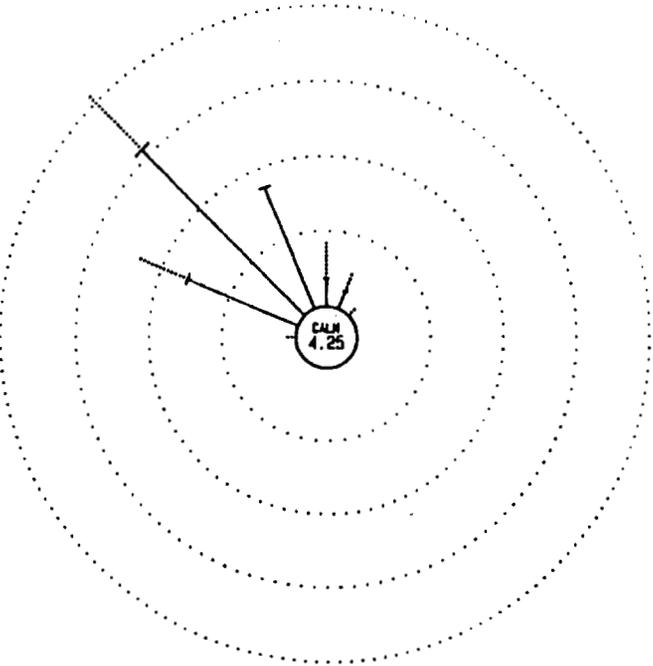
24.0 Total Hours.

Site1 day 22.



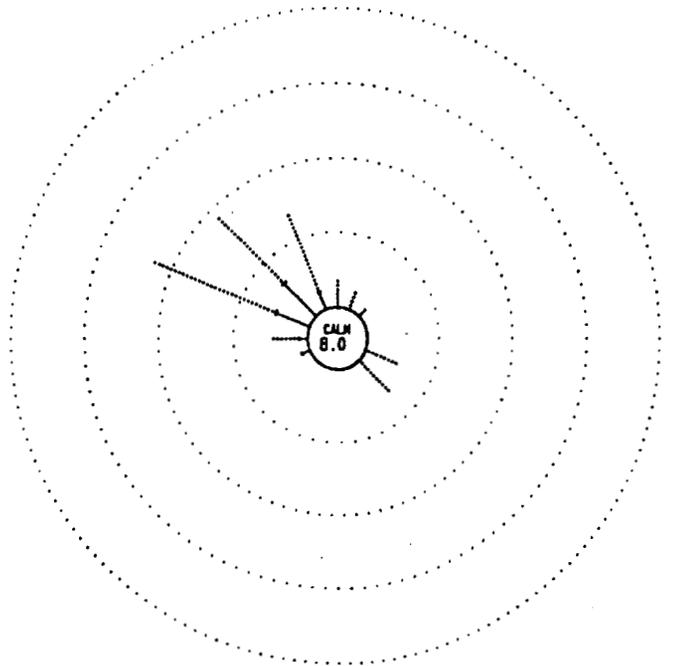
24.0 Total Hours.

Site1 day 23.



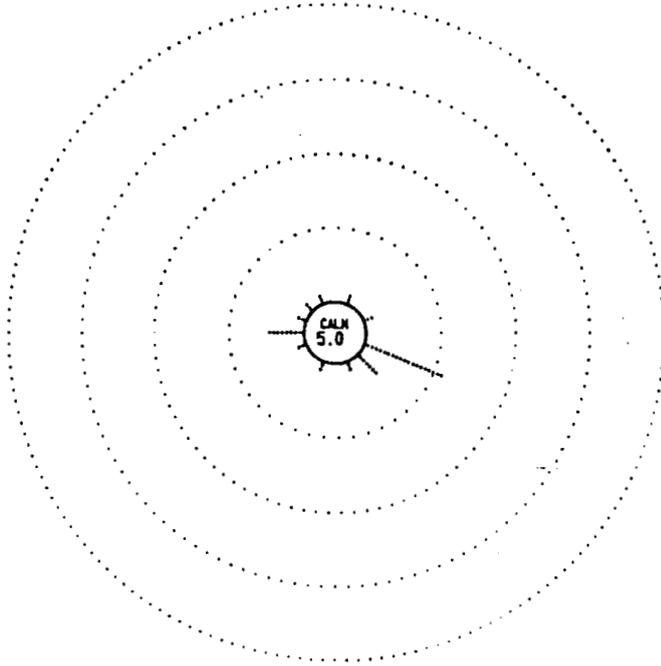
24.0 Total Hours.

Site1 day 24.



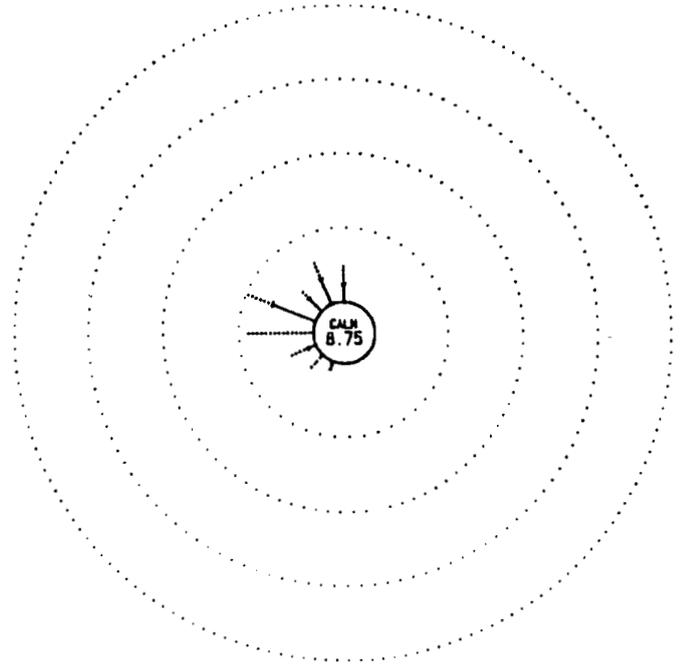
24.0 Total Hours.

Site1 day 25.



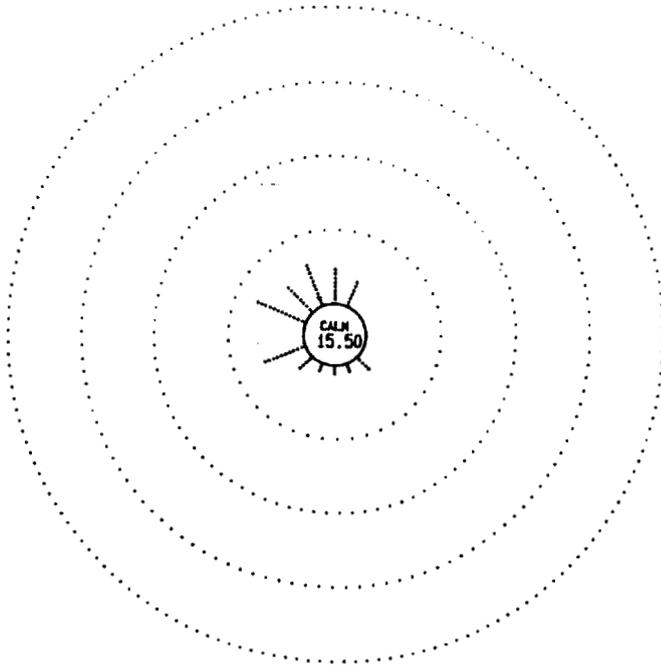
11.0 Total Hours.

Site1 day 26.



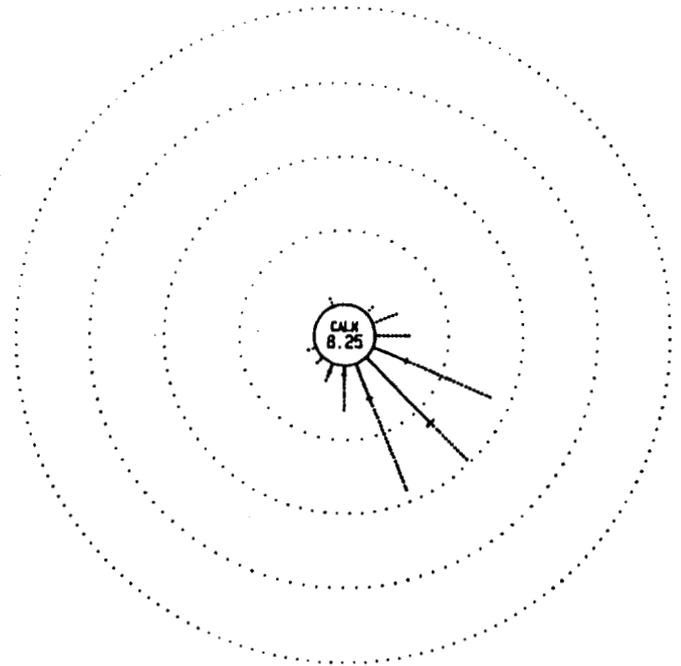
17.0 Total Hours.

Site1 day 27.



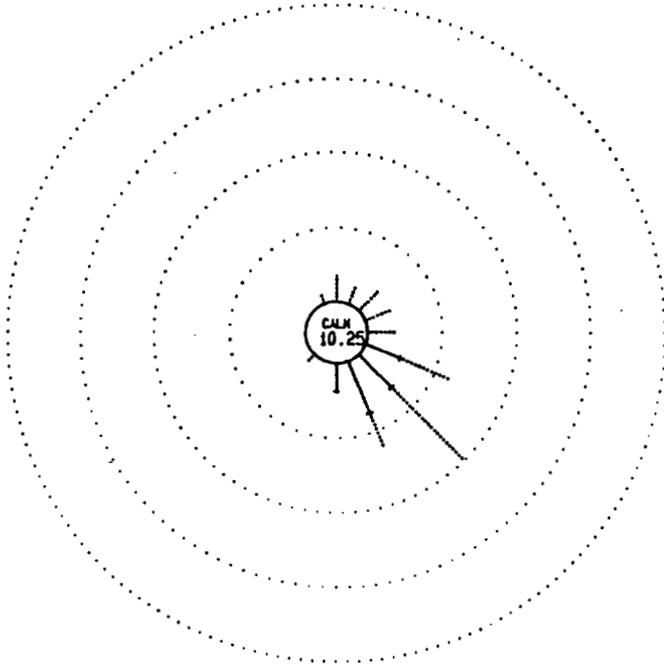
24.0 Total Hours.

Site1 day 28.



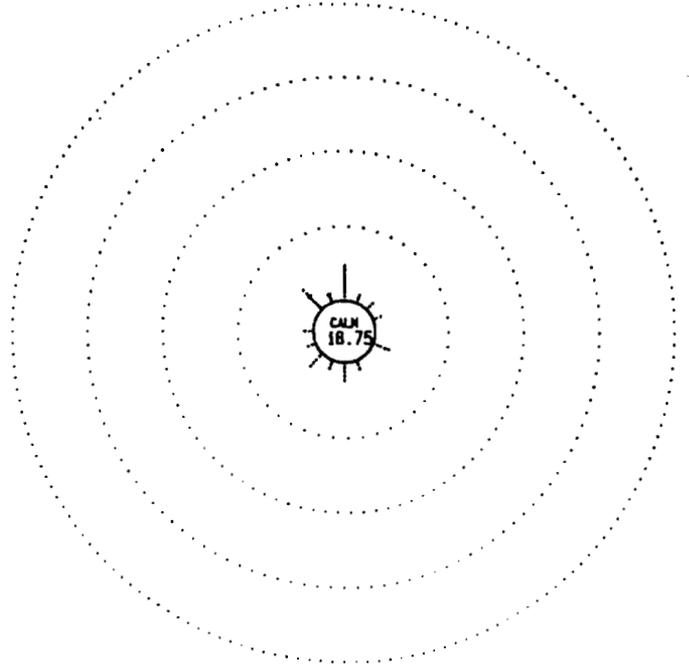
24.0 Total Hours.

Site1 day 29.



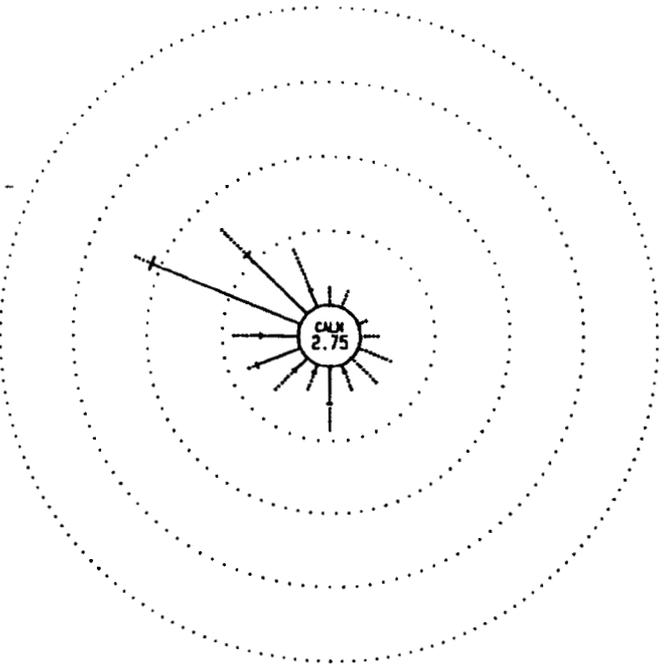
24.0 Total Hours.

Site1 day 30.



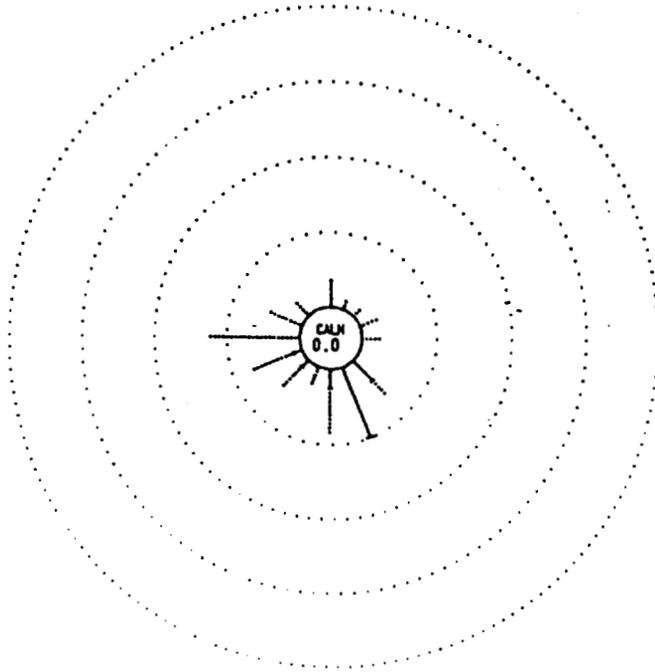
24.0 Total Hours.

Site1 day 31.



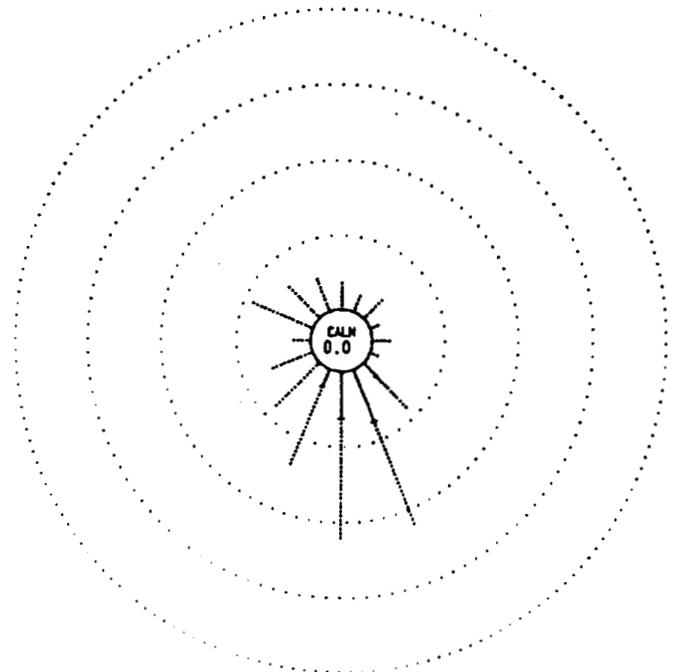
24.0 Total Hours.

Site2 day 1.



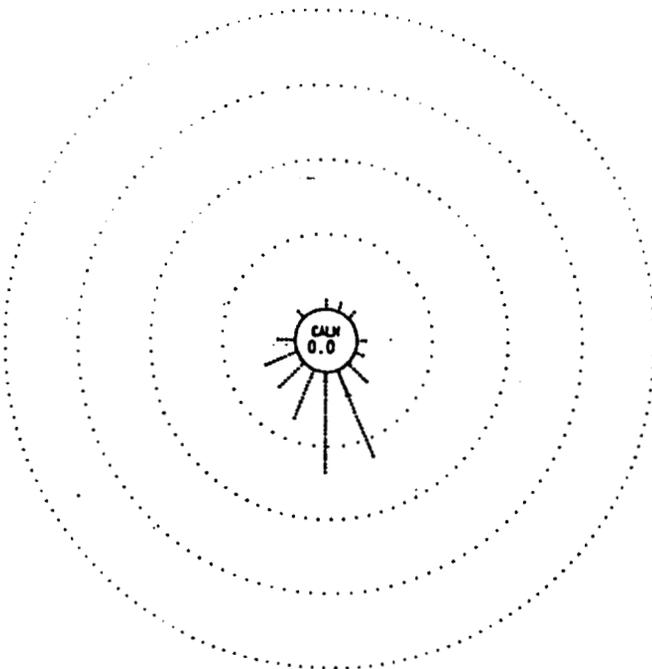
14.25 Total Hours.

Site2 day 2.



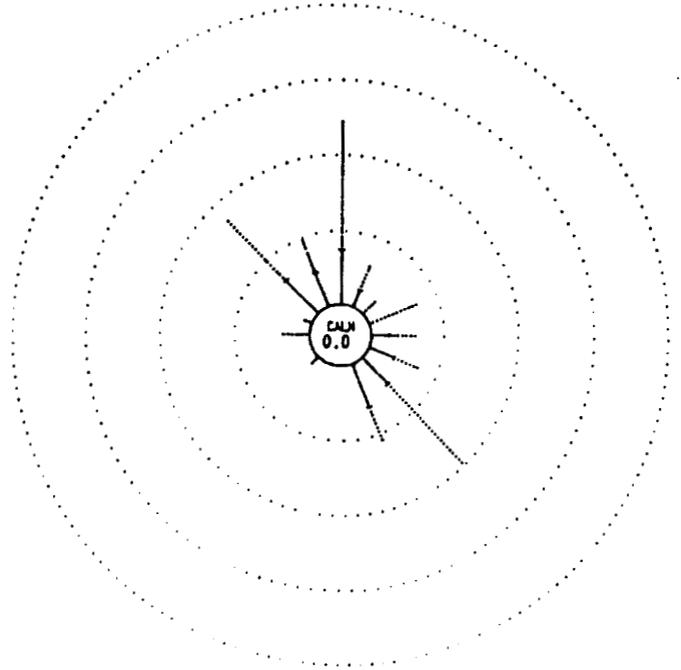
24.0 Total Hours.

Site2 day 3.



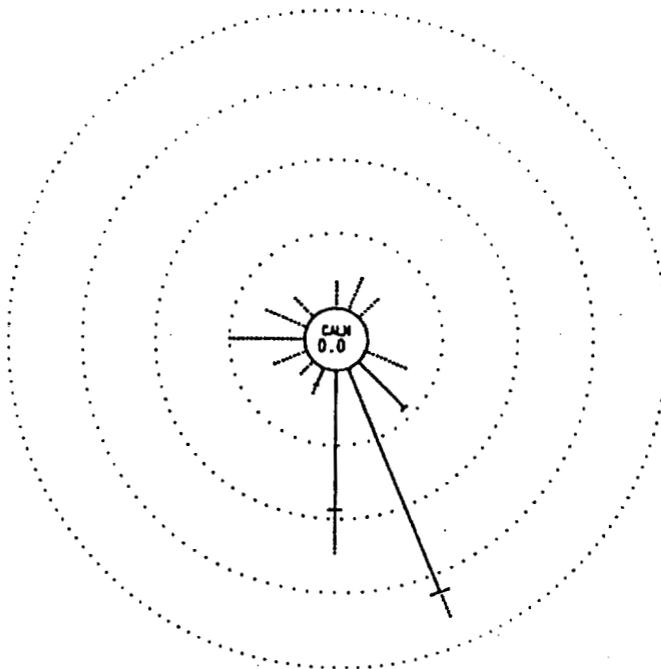
11.50 Total Hours.

Site2 day 6.



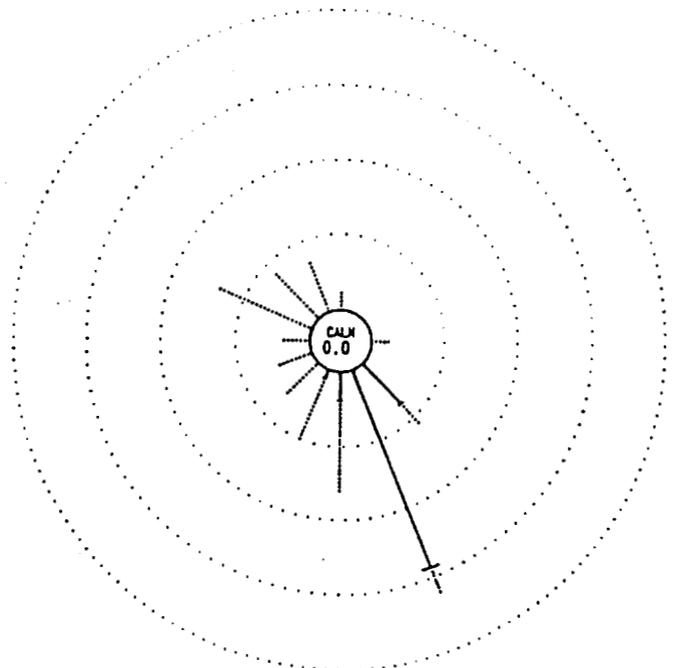
24.0 Total Hours.

Site2 day 7.



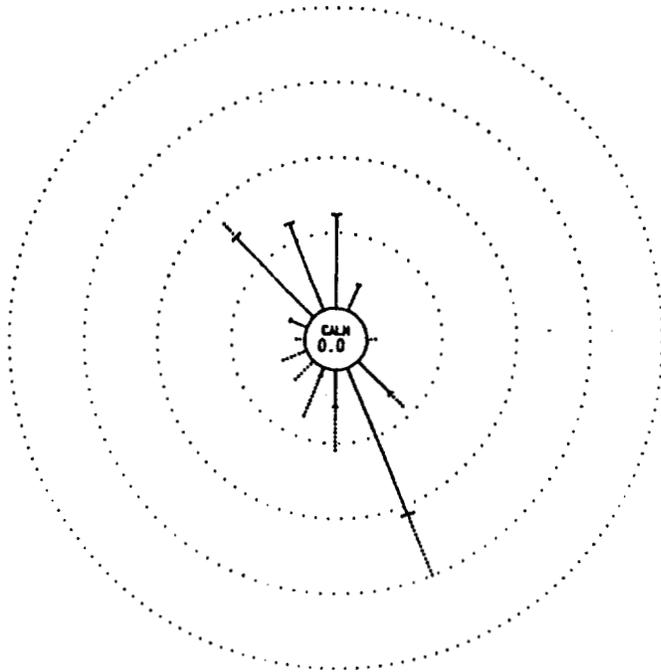
24.0 Total Hours.

Site2 day 8.



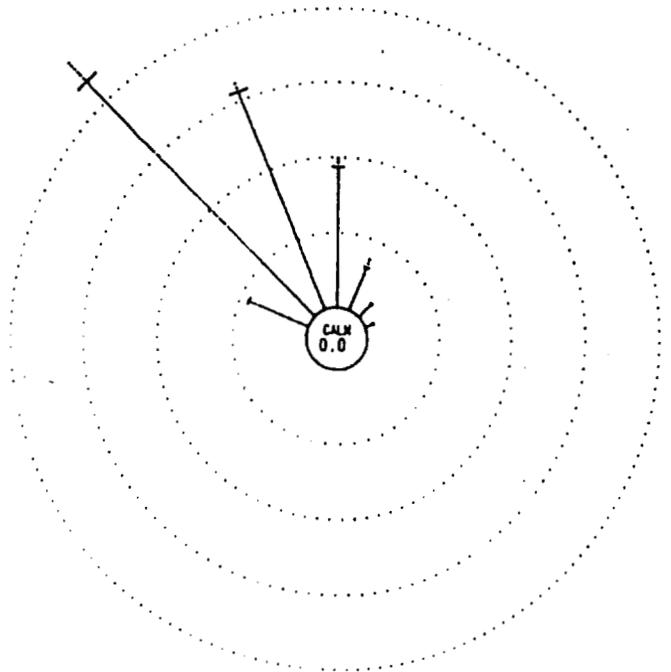
24.0 Total Hours.

Site2 day 9.



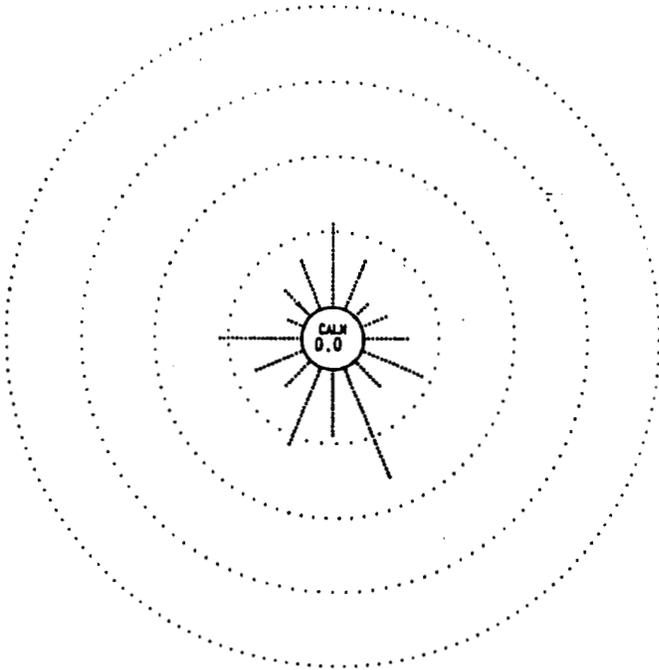
23.25 Total Hours.

Site2 day 10.



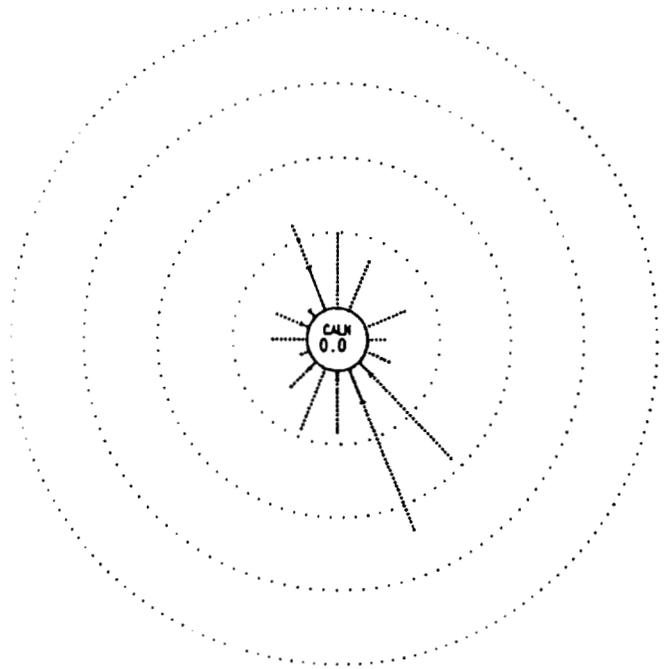
24.0 Total Hours.

Site2 day 11.



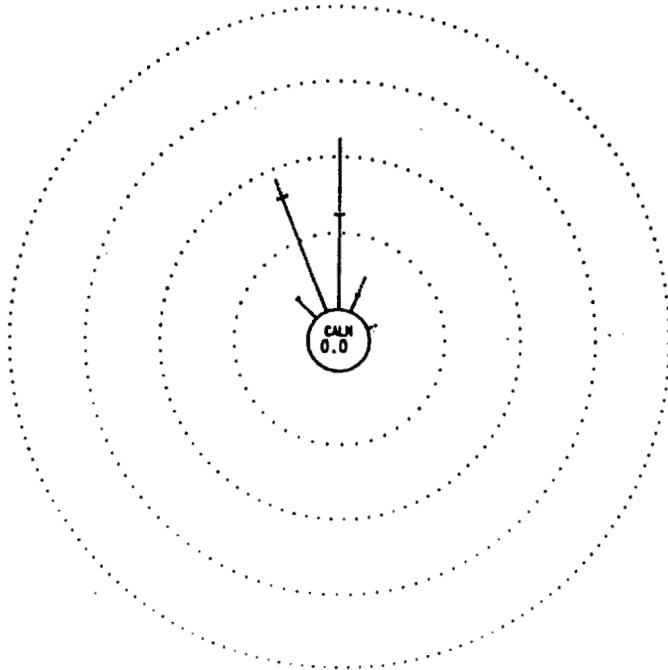
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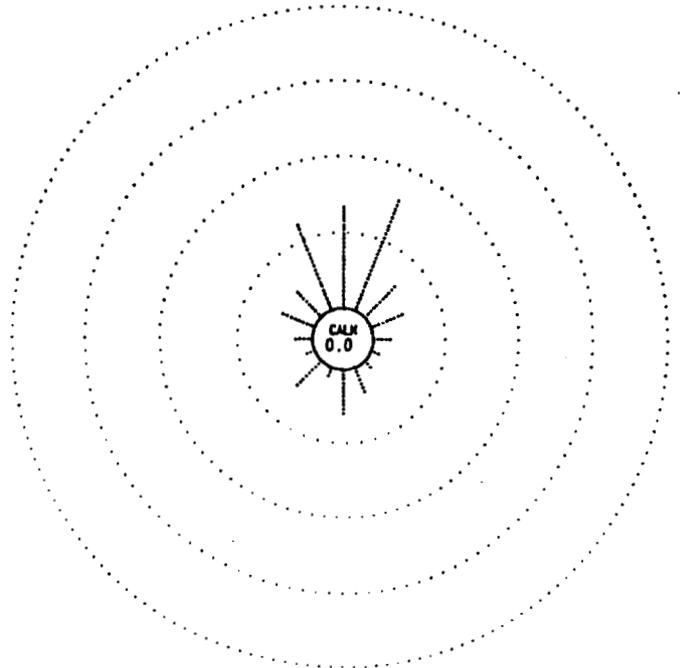
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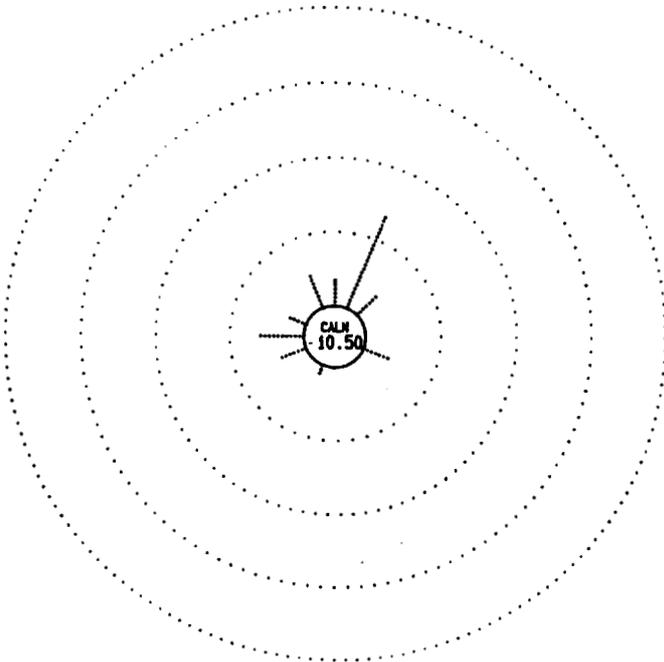
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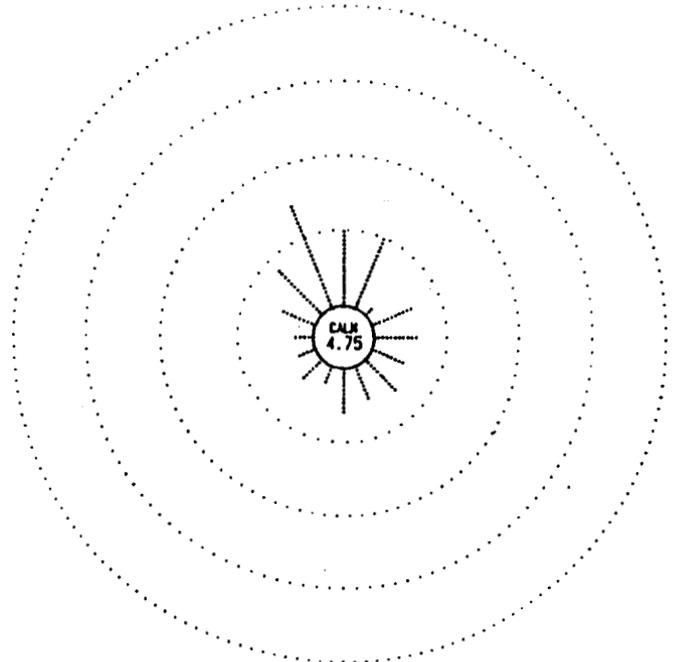
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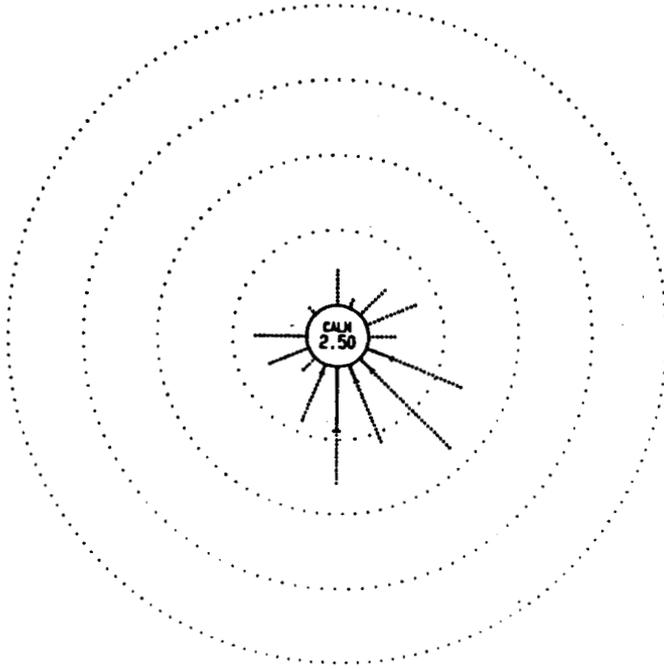
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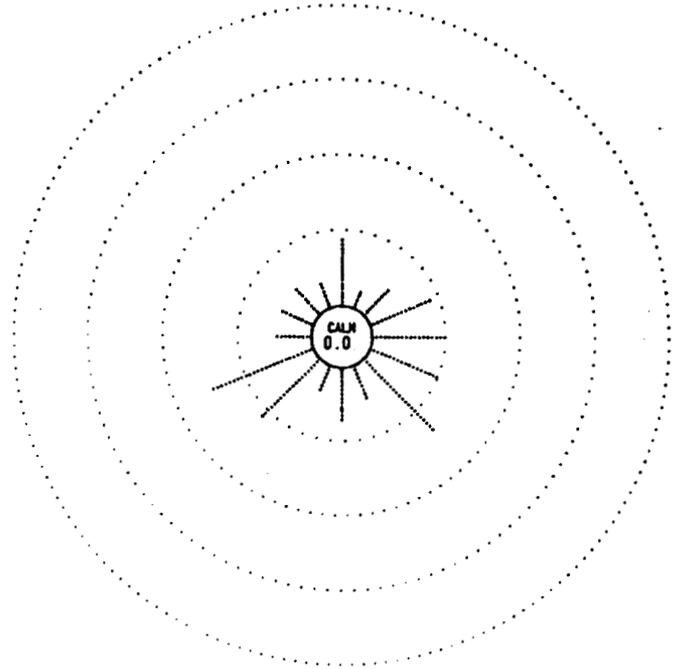
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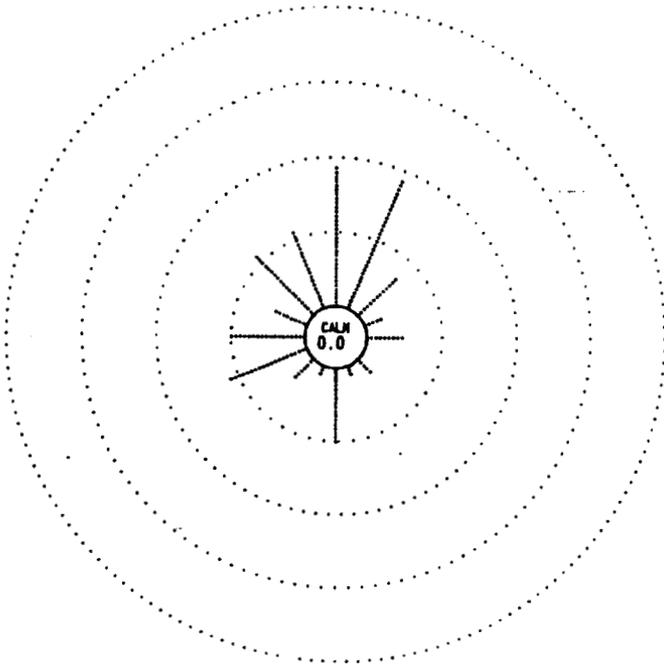
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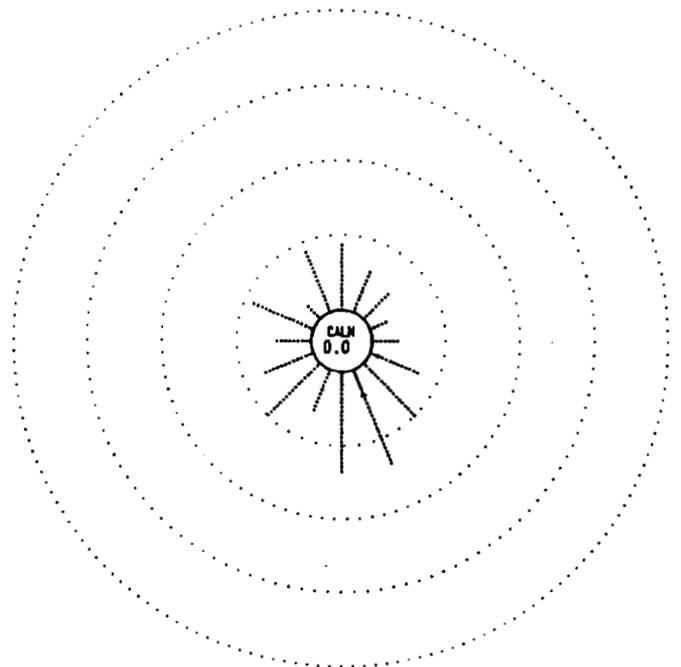
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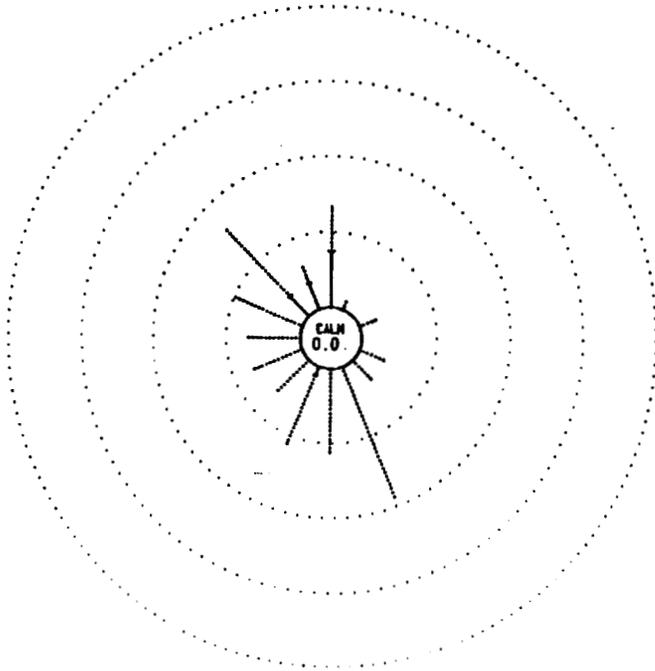
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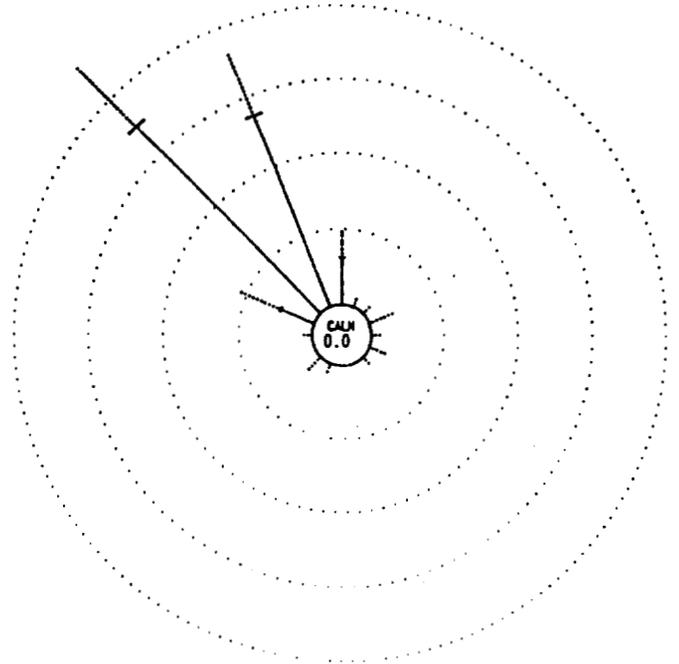
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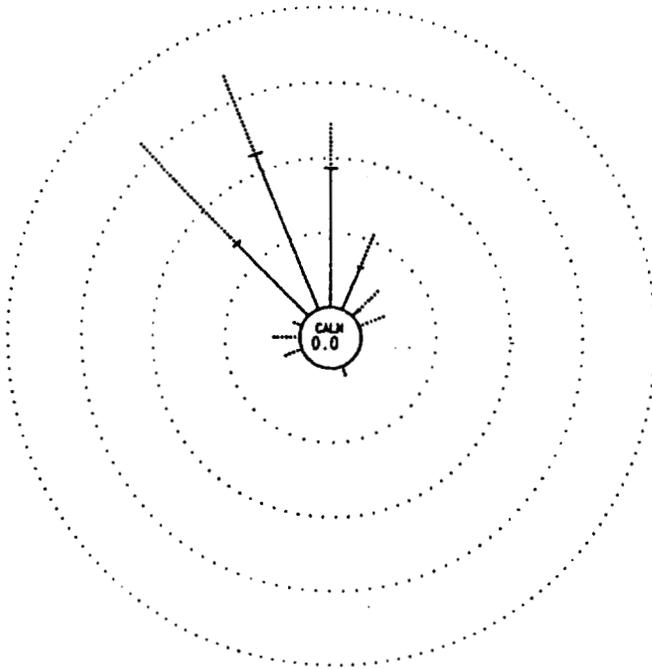
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Site2 day 22.



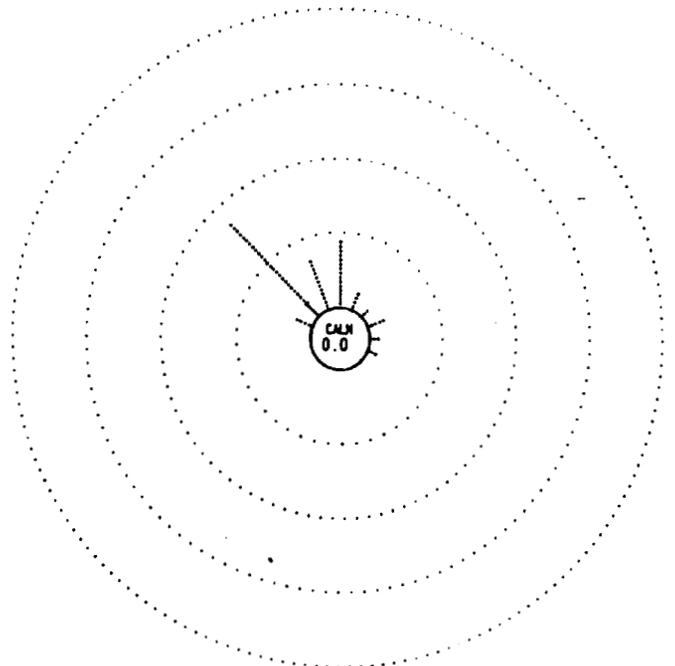
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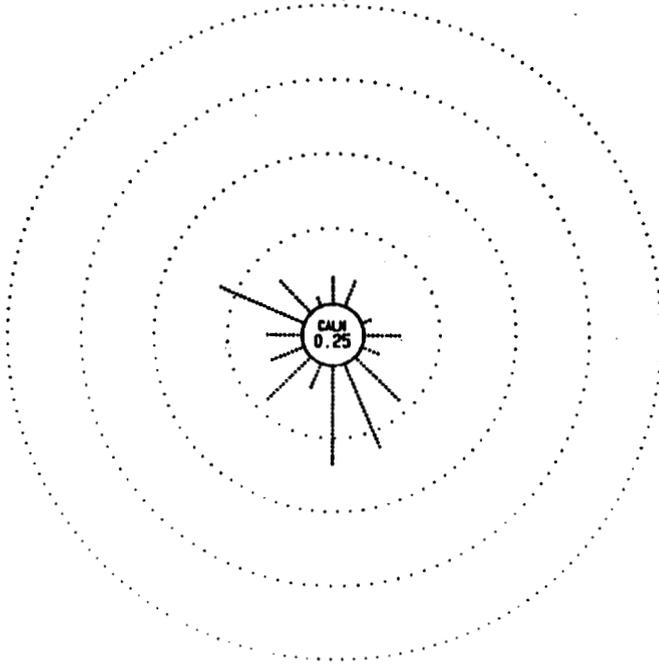
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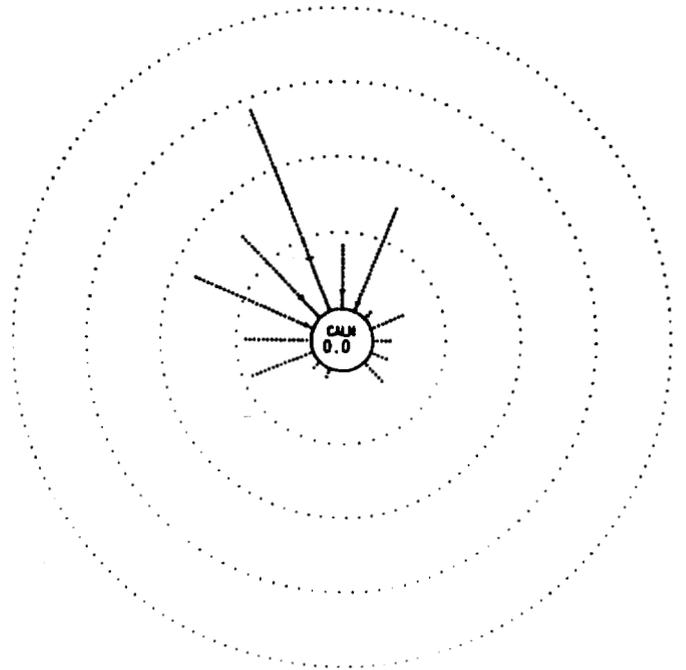
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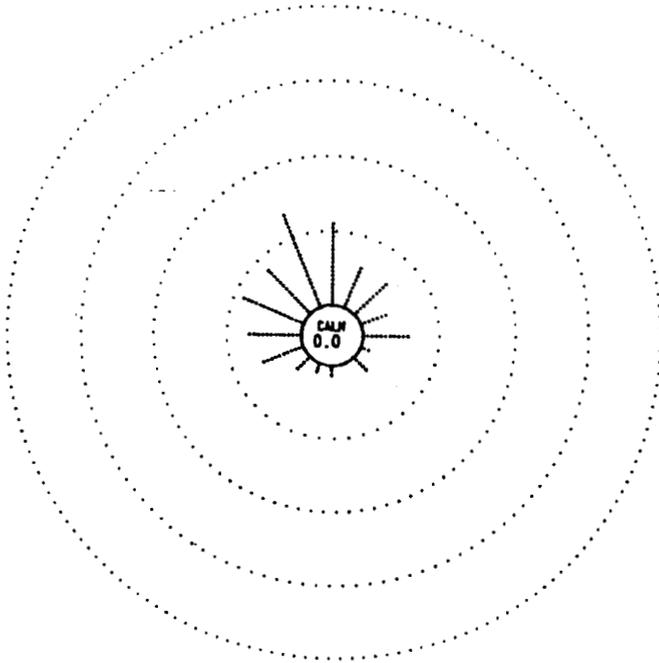
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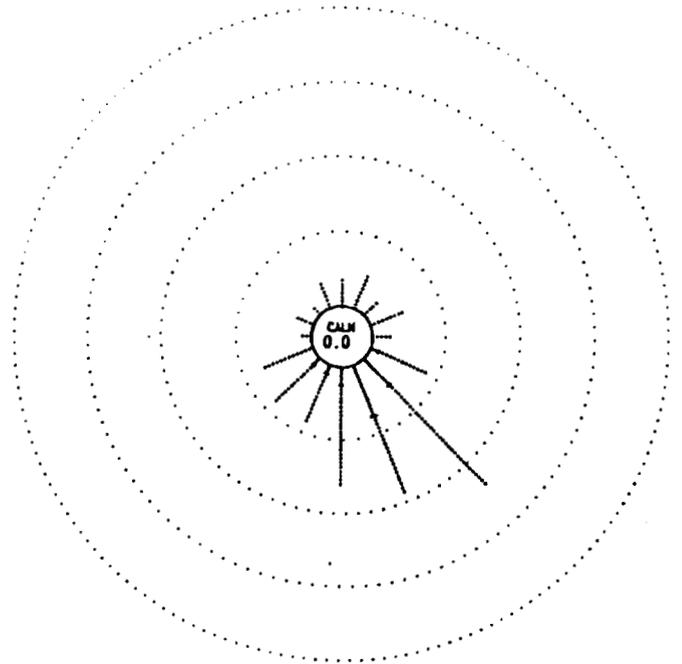
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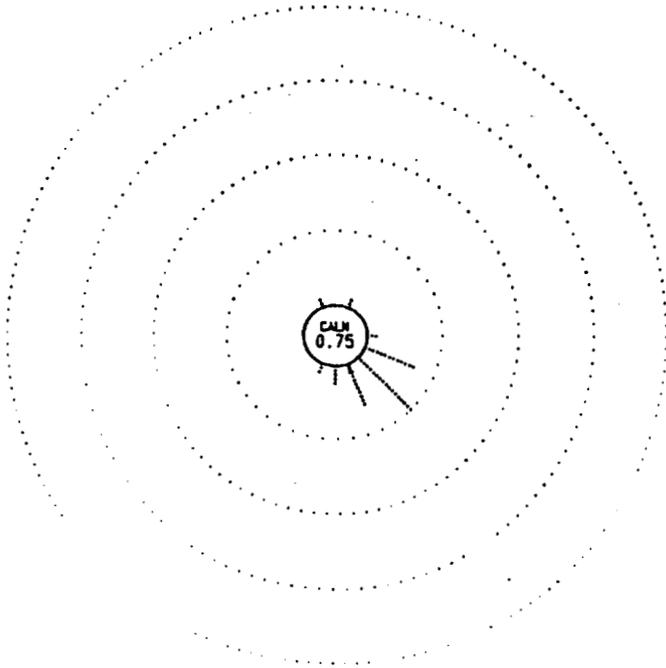
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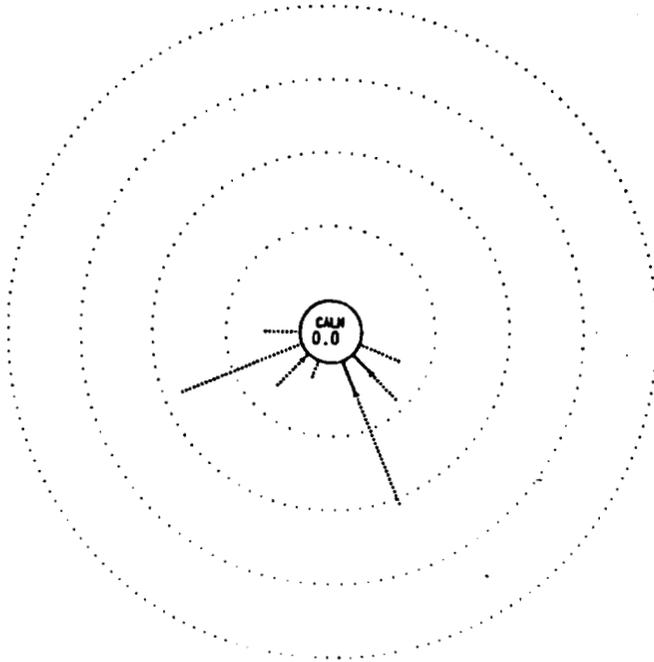
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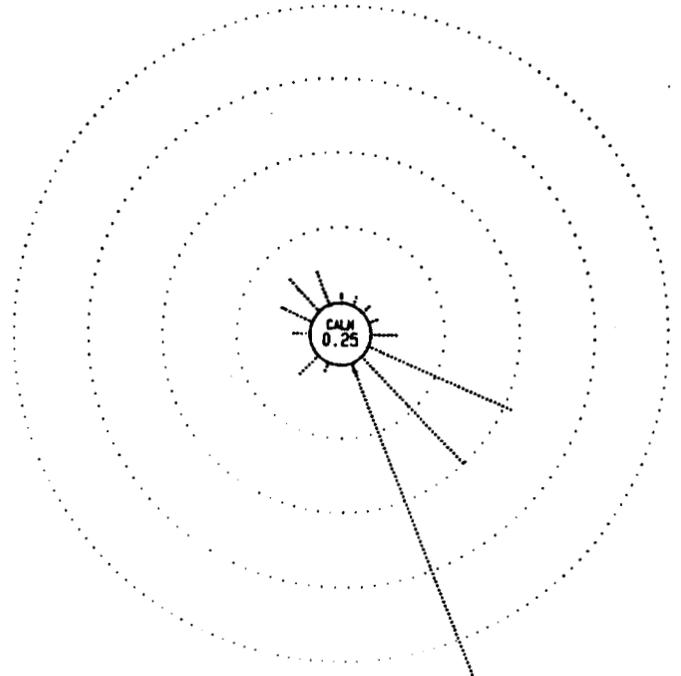
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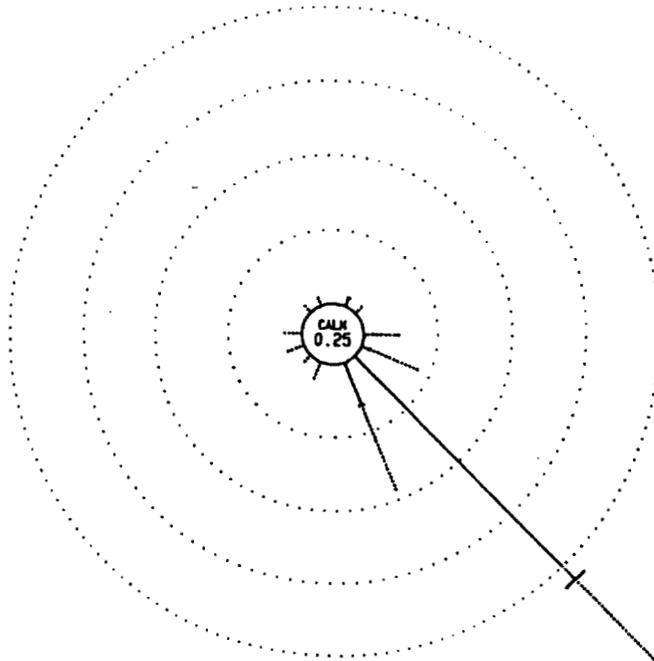
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Site3 day 2.



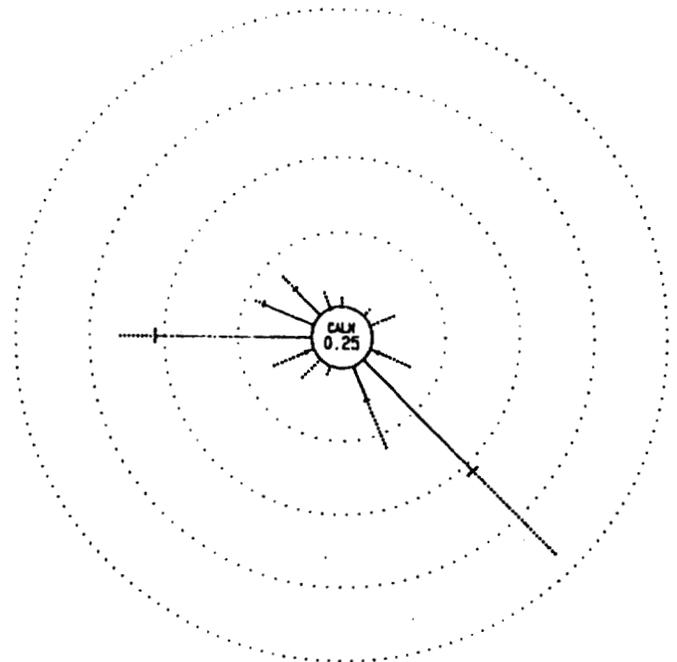
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Site3 day 3.



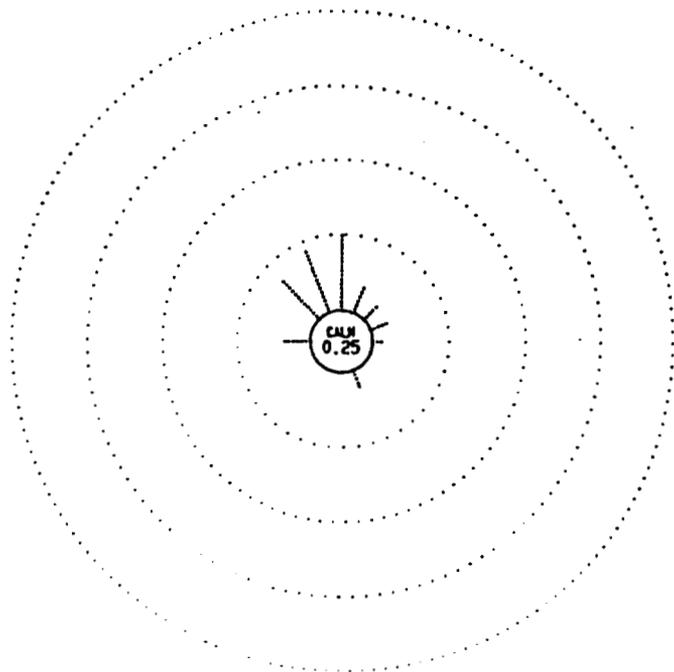
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Site3 day 4.



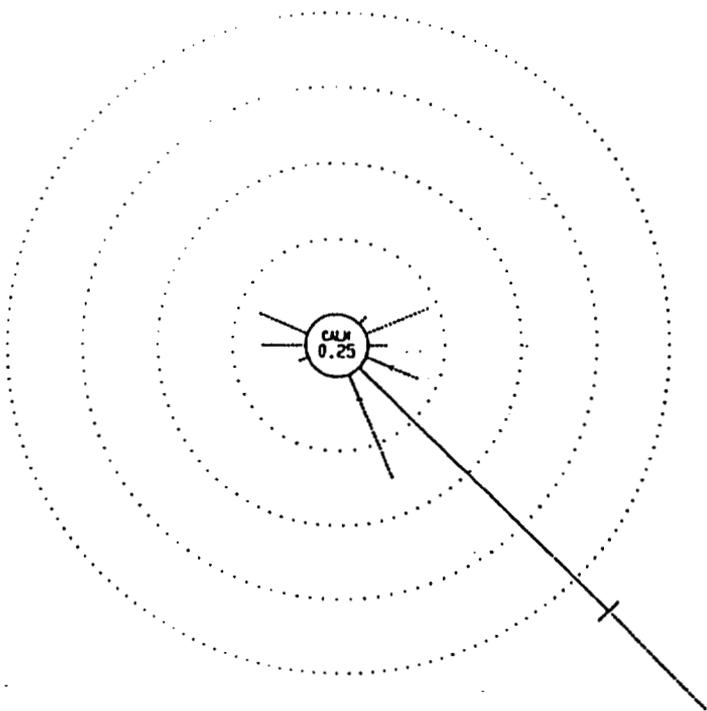
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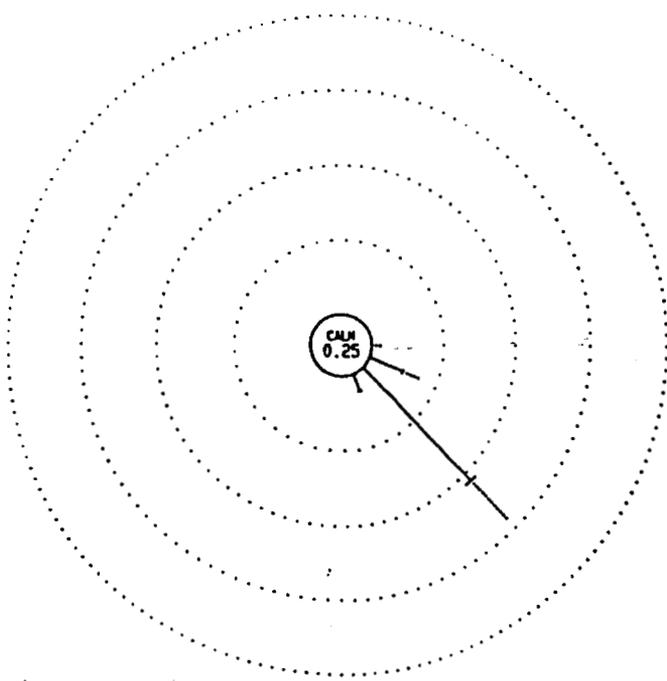
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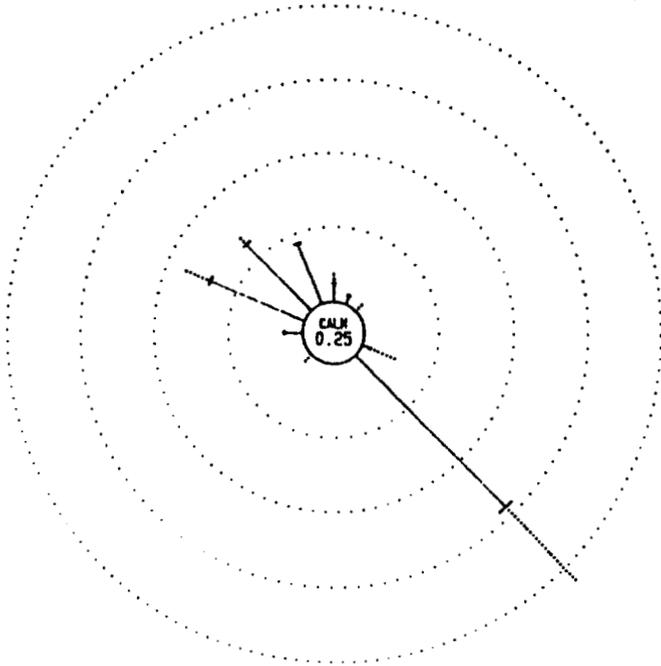
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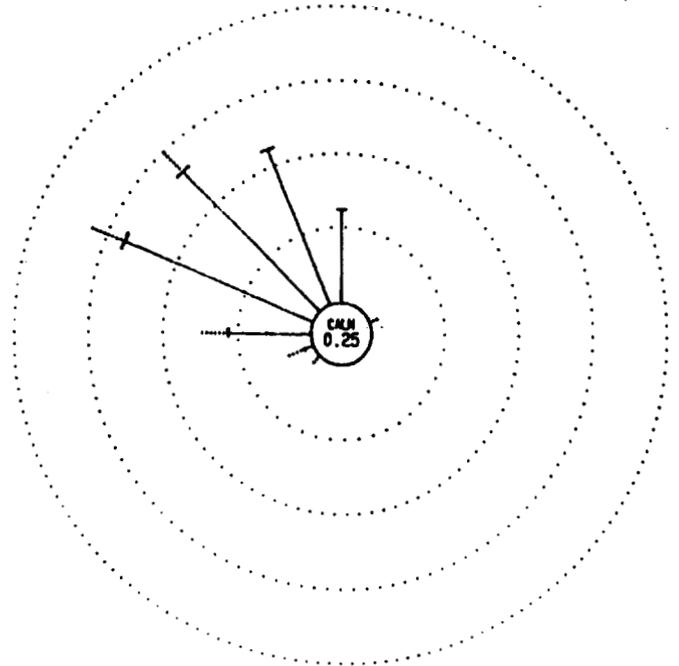
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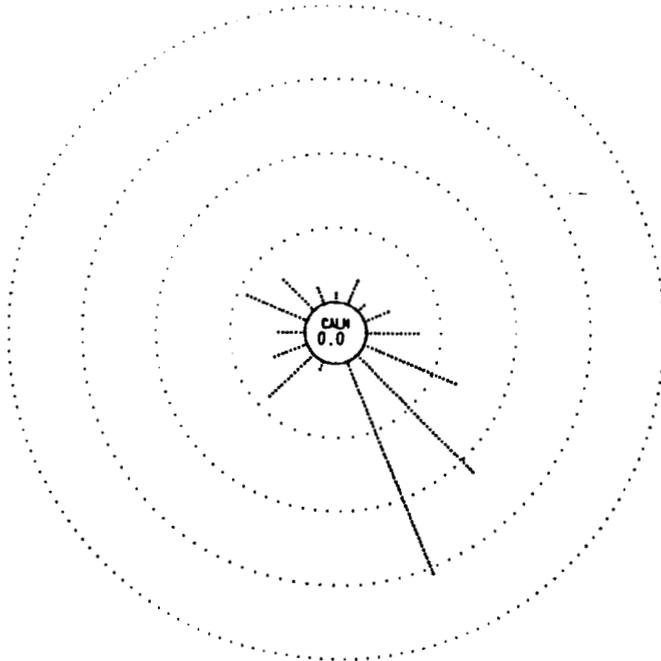
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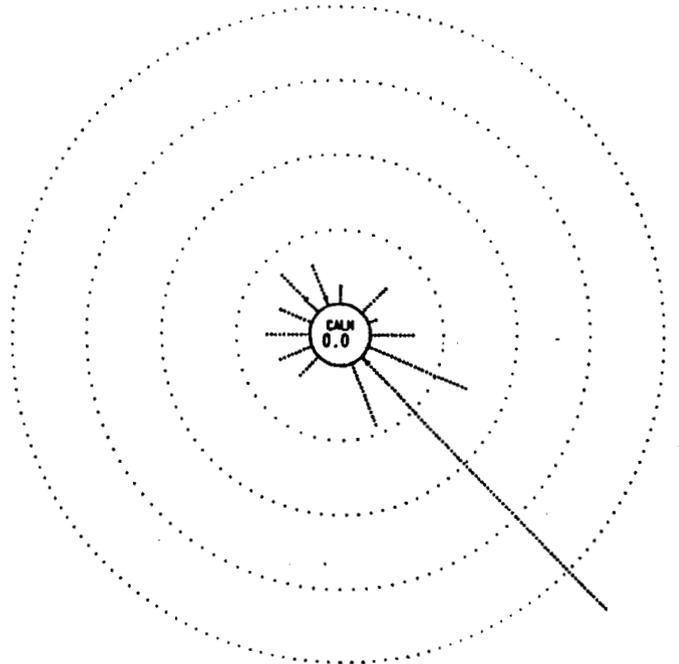
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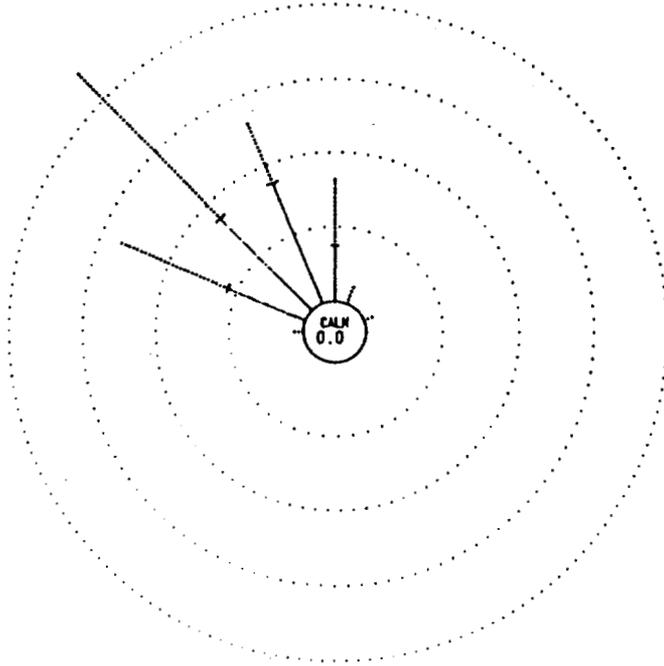
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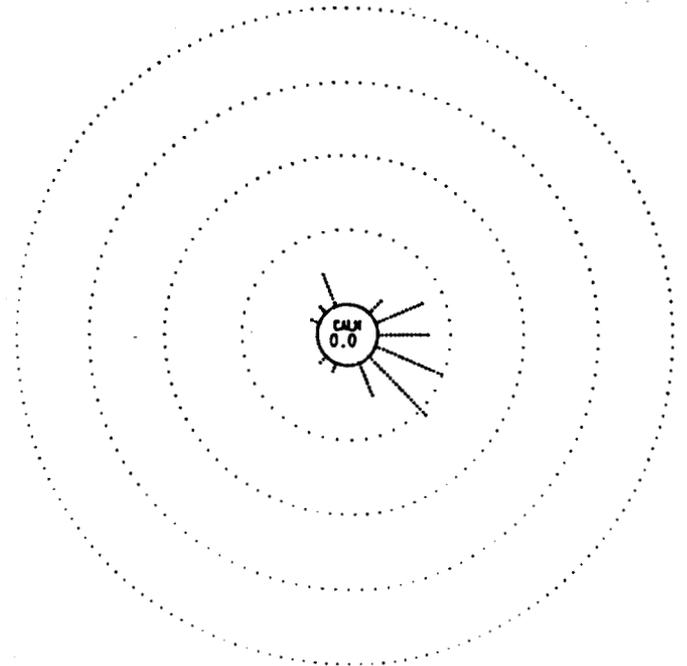
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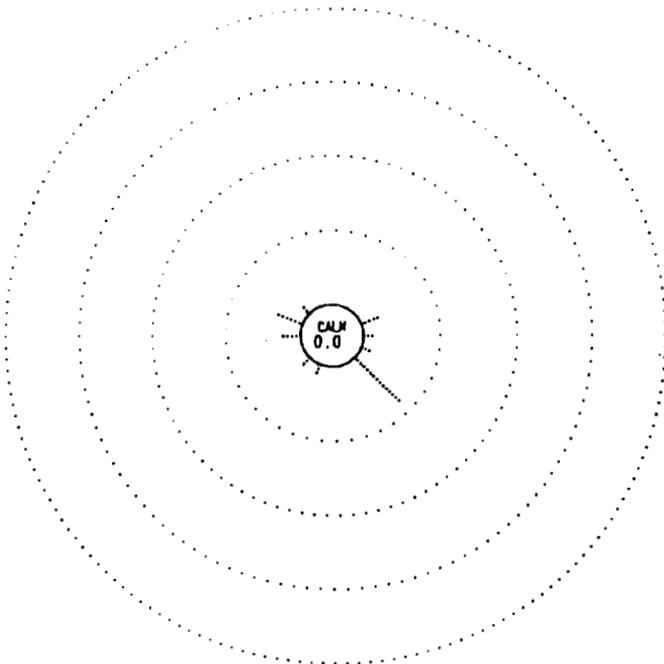
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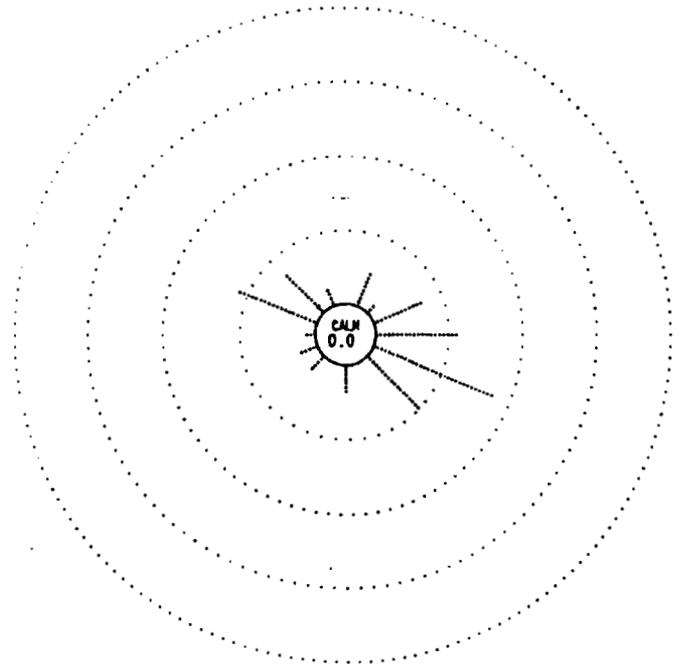
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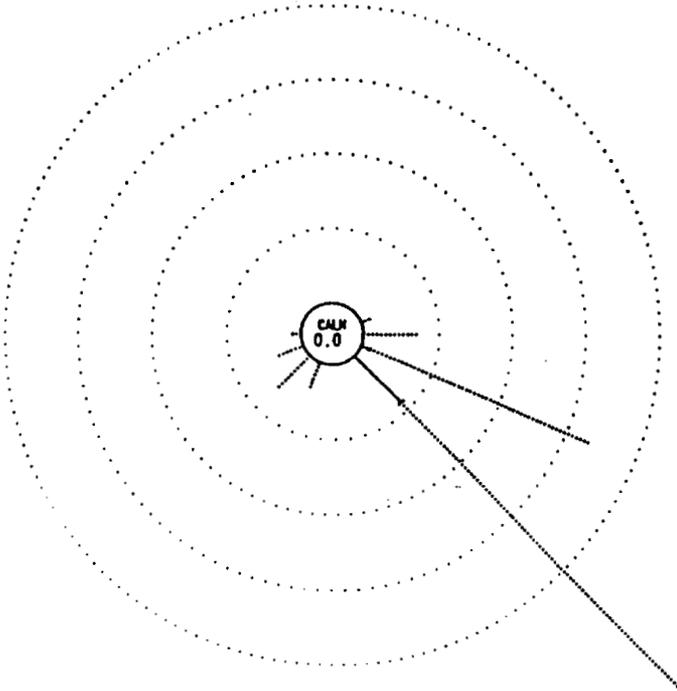
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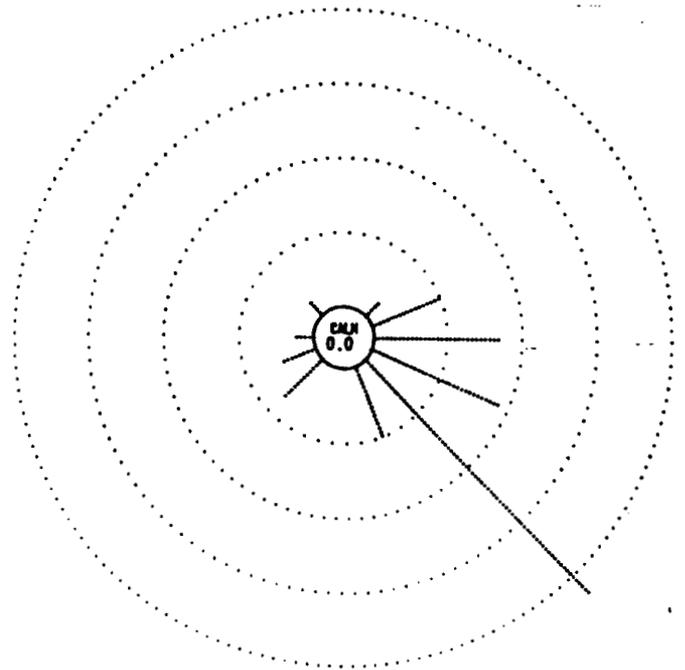
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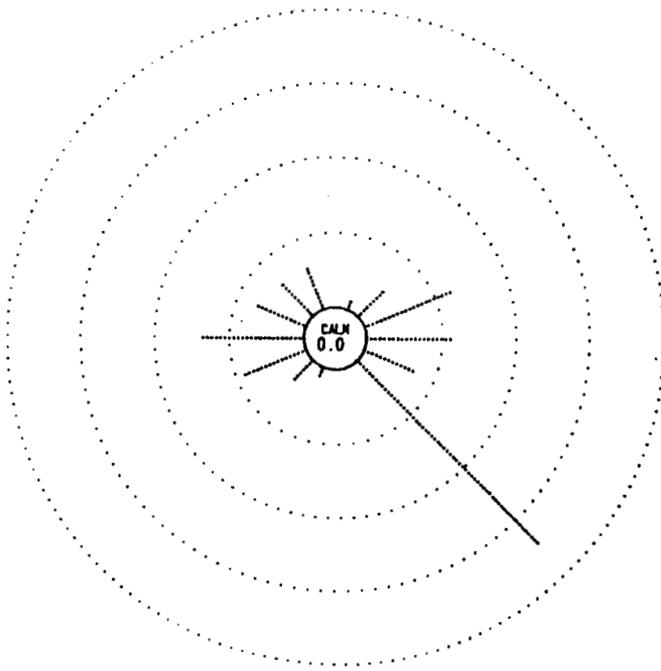
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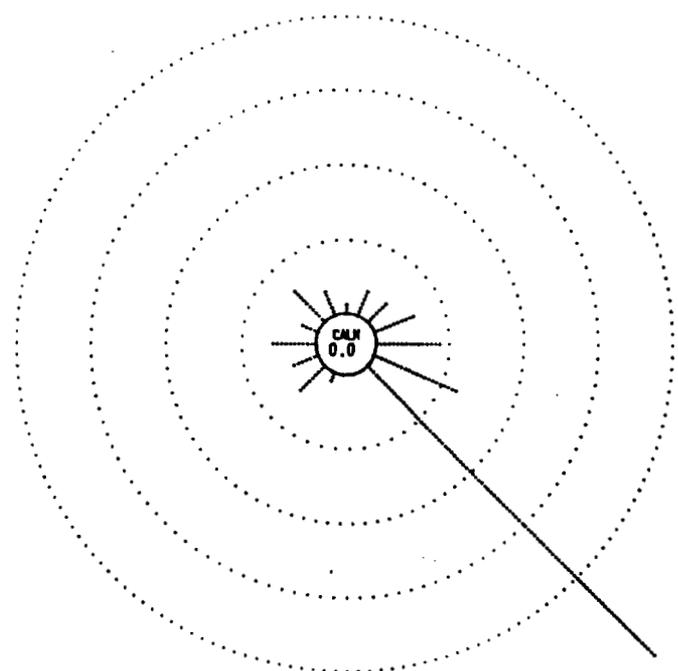
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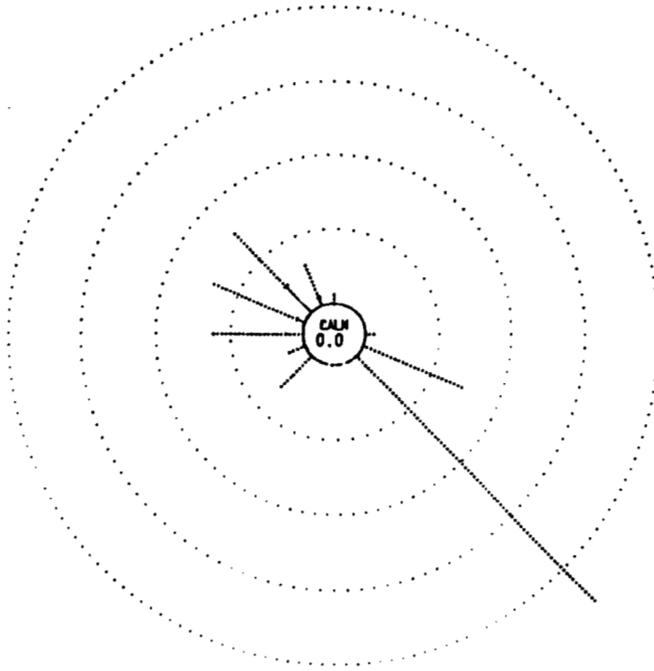
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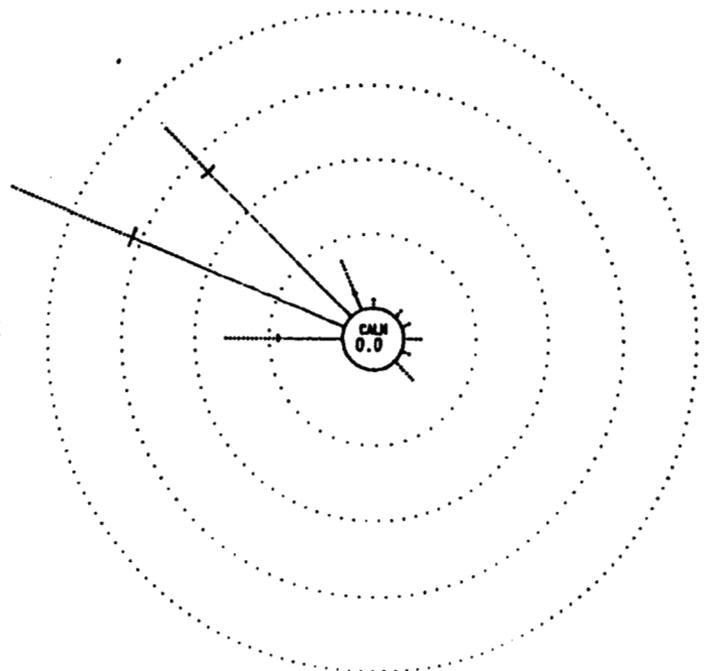
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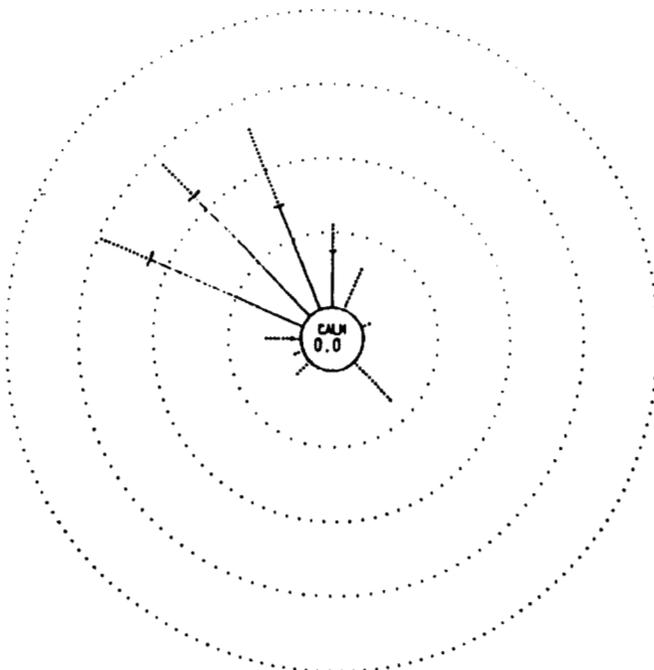
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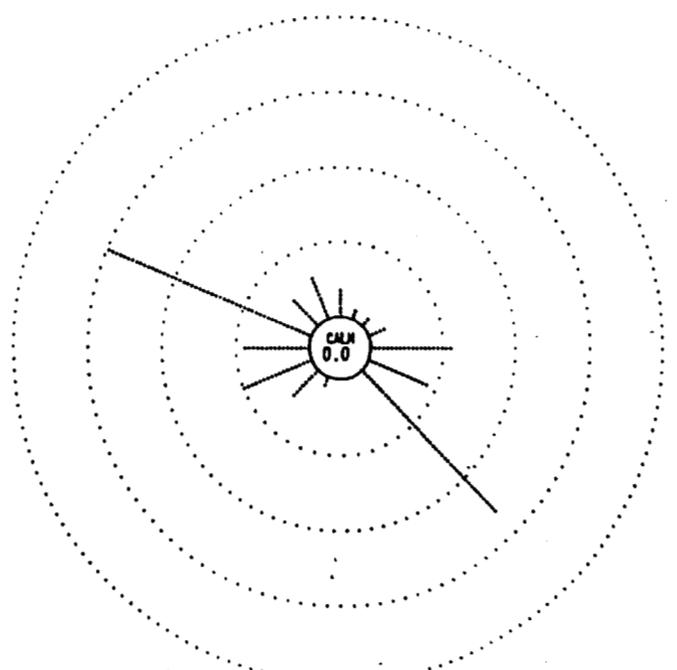
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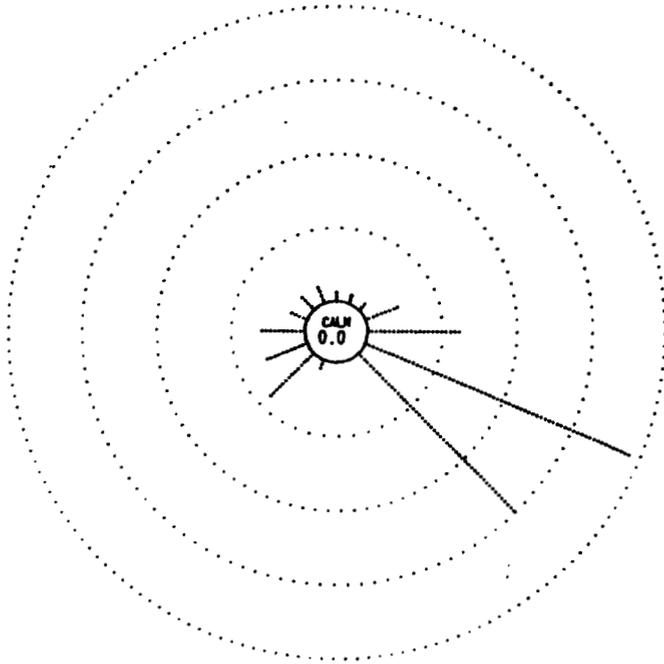
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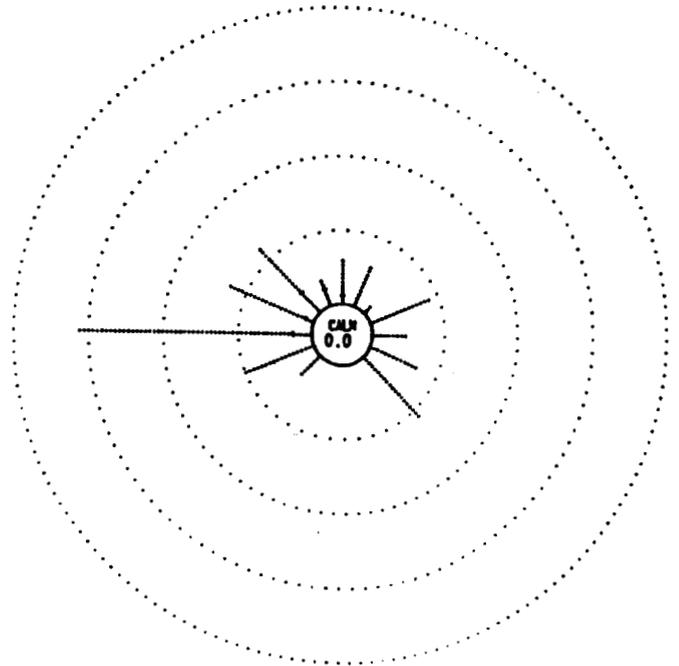
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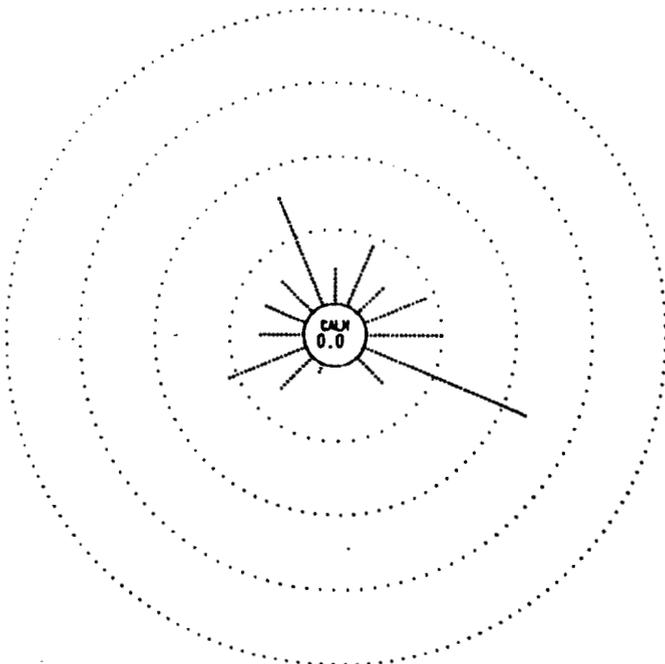
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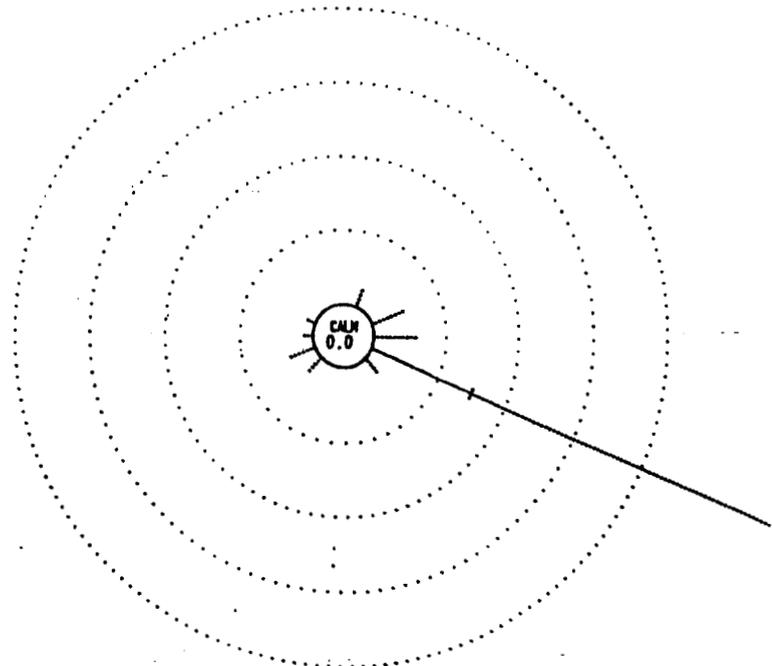
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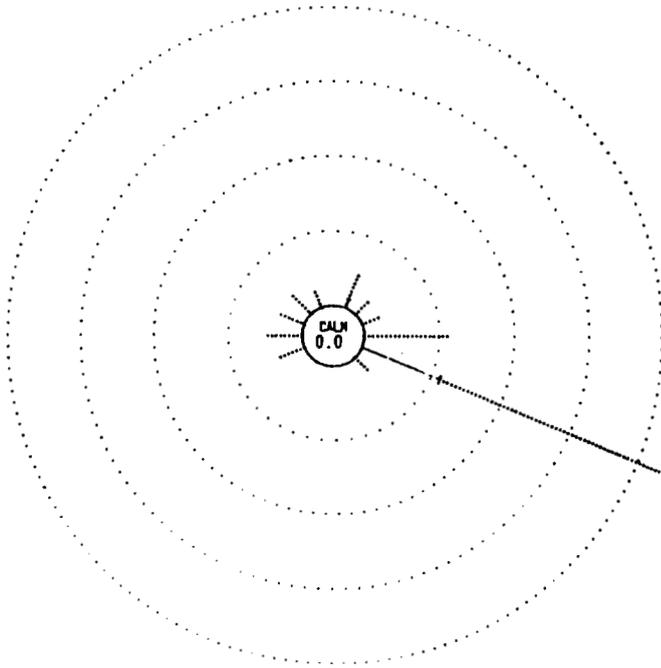
24.0 Total Hours.

Site3 day 28.



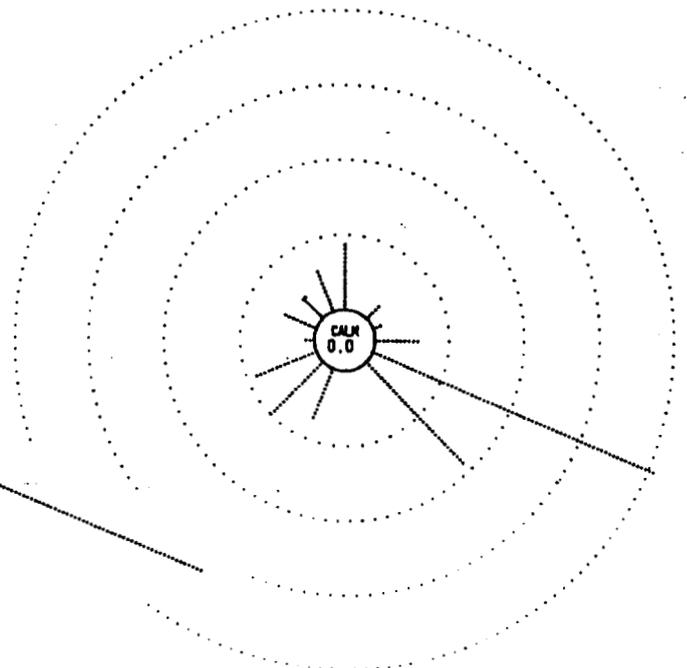
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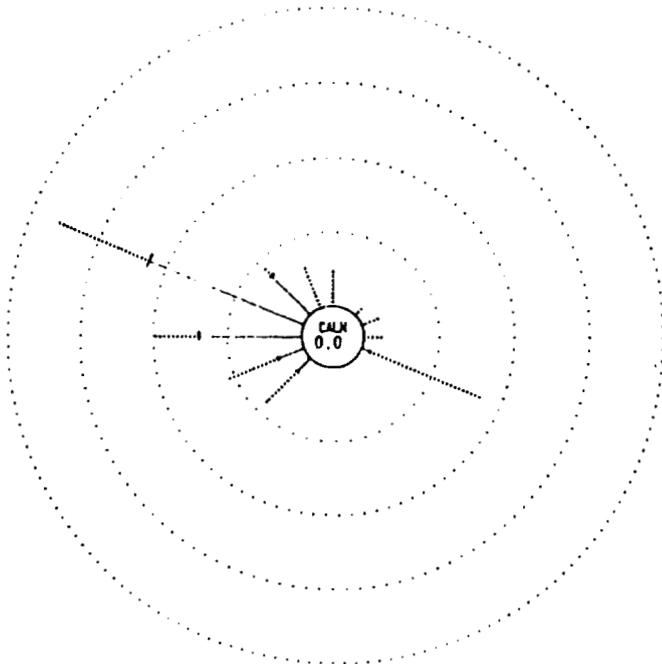
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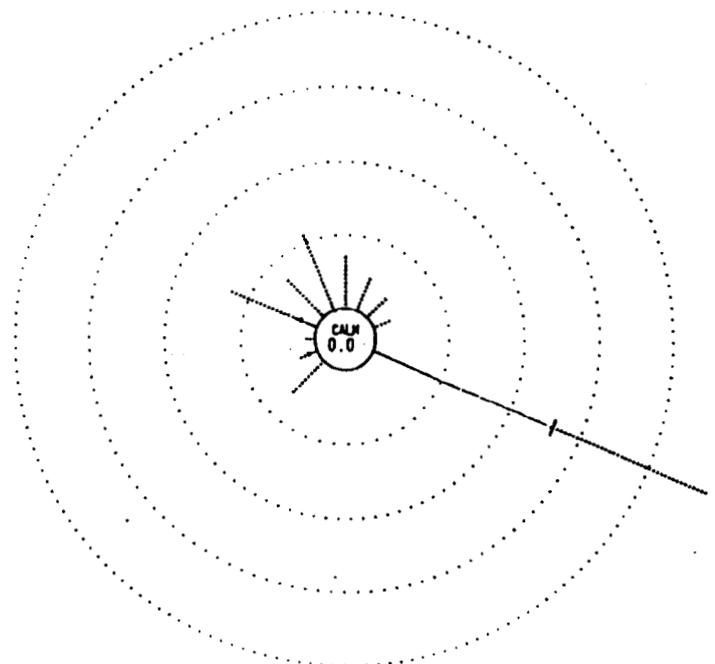
24.0 Total Hours.

Site3 day 31.



24.0 Total Hours.

Site3 day 32.



21.75 Total Hours.

APPENDIX III
METHODS OF CHEMICAL ANALYSIS

CALIFORNIA DEPT. OF FOOD & AGRIC.
CHEMISTRY LABORATORY SERVICES
ENVIRONMENTAL MONITORING SECTION
3292 Meadowview Road
Sacramento, Ca. 95832
(916) 427-4649/4999

Original Date: 06/09/89
Supercedes: New
Current Date: ??
Method #:

DIAZINON, CHLORPYRIFOS, PARATHION AND METHIDATHION IN FOG WATER

SCOPE:

This method is for the determination of diazinon, chlorpyrifos, parathion and methidathion in fog water.

PRINCIPLE:

The samples of fog water were extracted by shaking in a separatory funnel with methylene chloride. The extract was filtered and evaporated to dryness. It was then transferred and brought up to final volume with acetone. The extract was analyzed by gas chromatograph using a flame photometric detector (FPD).

REAGENTS AND EQUIPMENT:

- 1.) Solvent; (pesticide residue grade) methylene chloride and acetone.
- 2.) Sodium sulfate (anhydrous).
- 3.) Separatory funnels (500ml).
- 4.) Boiling flasks, flat bottomed (500ml).
- 5.) Glass stem funnels.
- 6.) Rotary evaporator (Büchi/Brinkmann, R110).
- 7.) Test tube, graduate (15ml).
- 8.) Nitrogen evaporator (Organomation N-EVAP Model#112).
- 9.) Varian 3700 gas chromatograph with flame photometric detector.

ANALYSIS:

- 1.) Remove sample from refrigerated storage and allow them to come to room temperature.

- 2.) Record weight and volume of the sample.
- 3.) Transfer sample to a 500 ml separatory funnel. Extract sample by shaking with 100 ml of methylene chloride for 2 minutes.
- 4.) Allow layers to separate and filter the organic layer through sodium sulfate. Collect extract in a 500 ml boiling flask.
- 5.) Repeat steps 3 & 4 two more times using 80 ml of methylene chloride.
- 6.) Rinse sodium sulfate with 20 ml methylene chloride and collect in the same 500 ml boiling flask.
- 7.) Take extract just to dryness on a rotary evaporator.
- 8.) Transfer sample with 10 ml acetone to a test tube and evaporate to a final volume of 1 ml with nitrogen. Submit sample for gas chromatographic for analysis.

EQUIPMENT CONDITIONS:

VARIAN 3700 G.C. WITH FPD
 COLUMN: HP 20M (Carbowax 20M) 10m x 0.53mm x 1.33um film thickness.
 CARRIER GAS: Helium
 INJECTOR: 210°C, DETECTOR: 250°C;
 TEMPERATURE PROGRAM: Initial Temp: 110°C held for 2 minutes;
 Rate: 20°C per minutes.
 Final Temp: 220° held for 4 minutes.

CALCULATIONS:

PPB DIAZINON, CHLORPYRIFOS, PARATHION AND METHIDATHION

$$\frac{(\text{peak height sample}) \times (\text{ng std}) \times (\text{final volume mls}) \times (1000)}{(\text{peak height std.}) \times (\text{ul sample injected}) \times (\text{weight of sample})}$$

RECOVERIES:

Recoveries of diazinon, chlopyrifos, parathion and methidathion at these levels:

Levels	Diazinon	Chlorpyrifos	Parathion	Methidathion
3.0ppm	104-121%	106-122%	102-126%	110-120%
5.0ppm	83-96%	85-103%	94-106%	83-97%
20.0ppm	94-112%	94-104%	93-108%	90-116%
100ppm	88-102%	82-100%	80-96%	86-104%
500ppm	81-96%	83-97%	82-97%	86-102%

SENSITIVITY:

0.4ng diazinon - 30% of full scale

0.4ng chlorpyrifos - 30% of full scale

0.4ng parathion - 50% of full scale

0.4ng methidathion - 40% of full scale

MINIMUM DETECTABLE LEVEL:

0.8ppb (whole volume of sample used.)

DISCUSSION

The fog water samples were analyzed using a well conditioned carbowax column. Upon installing a new carbowax column a total loss in sensitivity for supracide was found. Attempts were made to restore sensitivity for methidathion but failed. Therefore, it was necessary to use a 50% Ph Me Si column for the analysis of methidathion.

REFERENCE:

- 1) "The Sampling and Analysis of Water for Pesticides", EPA Manual of Analytical Methods for the Analysis of Pesticides in Humans and Environmental Samples, Sect. 10, A, pg 1-8, 1979.

WRITTEN BY: Jane Melvin

Jane Melvin
TITLE: Agricultural Chemist I

REVIEWED BY: Catherine Cooper

Catherine Cooper
TITLE: Agricultural Chemist III

APPROVED BY: George Tichelaar

George Tichelaar
TITLE: Principle Agricultural Chemist

CALIFORNIA DEPT. OF FOOD & AGRIC.
CHEMISTRY LABORATORY SERVICES
ENVIRONMENTAL MONITORING SECTION
3292 Meadowview Road
Sacramento, Ca 95832
(916) 427-4649/4999

Original Date: 06/9/89
Supercedes: New
Current Date:??
Method #:

DIAZINON, CHLORPYRIFOS, PARATHION AND METHIDATHION ON DILL

SCOPE:

This method is for the determination of diazinon, chlorpyrifos, parathion and methidathion on dill.

PRINCIPLE:

Residues of diazinon, chlorpyrifos, parathion and methidathion were extracted from dill samples by blending with acetonitrile. The extract was filtered and the aqueous layer salted out with sodium chloride. An aliquot of the organic layer was evaporated to dryness. The residue was brought up to volume with acetone and analyzed by gas chromatograph using a flame photometric detector (FPD).

REAGENTS AND EQUIPMENT:

- 1) Solvent; (pesticide residue grade) acetonitrile and acetone.
- 2) Sodium chloride.
- 3) Mixing glass cylinder (100ml).
- 4) Powder funnels.
- 5) Graduate test tube (15ml).
- 6) Whatman #1 filter paper.
- 7) Volumetric pipet (10ml).
- 8) Waring₀ stainless steel blender (1 quart).
- 9) Nitrogen evaporator (Organomation N-EVAP Model # 12).
- 10) Cusinart₀ food processor (Model DLC 7).
- 11) Dry ice.
- 12) Varian 3700 gas chromatograph with flame photometric detector.

ANALYSIS

- 1) Grind the frozen sample in a Cusinart with dry ice until the sample becomes homogenous.
- 2) Transfer the ground sample to a masson jar. Apply lid loosely to allow carbon dioxide to escape. Store in freezer overnight.
- 3) Take 50 gms of ground sample from freezer and place in a 1 quart Waring blender. Blend with 100 ml acetonitrile for 2-5 minutes at high speed.
- 4) Filter sample through Whatman #1 paper into a 100ml graduate mixing cylinder containing approximately 10 gms of sodium chloride. Stopper cylinder and shake vigorously for approximately 60 sec. Let stand for a few minutes to allow acetonitrile and water layers to separate.
- 5) Pipet a 10 ml aliquot of acetonitrile layer into a 15 ml test tube. CARE: Evaporate extract just to dryness on a nitrogen evaporator. Redissolve in acetone to a final volume of 1.0 ml. Submit sample for gas chromatographic analysis.

EQUIPMENT CONDITIONS:

VARIAN 3700 G.L.C. WITH FPD
COLUMN: HP 20M (Carbowax 20M), 10m x 0.53mm x 1.33um film thickness.
CARRIER GAS: Helium
INJECTOR: 210°C, DETECTOR: 250°C;
TEMPERATURE PROGRAM: Initial - Temp: 110°C held for 2 minutes;
Rate: 20°C per minute.
Final - Temp: 220°C held for 4 minutes;

CALCULATIONS:

* MOISTURE -

$$\frac{(\text{weight of undried sample + pan}) - (\text{weight of dried sample + pan})}{(\text{weight of undried sample + pan}) - (\text{weight of pan})} \times 100$$

PPM DIAZINON, CHLORPYRIFOS, PARATHION AND METHIDATHION

Undried dill

$$\frac{(\text{peak height sample}) \times (\text{ng std}) \times (\text{final volume ml})}{(\text{peak height standard}) \times (\text{ul sample injected}) \times (\text{weight of wet dill})}$$

RECOVERIES:

Recoveries of diazinon, chlorpyrifos, parathion and methidathion at these levels:

Levels	Diazinon	Chlorpyrifos	Parathion	Methidathion
0.03ppm	113-127%	133-147%	<u>133-157%</u>	116-130%
0.05ppm	104-128%	116-144%	126-148%	128-144%
0.2 ppm	79-108%	87-113%	85-110%	88-111%
1.0 ppm	63-86%	77-97%	77-95%	79-101%
5.0 ppm	80-97%	95-97%	88-94%	90-100%

SENSITIVITY:

0.4ng diazinon - 10% of full scale

0.4ng chlorpyrifos - 15% of full scale

0.4ng parathion - 40% of full scale

0.4ng methidathion - 40% of full scale

MINIMUM DETECTABLE LEVEL:

0.01ppm (50 grams undried sample extracted without moisture correction.)

DISCUSSION:

The dill samples were analyzed using a carbowax column. Over a period of time a loss of sensitivity was noticed, probably due to heavy loads of sample matrix depositing on the column. Shortening the column resulted in temporary renew of sensitivity. A new carbowax column was installed and a total loss in sensitivity for methidathion resulted. Attempts were made to restore sensitivity for supracid but failed.

REFERENCE:

- 1) Multi-Residue Pesticide Screens, Jan. 27, 1988. CDFA-Residue

WRITTEN BY: Jane Melvin

Jane Melvin
TITLE: Agricultural Chemist I

REVIEWED BY: Catherine Cooper

Catherine Cooper
TITLE: Agricultural Chemist III

APPROVED BY: George Tichelaar

George Tichelaar
TITLE: Principle Agricultural Chemist

PARATHION ON KIMBIES

SCOPE:

This method is for the determination of parathion on kimbies.

PRINCIPLE:

Residues of parathion were extracted from kimbies by shaking them with ethyl acetate. The extract was then concentrated and filtered through florsil sep-pak. It was then analyzed by gas chromatograph using a flame photometric detector (FPD).

REAGENTS AND EQUIPMENT:

- 1) Solvent; (Pesticide Residue Grade) ethyl acetate.
- 2) Glass jar (4 liters).
- 3) Mechanical shaker (G10 Gyrotory Shaker).
- 4) Graduated cylinder (1 liter).
- 5) boiling flasks, flat bottomed (500ml).
- 6) Graduate test tubes (15ml).
- 7) syringe
- 8) sep-pak florisil cartridge (Waters Assoc. # 51960).
- 9) Nitrogen evaporator (Organomation Model # 12).
- 10) Varian 3700 gas chromatograph with flame photometric detector.

ANALYSIS:

- 1) Place the kimbies in a 4 liter glass jar. Add 2 liters of ethyl acetate and shake on a mechanical shaker for 30 min. at a setting of - 190 RPM.
- 2) Take 1 liter of extract and concentrate down to 1 ml.
- 3) Transfer the extract to a test tube and bring the volume up to 10 ml with ethyl acetate.
- 4) Filter extract through a florisil cartridge and rinse cartridge with

1 ml of ethyl acetate. Collect sample and rinse in test tube. Evaporate sample down to a final volume of 10 ml. Submit sample to gas chromatograph analysis.

EQUIPMENT CONDITIONS:

VARIAN 3700 G.C. WITH FPD
COLUMN: HP 20M (Carbowax 20M), 10m x 0.53mm x 1.33um film thickness.
CARRIER GAS: Helium
INJECTOR: 210°C, DETECTOR: 250°C;
TEMPERATURE PROGRAM: Initial Temp: 170°C held for 2 minutes; Final Temp: 220°C held for 4 minutes; Rate: 20°C per minutes.

CALCULATIONS:

UG PARATHION

(peak height sample) x (ng std) x (final volume ml) x 2

(peak height standard) x (ul sample injected)

A factor of 2 was included in this equation to represent the whole sample.

RECOVERIES

Recoveries of parathion at these levels:

Levels	Parathion
1 ug	70-100%
5 ug	74-100%
25 ug	76-94%

SENSITIVITY:

0.4ng parathion ~ 25% of full scale

MINIMUM DETECTABLE LEVEL:

1.0 ug per sample (10 kimbies)

DICUSSION:

Kimbies are an asbordant towels with a plastic backing. Initially a study had to be set up for the selecting of an appropriate solvent. Ethyl acetate resulted in fewer peaks than acetone or methanol. It was found that further clean up was needed because the peak extracted by ethyl acetate from the plastic backing interfered with parathion. A florisil cartridge removed the interfering peak without loss of parathion.

The sample results were calculated two ways. One was calculated based upon the pure standard and the other was calculated based upon the pure standard in extract of blank kimbies. The results seem to differ at first

but over time there was little or no difference. It was thought that the kimblies might be enhancing the recover.

REFERENCE:

Private communication with Workers Health and Safety.

WRITTEN BY: Jane Melvin

Jane Melvin
TITLE: Agricultural Chemist I

REVIEWED BY: Catherine Cooper

Catherine Cooper
TITLE: Agricultural Chemist III

APPROVED BY: George Tichelaar

George Tichelaar
TITLE: Principle Agricultural Chemist

APPENDIX IV
QUALITY CONTROL RESULTS

Method Development

Method validation for analysis of diazinon, chlorpyrifos, parathion and methidathion in water, dill and kimble samples was performed by CDFA Laboratory Services in Sacramento, Ca. The detection limits, mean percent recoveries and SD for diazinon, chlorpyrifos, parathion and methidathion in distilled water, dill and kimble fallout samples are presented in Tables IV-1 through IV-12. The mean percent recovery and SD were used to calculate the warning (\pm SD from mean) and control (\pm 2 SD from mean) limits for accuracy.

Enseco-Cal laboratory also conducted a method validation study for the analysis of diazinon, chlorpyrifos, parathion and methidathion in distilled water and dill samples. The detection limits, mean percent recoveries and SD for all four compounds are presented in Tables IV-13 through IV-20. The mean percent recovery and SD were used to calculate the warning (\pm SD from mean) and control (\pm 2 SD from mean) limits for accuracy.

Quality Control Results

The average continuing quality control spike recoveries for all four compounds in each matrix fell within their respective control limits (Tables IV-21 through IV-28).

Split Sample Analyses

Enseco-Cal laboratory split dill results were consistently lower than CDFA's due to their overall low quality control spike recoveries (Tables IV-17 through IV-20 and IV-37 through IV-40).

Storage Dissipation Study

A storage dissipation study was conducted to determine the potential breakdown of diazinon, chlorpyrifos, parathion and methidathion in water and dill during cold storage. Nine replicate water and dill samples were spiked with all four compounds on day 0 and 2 replicates each were analyzed on days 0, 7, 14, 21, 28, 35, 42, 49, and 56. There is no apparent breakdown of all four compounds in water and dill over the 56 days (Tables IV-29 through IV-36).

Table IV-1. Method validation blank matrix spikes for the 1989 dormant spray study: water.

Analyte: Diazinon Matrix: D.I. Water Detection limit: 1.0 ppb				Lab: CDFA Chemist: Jane Melvin Date: 1/23/89		
Lab Sample #	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{X}	SD	CV (%)
1525	3.13	3.0	104.3			
1524	3.55	3.0	118.3			
1521	3.40	3.0	113.3			
1522	3.62	3.0	121.0			
1523	3.23	3.0	107.7			
1532	4.72	5.0	94.4			
1531	4.54	5.0	90.8			
1530	4.46	5.0	89.2			
1529	4.14	5.0	82.8			
1527	4.78	5.0	95.6			
1538	18.87	20.0	94.4			
1537	19.55	20.0	97.8			
1536	22.30	20.0	111.5			
1535	20.07	20.0	100.4			
1534	21.12	20.0	105.6			
1544	99.43	100	99.4			
1543	88.02	100	88.0			
1542	88.49	100	88.5			
1541	88.65	100	88.6			
1540	101.67	100	101.7			
1528	467.67	500	93.5			
1549	404.17	500	80.8			
1548	429.86	500	86.0			
1547	436.89	500	87.4			
1546	479.04	500	95.8	97.5	10.8	11.1
\bar{X}	SD	LWL	UWL	LCL	UCL	
98	11	87	108	76	119	

LWL and UWL = mean +/- SD, LCL and UCL = mean +/- 2 SD

Table IV-2. Method validation blank matrix spikes for the 1989 dormant spray study: water.

Analyte: Chlorpyrifos
 Matrix: D.I. Water
 Detection limit: 1.0 ppb

Lab: CDFA
 Chemist: Jane Melvin
 Date: 1/23/89

Lab Sample #	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{X}	SD	CV (%)
1525	3.18	3.0	106.0			
1524	3.36	3.0	112.0			
1521	3.55	3.0	118.3			
1522	3.65	3.0	121.6			
1523	3.46	3.0	115.3			
1532	5.01	5.0	100.2			
1531	5.04	5.0	100.8			
1530	4.60	5.0	92.0			
1529	4.24	5.0	84.8			
1527	5.14	5.0	102.8			
1538	18.77	20.0	93.9			
1537	19.37	20.0	96.9			
1536	20.74	20.0	103.7			
1535	19.10	20.0	95.5			
1534	20.73	20.0	103.7			
1544	89.24	100	89.2			
1543	82.44	100	82.4			
1542	84.71	100	84.7			
1541	87.48	100	87.4			
1540	99.60	100	99.6			
1528	474.19	500	94.8			
1549	416.65	500	83.3			
1548	446.69	500	89.3			
1547	441.01	500	88.2			
1546	485.69	500	97.1	97.7	10.9	11.2

\bar{X}	SD	LWL	UWL	LCL	UCL
98	11	87	109	76	120

LWL and UWL = mean +/- SD, LCL and UCL = mean +/- 2 SD

Table IV-3. Method validation blank matrix spikes for the 1989 dormant spray study: water.

Analyte: Parathion
 Matrix: D.I. Water
 Detection limit: 1.0 ppb

Lab: CDFA
 Chemist: Jane Melvin
 Date: 1/23/89

Lab Sample #	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{X}	SD	CV (%)
1525	3.15	3.0	105.0			
1524	3.66	3.0	122.0			
1521	3.57	3.0	119.0			
1522	3.77	3.0	125.7			
1523	3.05	3.0	101.6			
1532	5.29	5.0	105.8			
1531	4.83	5.0	96.6			
1530	4.78	5.0	95.6			
1529	4.29	5.0	85.8			
1527	4.69	5.0	93.8			
1538	18.68	20.0	93.4			
1537	19.98	20.0	99.9			
1536	21.61	20.0	108.1			
1535	20.33	20.0	101.7			
1534	19.49	20.0	97.5			
1544	90.12	100	90.1			
1543	80.42	100	80.4			
1542	85.77	100	85.8			
1541	86.42	100	86.4			
1540	95.88	100	95.8			
1528	463.75	500	92.8			
1549	407.49	500	81.5			
1548	452.65	500	90.5			
1547	420.45	500	84.1			
1546	483.29	500	96.7	97.4	11.9	12.3

\bar{X}	SD	LWL	UWL	LCL	UCL
97	12	86	109	74	121

LWL and UWL = mean +/- SD, LCL and UCL = mean +/- 2 SD

Table IV-4. Method validation blank matrix spikes for the 1989 dormant spray study: water.

Analyte: Methidathion Matrix: D.I. Water Detection limit: 1.0 ppb				Lab: CDFA Chemist: Jane Melvin Date: 1/23/89		
Lab Sample #	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{X}	SD	CV (%)
1525	3.29	3.0	109.6			
1524	3.49	3.0	116.0			
1521	3.49	3.0	116.3			
1522	3.60	3.0	120.0			
1523	3.39	3.0	113.0			
1532	4.87	5.0	97.4			
1531	4.49	5.0	89.8			
1530	4.77	5.0	95.4			
1529	4.16	5.0	83.2			
1527	4.45	5.0	89.0			
1538	17.98	20.0	89.9			
1537	19.41	20.0	97.1			
1536	23.13	20.0	115.6			
1535	21.74	20.0	108.7			
1534	20.32	20.0	101.6			
1544	96.94	100	96.9			
1543	86.01	100	86.0			
1542	91.56	100	91.6			
1541	97.28	100	97.3			
1540	104.24	100	104.2			
1528	469.06	500	93.8			
1549	428.76	500	85.8			
1548	479.62	500	95.9			
1547	450.29	500	90.1			
1546	510.17	500	102.0	99.4	10.8	10.9

\bar{X}	SD	LWL	UWL	LCL	UCL
99	11	89	110	78	121

LWL and UWL = mean +/- SD, LCL and UCL = mean +/- 2 SD

Table IV-5. Method validation blank matrix spikes for the 1989 dormant spray study: dill.

Analyte: Diazinon
 Matrix: Dill
 Detection limit: 0.01 ppm

Lab: CDFA
 Chemist: Jane Melvin
 Date: 1/27/89

Lab Sample #	Background (ppm)	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{X}	SD	CV (%)
1690	~0.002	0.034	0.03	113.3			
1691	~0.002	0.038	0.03	126.6			
1693	~0.002	0.037	0.03	126.7			
1692	~0.002	0.036	0.03	120.0			
1682	~0.002	0.038	0.03	126.6	122.6	5.96	4.86
1684	~0.001	0.056	0.05	112.0			
1685	~0.001	0.052	0.05	104.0			
1686	~0.001	0.054	0.05	108.0			
1687	~0.001	0.064	0.05	128.0			
1688	~0.001	0.058	0.05	116.0	113.6	9.21	8.11
1677	~0.004	0.159	0.2	79.5			
1678	~0.004	0.184	0.2	92.0			
1679	~0.004	0.216	0.2	108.0			
1680	~0.004	0.204	0.2	102.0			
1681	~0.004	0.199	0.2	99.5	96.2	11.0	11.4
1671		0.831	1.0	83.1			
1672		0.634	1.0	63.4			
1673		0.861	1.0	86.1			
1674		0.768	1.0	76.8			
1675		0.636	1.0	63.6	74.6	10.7	14.3
1665	~0.002	4.832	5.0	96.6			
1666	~0.002	4.011	5.0	80.2			
1667	~0.002	4.235	5.0	84.7			
1668	~0.002	4.024	5.0	80.5			
1669	~0.002	4.195	5.0	83.9	85.2	6.69	7.85
OVERALL=					98.4	19.8	20.1

\bar{X}	SD	LWL	UWL	LCL	UCL
98	20	78	118	58	138

LWL and UWL = mean +/- SD, LCL and UCL = mean +/- 2 SD

Table IV-6. Method validation blank matrix spikes for the 1989 dormant spray study: dill.

Analyte: Chlorpyrifos
 Matrix: Dill
 Detection limit: 0.01 ppm

Lab: CDFA
 Chemist: Jane Melvin
 Date: 1/27/89

Lab Sample #	Background (ppm)	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{X}	SD	CV (%)
1690	~0.005	0.041	0.03	136.7			
1691	~0.005	0.049	0.03	146.7			
1693	~0.005	0.043	0.03	143.3			
1692	~0.005	0.040	0.03	133.3			
1682	~0.005	0.042	0.03	140.0	140	5.28	3.77
1684	~0.004	0.062	0.05	124.0			
1685	~0.004	0.058	0.05	116.0			
1686	~0.004	0.070	0.05	140.0			
1687	~0.004	0.072	0.05	144.0			
1688	~0.004	0.067	0.05	134.0	132	11.5	8.76
1677	~0.004	0.173	0.2	86.5			
1678	~0.004	0.194	0.2	97.0			
1679	~0.004	0.225	0.2	112.5			
1680	~0.004	0.219	0.2	109.5			
1681	~0.004	0.202	0.2	101.0	101	10.4	10.2
1671	~0.004	0.967	1.0	96.7			
1672	~0.004	0.771	1.0	77.1			
1673	~0.004	0.964	1.0	96.4			
1674	~0.004	0.893	1.0	89.3			
1675	~0.004	0.850	1.0	85.0	88.9	8.24	9.27
1665	~0.006	4.801	5.0	96.0			
1666	~0.006	4.833	5.0	96.7			
1667	~0.006	4.961	5.0	99.2			
1668	~0.006	4.790	5.0	95.8			
1669	~0.006	4.751	5.0	95.0	96.5	1.61	1.66
OVERALL=					112	22.0	19.7

\bar{X}	SD	LWL	UWL	LCL	UCL
112	22	90	134	68	156

LWL and UWL = mean +/- SD, LCL and UCL = mean +/- 2 SD

Table IV-7. Method validation blank matrix spikes for the 1989 dormant spray study: dill.

Analyte: Parathion
 Matrix: Dill
 Detection limit: 0.01 ppm

Lab: CDFA
 Chemist: Jane Melvin
 Date: 1/27/89

Lab Sample #	Background (ppm)	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{X}	SD	CV (%)
1690	~0.005	0.040	0.03	133.3			
1691	~0.005	0.047	0.03	156.6			
1693	~0.005	0.046	0.03	153.3			
1692	~0.005	0.041	0.03	136.6			
1682	~0.005	0.041	0.03	136.7	143	10.8	7.53
1684	~0.004	0.065	0.05	130.0			
1685	~0.004	0.063	0.05	126.0			
1686	~0.004	0.072	0.05	144.0			
1687	~0.004	0.074	0.05	148.0			
1688	~0.004	0.066	0.05	132.0	136	9.49	6.98
1677		0.170	0.2	85.0			
1678		0.186	0.2	93.0			
1679		0.220	0.2	110.0			
1680		0.213	0.2	106.5			
1681		0.199	0.2	99.5	98.8	10.1	10.2
1671	~0.003	0.940	1.0	94.0			
1672	~0.003	0.767	1.0	76.7			
1673	~0.003	0.938	1.0	93.8			
1674	~0.003	0.945	1.0	94.5			
1675	~0.003	0.811	1.0	81.0	88	8.5	9.7
1665	~0.005	4.406	5.0	88.1			
1666	~0.005	4.543	5.0	90.9			
1667	~0.005	4.511	5.0	90.2			
1668	~0.005	4.409	5.0	88.2			
1669	~0.005	4.714	5.0	94.3	90.3	2.53	2.80
OVERALL=					111	25.3	22.8

\bar{X}	SD	LWL	UWL	LCL	UCL
111	25	86	136	60	162

LWL and UWL = mean +/- SD, LCL and UCL = mean +/- 2 SD

Table IV-8. Method validation blank matrix spikes for the 1989 dormant spray study: dill.

Lab Sample #	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{X}	SD	CV (%)
1690	0.035	0.03	116.7			
1691	0.039	0.03	130.0			
1693	0.039	0.03	130.0			
1692	0.039	0.03	130.0			
1682	0.038	0.03	126.6	127	5.76	4.55
1684	0.066	0.05	132.0			
1685	0.059	0.05	118.0			
1686	0.070	0.05	140.0			
1687	0.072	0.05	144.0			
1688	0.064	0.05	128.0	132	10.2	7.73
1677	0.180	0.2	90.0			
1678	0.176	0.2	88.0			
1679	0.222	0.2	111.0			
1680	0.215	0.2	107.5			
1681	0.198	0.2	99.0	99.1	10.2	10.3
1671	1.014	1.0	101.4			
1672	0.792	1.0	79.2			
1673	0.951	1.0	95.1			
1674	0.986	1.0	98.6			
1675	0.823	1.0	82.3	91.3	9.96	10.9
1665	5.001	5.0	100.0			
1666	4.991	5.0	99.8			
1667	4.998	5.0	99.9			
1668	4.631	5.0	92.6			
1669	4.527	5.0	90.5	96.6	4.63	4.80
OVERALL=				109	18.9	17.3

\bar{X}	SD	LWL	UWL	LCL	UCL
109	19	90	128	71	147

LWL and UWL = mean +/- SD, LCL and UCL = mean +/- 2 SD

Table IV-9. Method validation blank matrix spikes for the 1989 dormant spray study: kimbie.

Analyte: Diazinon
 Matrix: Kimbie
 Detection limit: 0.5 ug

Lab: CDFA
 Chemist: Jane Melvin
 Date: 5/19/89

Lab Sample #	Standard (ug)	Recovery %	Spike Blank (ug)	Recovery %	Level (ug)	Standard Mean	SD	Spike Blank Mean	SD
3150	5.2	104	4	80	5				
3151	5.8	116	5.8	116	5				
3156	5.2	104	4.4	88	5				
3159	6.2	124	5.4	108	5				
3162	5.5	110	5	100	5	112	8.53	98	15
3151	19.1	78	14.8	59	25				
3154	21.8	87	21.8	87	25				
3157	23.3	93	19.7	79	25				
3160	26.4	106	22.9	92	25				
3163	26.7	107	25.1	100	25	94	12	83	16
OVERALL =						103	13.6	91	16

Table IV-10. Method validation blank matrix spikes for the 1989 dormant spray study: kimbie.

Analyte: Chlorpyrifos
 Matrix: Kimbie
 Detection limit: 0.5 ug

Lab: CDFA
 Chemist: Jane Melvin
 Date: 5/19/89

Lab Sample #	Standard (ug)	Recovery %	Spike Blank (ug)	Recovery %	Level (ug)	Standard Mean	SD	Spike Blank Mean	SD
3150	4.5	90	4.2	84	5				
3151	5.0	100	4.5	90	5				
3156	4.9	98	5.0	100	5				
3159	7.1	142	7.3	146	5				
3162	5.9	118	5.9	118	5	110	20.8	108	25
3151	18.1	72	17.1	68	25				
3154	22.7	91	20.6	82	25				
3157	24.0	96	24.7	99	25				
3160	29.4	118	30.1	120	25				
3163	29.3	117	27.7	111	25	99	19	96	21
OVERALL =						104	19.7	102	22.7

Table IV-11. Method validation blank matrix spikes for the 1989 dormant spray study: kimbie.

Analyte: Parathion
 Matrix: Kimbie
 Detection limit: 1.0 ug

Lab: CDFA
 Chemist: Jane Melvin
 Date: 5/19/89

Lab Sample #	Standard (ug)	Recovery %	Spike Blank (ug)	Recovery %	Level (ug)	Standard Mean	SD	Spike Blank Mean	SD
3150	2.8	56	3.7	74	5				
3151	2.8	56	3.7	74	5				
3156	3.3	66	3.8	76	5				
3159	5.3	106	5.0	100	5				
3162	3.8	76	4.5	90	5	72	21	83	12
3151	14.4	58	18.9	76	25				
3154	18.0	72	24.0	96	25				
3157	19.8	79	23.3	93	25				
3160	24.5	98	23.2	93	25				
3163	25.5	102	23.6	94	25	82	18	90	8.1
OVERALL =						77	19	87	10

Table IV-12. Method validation blank matrix spikes for the 1989 dormant spray study: kimbie.

Analyte: Methidathion
 Matrix: Kimbie
 Detection limit: 1.0 ug

Lab: CDFA
 Chemist: Jane Melvin
 Date: 5/19/89

Lab Sample #	Standard (ug)	Recovery %	Spike Blank (ug)	Recovery %	Level (ug)	Standard Mean	SD	Spike Level Mean	SD
3150	5.0	100	4.2	84	5				
3151	4.3	86	4.3	86	5				
3156	4.6	92	4.4	88	5				
3159	4.7	94	5.0	100	5				
3162	4.9	98	4.7	94	5	94	5.5	90	6.5
3151	23.6	94	19.8	79	25				
3154	24.0	96	24.2	97	25				
3157	22.1	88	20.9	84	25				
3160	24.3	97	25.8	103	25				
3163	23.6	94	22.7	91	25	94	3.5	91	9.7
OVERALL =						94	4.3	91	7.8

Table IV-13. Method validation blank matrix spikes for the 1989 dormant spray study : water.

Analyte: Diazinon
 Matrix: D.I. Water
 Detection limit: 1 ppb

Lab: Cal Labs
 Chemist: Kris Murbach
 Date: 2/8/89

Lab Sample #	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{X}	SD	CV (%)
45203-1	3.1	3	103			
45203-2	3.1	3	103			
45203-3	3.1	3	103			
45203-4	3.0	3	100			
45203-5	3.1	3	103	102	1.34	1.31
45203-6	530	500	106			
45203-7	500	500	100			
45203-8	530	500	106			
45203-9	540	500	108			
45203-10	520	500	104	105	3.03	2.89
OVERALL =				104	2.55	2.46
\bar{X}	SD	LWL	UWL	LCL	UCL	
104	2.55	101	107	99	109	

Table IV-14. Method validation blank matrix spikes for the 1989 dormant spray study : water.

Analyte: Parathion
 Matrix: D.I. Water
 Detection limit: 1ppb

Lab: Cal Labs
 Chemist: Kris Murbach
 Date: 2/8/89

Lab Sample #	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{X}	SD	CV (%)
45203-1	3.2	3.0	107			
45203-2	3.2	3.0	107			
45203-3	3.2	3.0	107			
45203-4	3.0	3.0	100			
45203-5	3.1	3.0	103	105	3.19	3.05
45203-6	540	500	108			
45203-7	520	500	104			
45203-8	570	500	114			
45203-9	560	500	112			
45203-10	550	500	110	110	3.85	3.51
OVERALL =				107	4.18	3.90
\bar{X}	SD	LWL	UWL	LCL	UCL	
107	4.18	103	111	99	115	
LWL/UWL = mean +/- 1SD			LCL/UCL = mean +/- 2SD			

Table IV-15. Method validation blank matrix spikes for the 1989 dormant spray study : water.

Analyte: Methidathion
 Matrix: D.I. Water
 Detection limit: 1 ppb

Lab: Cal Labs
 Chemist: Kris Murbach
 Date: 2/8/89

Lab Sample #	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{X}	SD	CV (%)
45203-1	3.0	3.0	100			
45203-2	3.1	3.0	103			
45203-3	3.1	3.0	103			
45203-4	3.1	3.0	103			
45203-5	3.2	3.0	107	103	2.49	2.41
45203-6	540	500	108			
45203-7	500	500	100			
45203-8	560	500	112			
45203-9	520	500	104			
45203-10	520	500	104	106	4.56	4.32
OVERALL=				104	3.69	3.53
\bar{X}	SD	LWL	UWL	LCL	UCL	
104	3.69	100	108	97	111	

Table IV-16. Method validation blank matrix spikes for the 1989 dormant spray study : water.

Analyte: Chlorpyrifos
 Matrix: D.I. Water
 Detection limit: 1 ppb

Lab: Cal Labs
 Chemist: Kris Murbach
 Date: 2/8/89

Lab Sample #	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{X}	SD	CV (%)
45203-1	3.1	3.0	103			
45203-2	3.2	3.0	107			
45203-3	3.2	3.0	107			
45203-4	2.9	3.0	97			
45203-5	3.1	3.0	103	103	4.10	3.96
45203-6	540	500	108			
45203-7	530	500	106			
45203-8	580	500	116			
45203-9	550	500	110			
45203-10	550	500	110	110	3.74	3.40
OVERALL=				107	5.08	4.76
\bar{X}	SD	LWL	UWL	LCL	UCL	
107	5.08	102	112	97	117	

LWL and UWL = mean +/- SD

LCL and UCL = mean +/- 2 SD

Table IV-17. Method validation blank matrix spikes for the 1989 dormant spray study: dill.

Analyte: Diazinon
 Matrix: Dill
 Detection limit: 0.015 ppm

Lab: Cal Labs
 Chemist: Kris Murbach
 Date: 2/8/89

Lab Sample #	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{X}	SD	CV (%)
45203-11	0.015	0.03	50			
45203-12	0.015	0.03	50			
45203-13	0.018	0.03	60			
45203-14	0.018	0.03	60	55	5.8	10
45203-17	3.9	5.0	78			
45203-18	3.5	5.0	70			
45203-19	2.8	5.0	56			
45203-20	3.4	5.0	68	68	9.1	13
OVERALL=				62	9.9	16
\bar{X}	SD	LWL	UWL	LCL	UCL	
62	9.9	52	72	42	82	

Table IV-18. Method validation blank matrix spikes for the 1989 dormant spray study: dill.

Analyte: Parathion
 Matrix: Dill
 Detection limit: 0.015 ppm

Lab: Cal Labs
 Chemist: Kris Murbach
 Date: 2/8/89

Lab Sample #	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{X}	SD	CV (%)
45203-11	0.03	0.03	100			
45203-12	0.03	0.03	100			
45203-13	0.038	0.03	127			
45203-14	0.038	0.03	127	114	15.6	13.7
45203-17	4.2	5.0	84			
45203-18	3.7	5.0	74			
45203-19	3.0	5.0	60			
45203-20	3.5	5.0	70	72	9.93	13.8
OVERALL=				93	25	27
\bar{X}	SD	LWL	UWL	LCL	UCL	
93	25	68	118	43	143	

LWL and UWL = mean +/- SD

LCL/UCL = mean +/- 2SD

Table IV-19. Method validation blank matrix spikes for the 1989 dormant spray study: dill.

Analyte: Methidathion
 Matrix: Dill
 Detection limit: 0.015 ppm

Lab: Cal Labs
 Chemist: Kris Murbach
 Date: 2/8/89

Lab Sample #	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{X}	SD	CV (%)
45203-11	0.018	0.03	60			
45203-12	0.018	0.03	60			
45203-13	0.02	0.03	67			
45203-14	0.018	0.03	60	62	3.5	5.7
45203-17	4.5	5.0	90			
45203-18	4.3	5.0	86			
45203-19	3.5	5.0	70			
45203-20	3.9	5.0	78	81	8.9	11
OVERALL=				71	12	17
\bar{X}	SD	LWL	UWL	LCL	UCL	
71	12	59	83	47	95	

Table IV-20. Method validation blank matrix spikes for the 1989 dormant spray study: dill.

Analyte: Chlorpyrifos
 Matrix: Dill
 Detection limit: 0.015 ppm

Lab: Cal Labs
 Chemist: Kris Murbach
 Date: 2/8/89

Lab Sample #	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{X}	SD	CV (%)
45203-11	0.016	0.03	53			
45203-12	<0.015	0.03	0			
45203-13	0.018	0.03	60			
45203-14	0.016	0.03	53	42	28	67
45203-17	4.2	5.0	84			
45203-18	3.8	5.0	76			
45203-19	3.0	5.0	60			
45203-20	3.5	5.0	70	73	10	14
OVERALL=				57	26	45
\bar{X}	SD	LWL	UWL	LCL	UCL	
57	26	31	83	5	109	

LWL and UWL = mean +/- SD

LCL and UCL = mean +/- 2 SD

Table IV-21. Continuing quality control data for the 1989 dormant spray study: water.

Analyte: Diazinon Matrix: Water Detection limit: 1.0 ppb					Lab: CDFA Chemist: Jane Melvin Date: 03/31/89		
Extraction Set #	Lab Sample #	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{X}	SD	CV (%)
133, 173, 176-7, 179	1767	0.93	1.0	93			
121-3, 169-71 217-8	1785	0.86	1.0	86			
125, 128-9, 176, 220, 225	1796	0.75	1.0	75			
136-9, 184, 227-8	1819	0.8	1.0	80			
130-1, 180, 182-3, 229-31	1889	0.76	1.0	76			
142-3, 181, 186-7, 233-4	1898	0.72	1.0	72			
124, 132, 172, 178, 219, 224	2094	0.82	1.0	82			
132, 172, 219, 223-6	2407	0.85	1.0	85			
185	2503	1.03	1.0	103	84	9.7	12

Table IV-22. Continuing quality control data for the 1989 dormant spray study: water.

Analyte: Chlorpyrifos Matrix: Water Detection limit: 1.0 ppb					Lab: CDFA Chemist: Jane Melvin Date: 03/31/89		
Extraction Set #	Lab Sample #	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{X}	SD	CV (%)
133, 173, 176-7, 179	1767	1.03	1.0	103			
121-3, 169-71 217-8	1785	0.86	1.0	86			
125, 128-9, 176, 220, 225	1796	0.89	1.0	89			
136-9, 184, 227-8	1819	0.84	1.0	84			
130-1, 180, 182-3, 229-31	1889	0.72	1.0	72			
142-3, 181, 186-7, 233-4	1898	0.72	1.0	72			
124, 132, 172, 178, 219, 224	2094	0.86	1.0	86			
132, 172, 219, 223-6	2407	0.88	1.0	88			
185	2503	1.00	1.0	100	87	11	12

Table IV-23. Continuing quality control data for the 1989 dormant spray study : water.

Analyte: Parathion Matrix: Water Detection limit: 1.0 ppb					Lab: CDFA Chemist: Jane Melvin Date: 03/31/89		
Extraction Set #	Lab Sample #	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{X}	SD	CV (%)
133, 173, 176-7, 179	1767	0.95	1.0	95			
121-3, 169-71 217-8	1785	0.95	1.0	95			
125, 128-9, 176, 220, 225	1796	0.93	1.0	93			
136-9, 184, 227-8	1819	0.93	1.0	93			
130-1, 180, 182-3, 229-31	1889	0.74	1.0	74			
142-3, 181, 186-7, 233-4	1898	0.74	1.0	74			
124, 132, 172, 178, 219, 224	2094	0.83	1.0	83			
132, 172, 219, 223-6	2407	0.92	1.0	92			
185	2503	0.97	1.0	97	88	9.1	10

Table IV-24. Continuing quality control data for the 1989 dormant spray study: water.

Analyte: Methidathion Matrix: Water Detection limit: 1.0 ppb					Lab: CDFA Chemist: Jane Melvin Date: 03/31/89		
Extraction Set #	Lab Sample #	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{X}	SD	CV (%)
133, 173, 176-7, 179	1767	0.97	1.0	97			
121-3, 169-71 217-8	1785	0.89	1.0	89			
125, 128-9, 176, 220, 225	1796	0.88	1.0	88			
136-9, 184, 227-8	1819	1.00	1.0	100			
130-1, 180, 182-3, 229-31	1889	0.80	1.0	80			
142-3, 181, 186-7, 233-4	1898	0.81	1.0	81			
124, 132, 172, 178, 219, 224	2094	0.80	1.0	80			
132, 172, 219, 223-6	2407	0.98	1.0	98			
185	2503	0.98	1.0	98	90	8.4	9.3

Table IV-25. Continuing quality control data for the 1989 dormant spray study: dill.

Analyte: Diazinon Matrix: Dill Detection Limit : 0.01 ppm					Lab: CDFA Chemist: Jane Melvin Date: 04/03/89		
Extraction Set #	Lab Sample #	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{X}	SD	CV (%)
271-3	1714	0.058	0.05	118			
282, 291, 301,	2519	0.041	0.05	82			
278, 384-5, 288, 293, 296, 298-9	2546	0.038	0.05	76			
279, 286-7, 289	2559	0.053	0.05	106			
102, 275-6, 280, 283, 290, 295, 297, 303, 308	2646	0.046	0.05	92			
274, 277, 281, 300	2676	0.049	0.05	98	95	15	16

Table IV-26. Continuing quality control data for the 1989 dormant spray study: dill.

Analyte: Chlorpyrifos Matrix: Dill Detection Limit: 0.01 ppm					Lab: CDFA Chemist: Jane Melvin Date: 04/03/89		
Extraction Set #	Lab Sample #	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{X}	SD	CV (%)
271-3	1714	0.0598	0.05	120			
282, 291, 301,	2519	0.049	0.05	98			
278, 284-5, 288, 293, 296, 298-9	2546	0.047	0.05	94			
279, 286-7, 289	2559	0.054	0.05	108			
102, 275-6, 280, 283, 290, 295, 297, 303, 308	2646	0.052	0.05	104			
274, 277, 281, 300	2676	0.051	0.05	102	104	9	9

Table IV-27. Continuing quality control data for the 1989 dormant spray study: dill.

Analyte: Parathion Matrix: Dill Detection Limit: 0.01 ppm					Lab: CDFA Chemist: Jane Melvin Date: 04/03/89		
Extraction Set #	Lab Sample #	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{X}	SD	CV (%)
271-3	1714	0.0564	0.05	113			
282, 291, 301,	2519	0.056	0.05	112			
278, 284-5, 288, 293, 296, 298-9	2546	0.051	0.05	102			
279, 286-7, 289	2559	0.056	0.05	112			
102, 275-6, 280, 283, 290, 295, 297, 303, 308	2646	0.055	0.05	110			
274, 277, 281, 300	2676	0.049	0.05	130	113	9.2	8.1

Table IV-28. Continuing quality control data for the 1989 dormant spray study: dill.

Analyte: Methidathion Matrix: Dill Detection Limit: 0.01 ppm					Lab: CDFA Chemist: Jane Melvin Date: 04/03/89		
Extraction Set #	Lab Sample #	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{X}	SD	CV (%)
271-3	1714	0.0525	0.05	105			
282, 291, 301,	2519	0.058	0.05	116			
278, 284-5, 288, 293, 296, 298-9	2546	0.058	0.05	116			
279, 286-7, 289	2559	0.054	0.05	108			
102, 275-6, 280, 283, 290, 295, 297, 303, 308	2646	0.052	0.05	104			
274, 277, 281, 300	2676	0.062	0.05	124	112	7.81	6.96

Table IV-29. Storage dissipation analyses for the 1989 dormant spray study: water.

Analyte: Diazinon
 Matrix: D.I. Water
 Detection Limit: 1 ppb

Lab: CDFA
 Chemist: Jane Melvin
 Date: 1/23/89

Lab Sample	Day	Date Extracted	Date Analyzed	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{x}	SD	CV (%)
1586	0	1/17/89	1/20/89	8.77	10.0	87.7			
1587	0	1/17/89	1/20/89	8.78	10.0	87.8	87.8	0.07	0.08
1699	7	1/24/89	1/26/89	7.39	10.0	73.9			
1698	7	1/24/89	1/26/89	8.28	10.0	82.8	78.4	6.29	8.03
1744	14	1/31/89	2/1/89	9.44	10.0	94.4			
1745	14	1/31/89	2/1/89	7.52	10.0	75.2	84.8	13.6	16.0
1868*	21	2/7/89	2/8/89	5.64	10.0	56.4			
1869	21	2/7/89	2/8/89	8.27	10.0	82.7	69.6	18.6	26.7
1931	28	2/14/89	2/15/89	7.65	10.0	76.5			
1932	28	2/14/89	2/15/89	7.95	10.0	79.5	78.0	2.12	2.72
2058	35	2/21/89	2/27/89	7.94	10.0	79.4			
2059	35	2/21/89	2/27/89	7.62	10.0	76.2	77.8	2.26	2.91
2127	42	2/28/89	2/28/89	7.87	10.0	78.7			
2128	42	2/28/89	2/28/89	6.99	10.0	69.9	74.3	6.22	8.37
2268	49	3/7/89	3/7/89	6.95	10.0	69.5			
2269	49	3/7/89	3/7/89	8.00	10.0	80.0	74.8	7.42	9.93
2486	56	3/14/89	3/20/89	6.22	10.0	62.2			
2487	56	3/14/89	3/20/89	6.01	10.0	60.1	61.2	1.48	2.43

* Sample was spilled during extraction.

Table IV-30. Storage dissipation analyses for the 1989 dormant spray study: water.

Analyte: Chlorpyrifos
 Matrix: D.I. Water
 Detection limit: 1 pbb

Lab: CDFA
 Chemist: Jane Melvin
 Date: 1/23/89

Lab Sample #	Day	Date Extracted	Date Analyzed	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{X}	SD	CV (%)
1586	0	1/17/89	1/20/89	9.42	10	94.2			
1587	0	1/17/89	1/20/89	8.94	10	89.4	91.8	3.39	3.70
1699	7	1/24/89	1/26/89	8.14	10	81.4			
1698	7	1/24/89	1/26/89	9.22	10	92.2	86.8	76.64	8.80
1744	14	1/31/89	2/1/89	10.29	10	102.9			
1745	14	1/31/89	2/1/89	9.15	10	91.5	97.2	8.06	8.29
1868*	21	2/7/89	2/8/89	6.20	10	62.0			
1869	21	2/7/89	2/8/89	8.84	10	88.4	75.2	18.70	24.80
1931	28	2/14/89	2/15/89	7.90	10	79.0			
1932	28	2/14/89	2/15/89	7.86	10	78.6	78.8	0.28	0.36
2058	35	2/21/89	2/27/89	7.86	10	78.6			
2059	35	2/21/89	2/27/89	7.48	10	74.8	76.7'	2.69	3.50
2127	42	2/28/89	2/28/89	8.11	10	81.1			
2128	42	2/28/89	2/28/89	7.36	10	73.6	77.4	5.30	6.86
2268	49	3/7/89	3/7/89	6.71	10	67.1			
2269	49	3/7/89	3/7/89	7.37	10	73.7	70.4	4.67	6.63
2486	56	3/14/89	3/20/89	7.66	10	76.6			
2487	56	3/14/89	3/20/89	7.50	10	75.0	75.8	1.13	1.49

*Sample was spilled during extraction.

Table IV-31. Storage dissipation analyses for the 1989 dormant spray study: water.

Analyte: Parathion
 Matrix: D.I. Water
 Detection Limit: 1 ppb

Lab: CDFA
 Chemist: Jane Melvin
 Date: 1/23/89

Lab Sample	Day	Date Extracted	Date Analyzed	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{x}	SD	CV (%)
1586	0	1/17/89	1/20/89	9.42	10.0	94.2			
1587	0	1/17/89	1/20/89	8.93	10.0	89.3	91.8	3.46	3.78
1699	7	1/24/89	1/26/89	7.94	10.0	79.4			
1698	7	1/24/89	1/26/89	8.56	10.0	85.6	82.5	4.38	5.31
1744	14	1/31/89	2/1/89	10.06	10.0	100.6			
1745	14	1/31/89	2/1/89	9.08	10.0	90.8	95.7	6.93	7.24
1868*	21	2/7/89	2/8/89	5.83	10.0	58.3			
1869	21	2/7/89	2/8/89	8.40	10.0	84.0	71.2	18.2	25.5
1931	28	2/14/89	2/15/89	8.44	10.0	84.4			
1932	28	2/14/89	2/15/89	9.64	10.0	96.4	90.4	8.49	9.39
2058	35	2/21/89	2/27/89	7.60	10.0	76.0			
2059	35	2/21/89	2/27/89	7.30	10.0	73.0	74.5	2.12	2.85
2127	42	2/28/89	2/28/89	8.41	10.0	84.1			
2128	42	2/28/89	2/28/89	7.26	10.0	72.6	78.4	8.13	10.4
2268	49	3/7/89	3/7/89	6.88	10.0	68.8			
2269	49	3/7/89	3/7/89	7.90	10.0	79.0	73.9	7.21	9.8
2486	56	3/14/89	3/20/89	8.40	10.0	84.0			
2487	56	3/14/89	3/20/89	8.30	10.0	83.0	83.5	0.71	0.8

* Sample was spilled during extraction.

Table IV-32. Storage dissipation analyses for the 1989 dormant spray study: water.

Analyte: Methidathion
 Matrix: D.I. Water
 Detection Limit: 1 ppb

Lab: CDFA
 Chemist: Jane Melvin
 Date: 1/23/89

Lab Sample	Day	Date Extracted	Date Analyzed	Results (ppb)	Spike Level (ppb)	Recovery %	\bar{x}	SD	CV (%)
1586	0	1/17/89	1/20/89	9.45	10.0	94.5			
1587	0	1/17/89	1/20/89	9.56	10.0	95.6	95.1	0.78	0.82
1699	7	1/24/89	1/26/89	7.82	10.0	78.2			
1698	7	1/24/89	1/26/89	7.89	10.0	78.9	78.6	0.49	0.63
1744	14	1/31/89	2/1/89	8.89	10.0	88.9			
1745	14	1/31/89	2/1/89	8.15	10.0	81.5	85.2	5.23	6.14
1868*	21	2/7/89	2/8/89	5.45	10.0	54.5			
1869	21	2/7/89	2/8/89	7.74	10.0	77.4	66.0	16.2	24.6
1931	28	2/14/89	2/15/89	7.70	10.0	77.0			
1932	28	2/14/89	2/15/89	6.01	10.0	60.1	68.6	12.0	17.4
2058	35	2/21/89	2/27/89	7.57	10.0	75.7			
2059	35	2/21/89	2/27/89	7.05	10.0	70.5	73.1	3.68	5.03
2127	42	2/28/89	2/28/89	7.85	10.0	78.5			
2128	42	2/28/89	2/28/89	7.14	10.0	71.4	75.0	5.02	6.70
2268	49	3/7/89	3/7/89	6.88	10.0	68.8			
2269	49	3/7/89	3/7/89	7.79	10.0	77.9	73.4	6.43	8.8
2486	56	3/14/89	3/20/89	8.85	10.0	88.5			
2487	56	3/14/89	3/20/89	8.98	10.0	89.8	89.2	0.92	1.0

* Sample was spilled during extraction.

Table IV-33. Storage dissipation analyses for the 1989 dormant spray study: dill.

Analyte: Diazinon

Matrix: Dill

Detection Limit: 0.01 ppm

Lab: CDFA

Chemist: Jane Melvin

Date: 1/24/89

Lab Sample	Day	Date Extracted	Date Analyzed	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{x}	SD	CV (%)
1696	0	1/24/89	1/25/89	0.099	0.1	99.0			
1695	0	1/24/89	1/25/89	0.099	0.1	99.0	99.0	0.00	0.00
1742	7	1/31/89	2/1/89	0.092	0.1	92.0			
1743	7	1/31/89	2/1/89	0.103	0.1	103	97.5	7.78	7.98
1866	14	2/7/89	2/8/89	0.083	0.1	83.0			
1867	14	2/7/89	2/8/89	0.079	0.1	79.0	81.0	2.83	3.49
1929	21	2/14/89	2/15/89	0.093	0.1	93.0			
1930	21	2/14/89	2/15/89	0.103	0.1	103	98.0	7.07	7.22
2044	28	2/21/89	2/27/89	0.100	0.1	100			
2045	28	2/21/89	2/27/89	0.078	0.1	78.0	89.0	15.6	17.5
2130	35	2/28/89	2/28/89	0.079	0.1	79.0			
2131	35	2/28/89	2/28/89	0.092	0.1	92.0	85.5	9.19	10.8
2271	42	3/7/89	3/7/89	0.109	0.1	109.0			
2272	42	3/7/89	3/7/89	0.111	0.1	111.0	110.0	1.41	1.3
2437	49	3/14/89	3/15/89	0.104	0.1	104.0			
2438	49	3/14/89	3/15/89	0.102	0.1	102.0	103.0	1.41	1.4
2517	56	3/21/89	3/22/89	0.105	0.1	105.0			
2518	56	3/21/89	3/22/89	0.083	0.1	83.0	94.0	15.6	16.5

Table IV-34. Storage dissipation analyses for the 1989 dormant spray study: dill.

Analyte: Chlorpyrifos
 Matrix: Dill
 Detection Limit: 0.01 ppm

Lab: CDFA
 Chemist: Jane Melvin
 Date: 1/24/89

Lab Sample	Day	Date Extracted	Date Analyzed	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{x}	SD	CV (%)
1696	0	1/24/89	1/25/89	0.112	0.1	112.0			
1695	0	1/24/89	1/25/89	0.109	0.1	109.0	111	2.12	1.92
1742	7	1/31/89	2/1/89	0.104	0.1	104.0			
1743	7	1/31/89	2/1/89	0.113	0.1	113	109	6.36	5.87
1866	14	2/7/89	2/8/89	0.096	0.1	96.0			
1867	14	2/7/89	2/8/89	0.101	0.1	101.0	98.5	3.54	3.59
1929	21	2/14/89	2/15/89	0.088	0.1	88.0			
1930	21	2/14/89	2/15/89	0.090	0.1	90.0	89.0	1.41	1.59
2044	28	2/21/89	2/27/89	0.097	0.1	97.0			
2045	28	2/21/89	2/27/89	0.086	0.1	86.0	91.5	7.78	8.50
2130	35	2/28/89	2/28/89	0.087	0.1	87.0			
2131	35	2/28/89	2/28/89	0.098	0.1	98.0	92.5	7.78	8.41
2271	42	3/7/89	3/7/89	0.090	0.1	90.0			
2272	42	3/7/89	3/7/89	0.100	0.1	100.0	95.0	7.07	7.4
2437	49	3/14/89	3/15/89	0.106	0.1	106.0			
2438	49	3/14/89	3/15/89	0.101	0.1	101.0	103.5	3.54	3.4
2517	56	3/21/89	3/22/89	0.092	0.1	92.0			
2518	56	3/21/89	3/22/89	0.085	0.1	85.0	88.5	4.9	5.6

Table IV-35. Storage dissipation analyses for the 1989 dormant spray study: dill.

Analyte: Parathion

Matrix: Dill

Detection Limit: 0.01 ppm

Lab: CDFA

Chemist: Jane Melvin

Date: 1/24/89

Lab Sample	Day	Date Extracted	Date Analyzed	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{x}	SD	CV (%)
1696	0	1/24/89	1/25/89	0.113	0.1	113.0			
1695	0	1/24/89	1/25/89	0.110	0.1	110.0	112	2.12	1.90
1742	7	1/31/89	2/1/89	0.110	0.1	110.0			
1743	7	1/31/89	2/1/89	0.109	0.1	109	110	0.707	0.646
1866	14	2/7/89	2/8/89	0.111	0.1	111.0			
1867	14	2/7/89	2/8/89	0.110	0.1	110.0	111	0.707	0.640
1929	21	2/14/89	2/15/89	0.122	0.1	122.0			
1930	21	2/14/89	2/15/89	0.113	0.1	113.0	118	6.36	5.42
2044	28	2/21/89	2/27/89	0.117	0.1	117.0			
2045	28	2/21/89	2/27/89	0.102	0.1	102	110	10.6	9.69
2130	35	2/28/89	2/28/89	0.108	0.1	108			
2131	35	2/28/89	2/28/89	0.118	0.1	118	113	7.07	6.26
2271	42	3/7/89	3/7/89	0.115	0.1	115			
2272	42	3/7/89	3/7/89	0.122	0.1	122	119	4.95	4.18
2437	49	3/14/89	3/15/89	0.111	0.1	111			
2438	49	3/14/89	3/15/89	0.108	0.1	108	110	2.12	1.94
2517	56	3/21/89	3/22/89	0.114	0.1	114			
2518	56	3/21/89	3/22/89	0.099	0.1	99	107	10.61	9.96

Table IV-36. Storage dissipation analyses for the 1989 dormant spray study: dill.

Analyte: Methidathion
 Matrix: Dill
 Detection Limit: 0.01 ppm

Lab: CDFA
 Chemist: Jane Melvin
 Date: 1/24/89

Lab Sample	Day	Date Extracted	Date Analyzed	Results (ppm)	Spike Level (ppm)	Recovery %	\bar{x}	SD	CV (%)
1696	0	1/24/89	1/25/89	0.122	0.1	122.0			
1695	0	1/24/89	1/25/89	0.121	0.1	121.0	122	0.707	0.582
1742	7	1/31/89	2/1/89	0.113	0.1	113.0			
1743	7	1/31/89	2/1/89	0.113	0.1	113.0	113	0.00	0.00
1866	14	2/7/89	2/8/89	0.120	0.1	120.0			
1867	14	2/7/89	2/8/89	0.120	0.1	120.0	120	0.00	0.00
1929	21	2/14/89	2/15/89	0.127	0.1	127.0			
1930	21	2/14/89	2/15/89	0.132	0.1	132.0	130	3.54	2.73
2044	28	2/21/89	2/27/89	0.119	0.1	119			
2045	28	2/21/89	2/27/89	0.106	0.1	106	113	9.19	8.17
2130	35	2/28/89	2/28/89	0.120	0.1	120			
2131	35	2/28/89	2/28/89	0.131	0.1	131	126	7.78	6.20
2271	42	3/7/89	3/7/89	0.127	0.1	127			
2272	42	3/7/89	3/7/89	0.135	0.1	135	131	5.66	4.32
2437	49	3/14/89	3/15/89	0.107	0.1	107			
2438	49	3/14/89	3/15/89	0.113	0.1	113	110	4.24	3.86
2517	56	3/21/89	3/22/89	0.125	0.1	125			
2518	56	3/21/89	3/22/89	0.114	0.1	114	120	7.78	6.51

Table IV-37. Split/confirmation analyses for the 1989 dormant spray study: dill.

Analyte: Diazinon			Lab: CDFA			
Matrix: Dill			Chemist: Jane Melvin			
Date of Report: 03/23/89						
Lab # 1: CDFA		MDL: 10 ppb	Date Extracted: 03/03/89			
Lab # 2: Cal Labs		MDL: 10 ppb	Date Extracted: 03/06/89			
EHAP Sample #	Lab Sample #	CDFA * (ppb)	Cal Labs * (ppb)	\bar{X}	SD	CV (%)
282	2522	95				
307	45931-3		46	71	35	49
291	2521	73				
292	45931-1		43	58	21	36
301	2523	2379				
302	45931-2		1300	1840	763	41

* wet weight basis

Table IV-38. Split/confirmation analyses for the 1989 dormant spray study: dill.

Analyte: Chlorpyrifos			Lab: CDFA			
Matrix: Dill			Chemist: Jane Melvin			
Date of Report: 03/23/89						
Lab # 1: CDFA		MDL: 10 ppb	Date Extracted: 03/03/89			
Lab # 2: Cal Labs		MDL: 10 ppb	Date Extracted: 03/06/89			
EHAP Sample #	Lab Sample #	CDFA * (ppb)	Cal Labs * (ppb)	\bar{X}	SD	CV (%)
282	2522	264				
307	45931-3		140	202	877	43.4
291	2521	214				
292	45931-1		93	154	85.6	55.6
301	2523	170				
302	45931-2		48	109	86.3	79.2

* wet weight basis

Table IV-39. Split/confirmation analyses for the 1989 dormant spray study: dill.

Analyte: Parathion				Lab: CDFA		
Matrix: Dill				Chemist: Jane Melvin		
Date of Report: 03/23/89						
Lab # 1: CDFA		MDL: 10 ppb		Date Extracted: 03/03/89		
Lab # 2: Cal Labs		MDL: 10 ppb		Date Extracted: 03/06/89		
EHAP Sample #	Lab Sample #	CDFA * (ppb)	Cal Labs * (ppb)	\bar{X}	SD	CV (%)
282	2522	75				
307	45931-3		37	56	27	48
291	2521	89				
292	45931-1		38	64	36	56
301	2523	186				
302	45931-2		55	121	92.6	76.5

*wet weight basis

Table IV-40. Split/confirmation analyses for the 1989 dormant spray study: dill.

Analyte: Methidathion				Lab: CDFA		
Matrix: Dill				Chemist: Jane Melvin		
Date of Report: 03/23/89						
Lab # 1: CDFA		MDL: 10 ppb		Date Extracted: 03/03/89		
Lab # 2: Cal Labs		MDL: 10 ppb		Date Extracted: 03/06/89		
EHAP Sample #	Lab Sample #	CDFA * (ppb)	Cal Labs * (ppb)	\bar{X}	SD	CV (%)
282	2522	26				
307	45931-3		<10			
291	2521	12				
292	45931-1		<10			
301	2523	56				
302	45931-2		14	35	30	86

*wet weight basis

APPENDIX V

VEGETATION ANALYTICAL RESULTS

Table V-1. Pesticide concentrations in dill samples at three sites in Stanislaus County, January 1989

Date	Parathion	Diazinon	Chlorpyrifos	Methidathion
-----(mg kg^{-1} , fresh wt)-----				
<u>Site 1</u>				
12/29 ^a	ND ^b	ND	ND	ND
1/03	ND	ND	ND	ND
1/06	0.013	0.014	0.020	ND
1/09	0.022	0.038	0.022	ND
1/12	0.016	0.011	0.030	ND
1/15	0.033	0.024	0.089	ND
1/18	0.039	0.044	0.199	ND
1/21	0.072	0.081	0.291	ND
1/24	0.072	0.067	0.278	ND
1/27	0.075	0.095	0.264	0.026
1/30	0.123	0.141	0.453	0.048
<u>Site 2</u>				
12/29	ND	ND	ND	ND
1/03	ND	ND	ND	ND
1/06	ND	ND	ND	ND
1/09	0.016	ND	ND	ND
1/12	0.018	ND	0.033	ND
1/15	0.030	0.022	0.141	0.012
1/18	0.050	0.016	0.104	ND
1/21	0.150	0.062	0.240	0.018
1/24	0.119	0.045	0.199	0.011
1/27	0.089	0.073	0.214	0.012
1/30	0.102	0.255	0.282	0.028
<u>Site 3</u>				
12/29	ND	ND	ND	ND
1/03	-- ^c	--	--	--
1/06	ND	0.029	ND	ND
1/09	0.019	0.010	0.012	ND
1/12	0.040	ND	0.018	0.021
1/15	0.046	2.982	0.019	0.015
1/18	0.093	3.680	0.020	0.020
1/21	0.048	2.196	0.071	0.018
1/24	0.136	3.502	0.112	0.028
1/27	0.186	2.379	0.170	0.056
1/30	0.265	5.064	0.238	0.062

^aBackground samples were collected before study started.

^bNot detected. Minimum detection level was 0.01 mg kg^{-1} .

^cNo sample collected.

Table V-2. Predicted increases of pesticide concentrations on dill samples due to fog at three sites, Stanislaus County, January 1989

Vegetation		Predicted increase of pesticide residues in dill ¹			
Sampling Interval	Site	Parathion	Diazinon	Chlorpyrifos	Methidathion
		-----µg kg ⁻¹ -----			
1/3	1	0.64	0.73	0.39	0.11
1/6		0.63	1.21	0.16	0.11
1/21		14.00	66.87	6.10	1.42
1/24		6.94	15.12	1.62	0.96
1/27		12.96	58.67	2.49	3.39
1/30		0.87	5.20	0.49	0.44
1/3	2	0.41	0.27	0.37	1.79
1/6		1.45	0.19	0.31	0.11
1/21		10.62	33.94	4.42	1.62
1/24		8.91	15.16	1.39	0.33
1/27		3.54	8.75	1.87	0.34
1/30		1.19	7.31	1.15	0.36
1/6	3	0.54	0.44	0.11	0.11
1/21		16.17	128.01	3.18	2.65
1/24		4.10	38.44	1.01	0.83
1/27		2.11	18.95	0.84	0.57
1/30		1.11	6.66	0.33	0.43

¹Prediction based on maximum of 40 g of fog water being deposited on dill per fog event x pesticide (µg/kg) contained in fog water for that event.

Figure V-1. Comparison of actual and predicted diazinon concentration in dill samples

Site 1

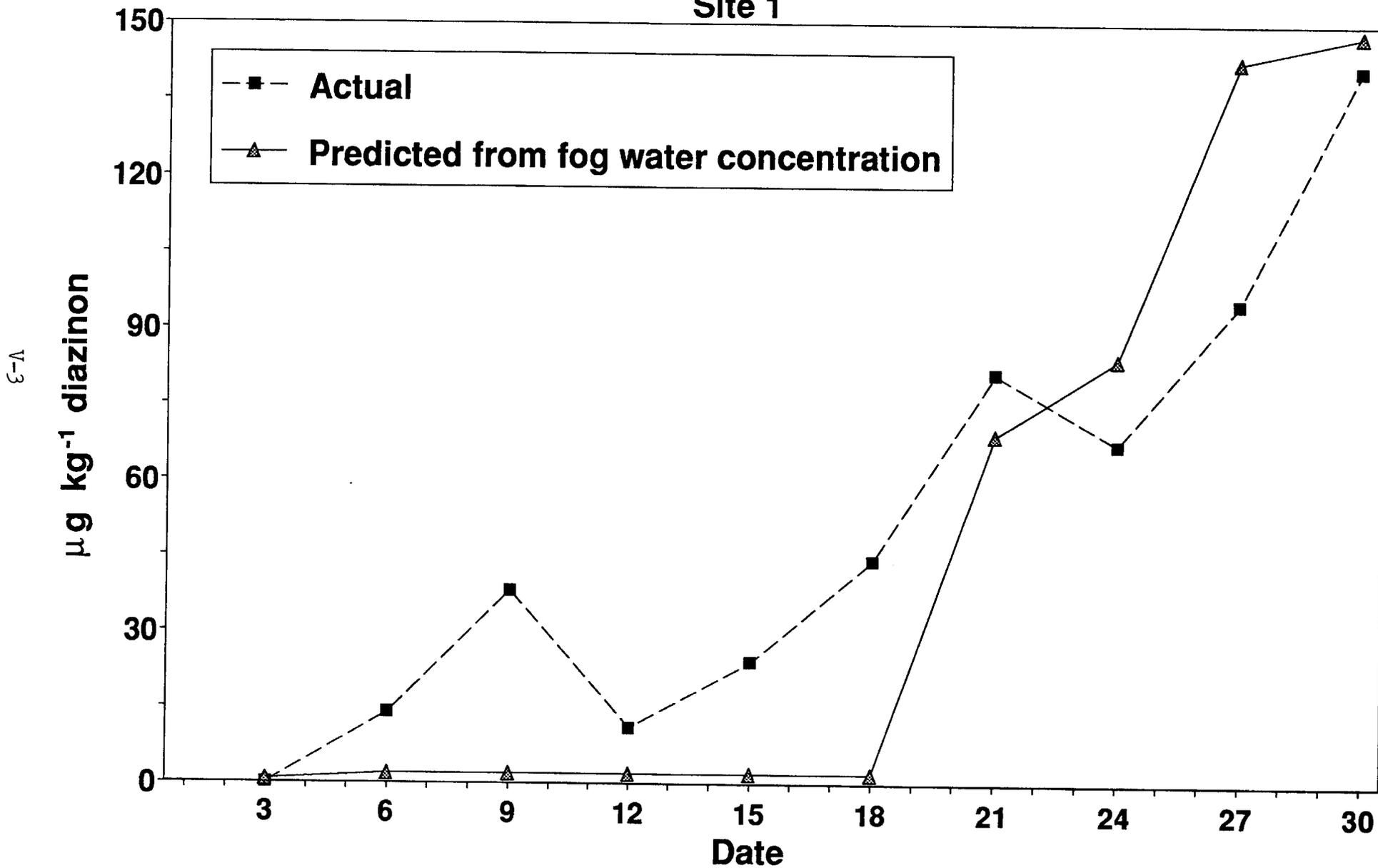


Figure V-2. Comparison of actual and predicted diazinon concentration in dill samples
Site 2

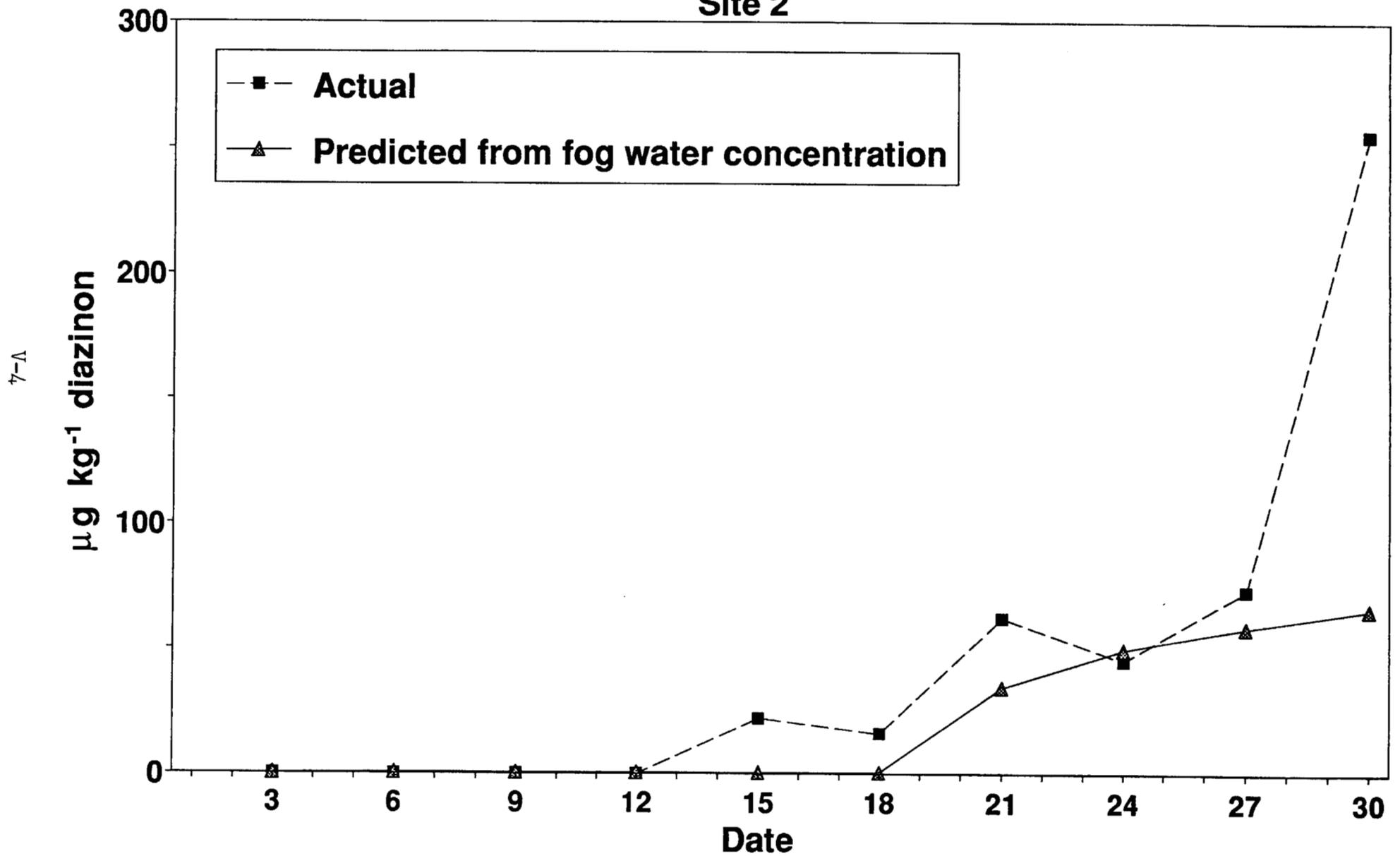


Figure V-3. Comparison of actual and predicted diazinon concentration in dill samples

Site 3

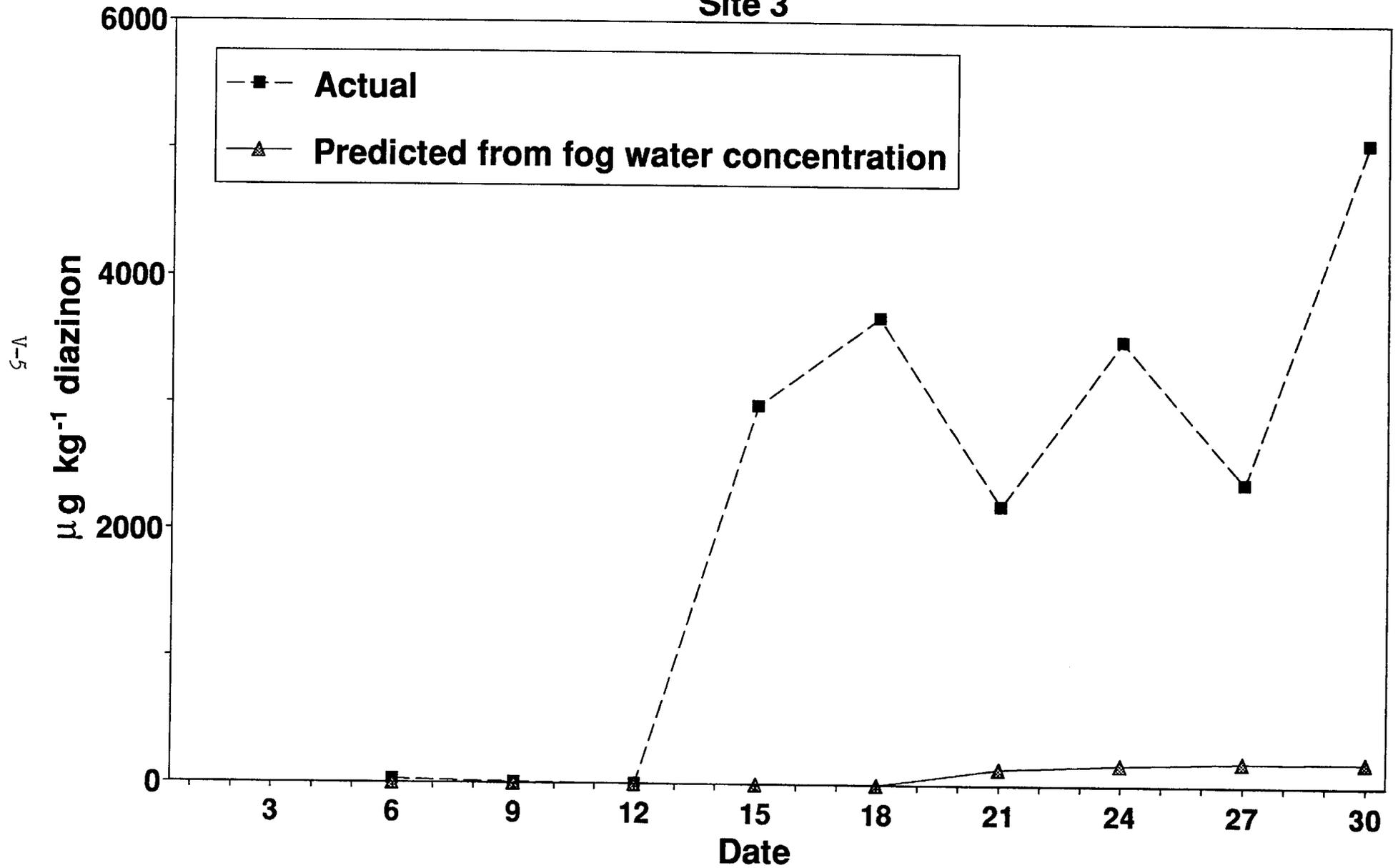


Figure V-4. Comparison of actual and predicted chlorpyrifos concentration in dill samples

Site 1

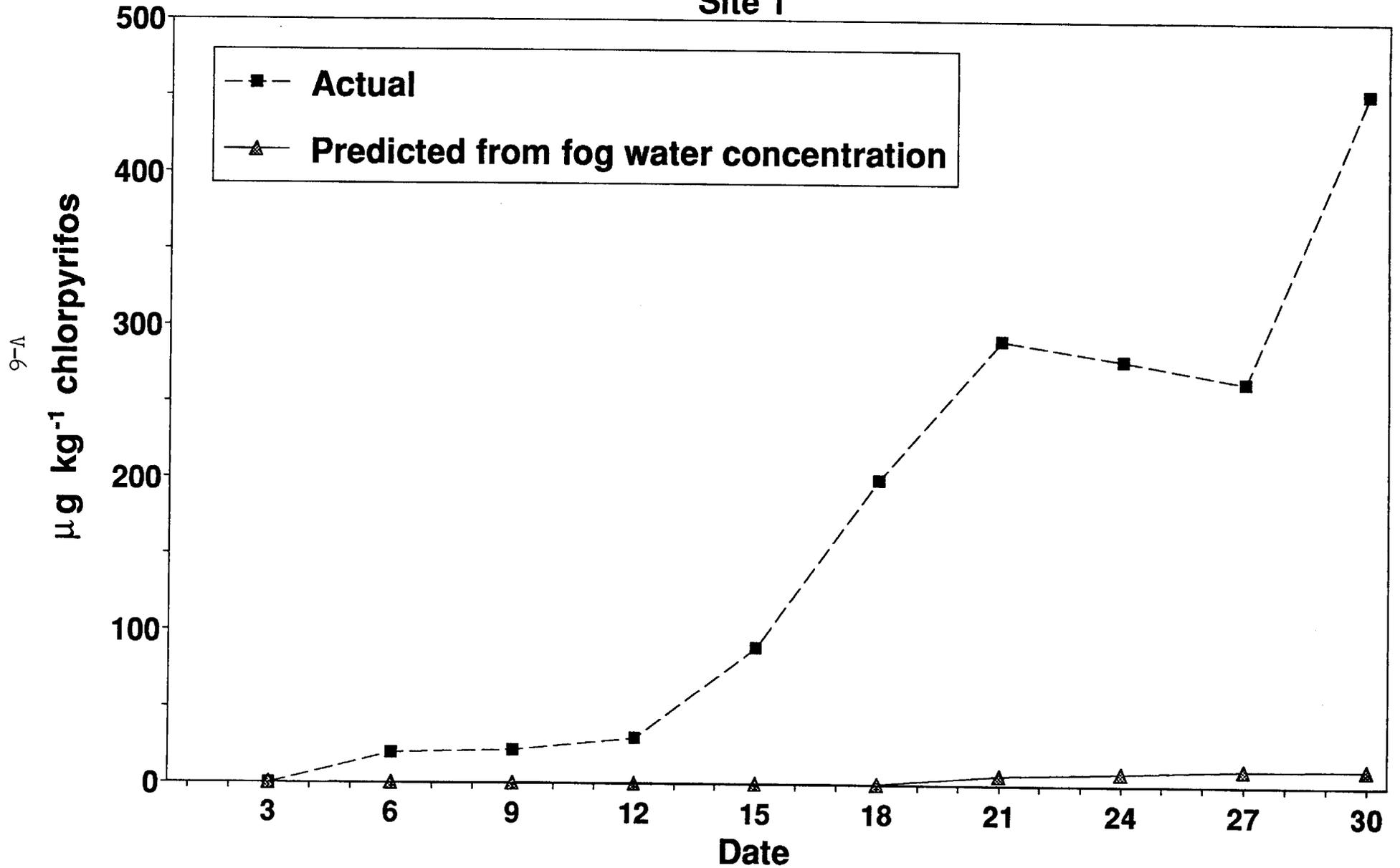


Figure V-5. Comparison of actual and predicted chlorpyrifos concentration in dill samples

Site 2

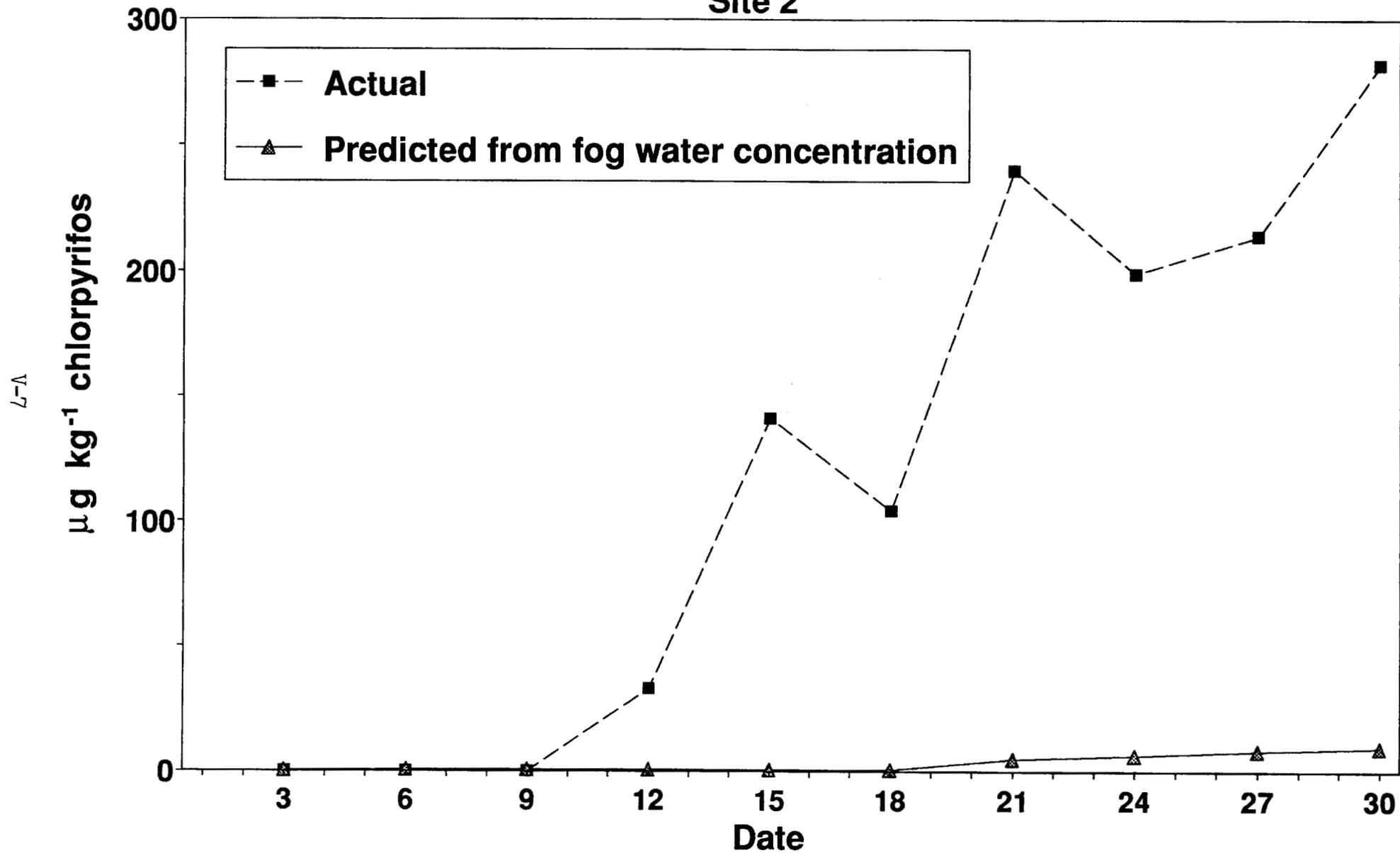


Figure V-6. Comparison of actual and predicted chlorpyrifos concentration in dill samples
Site 3

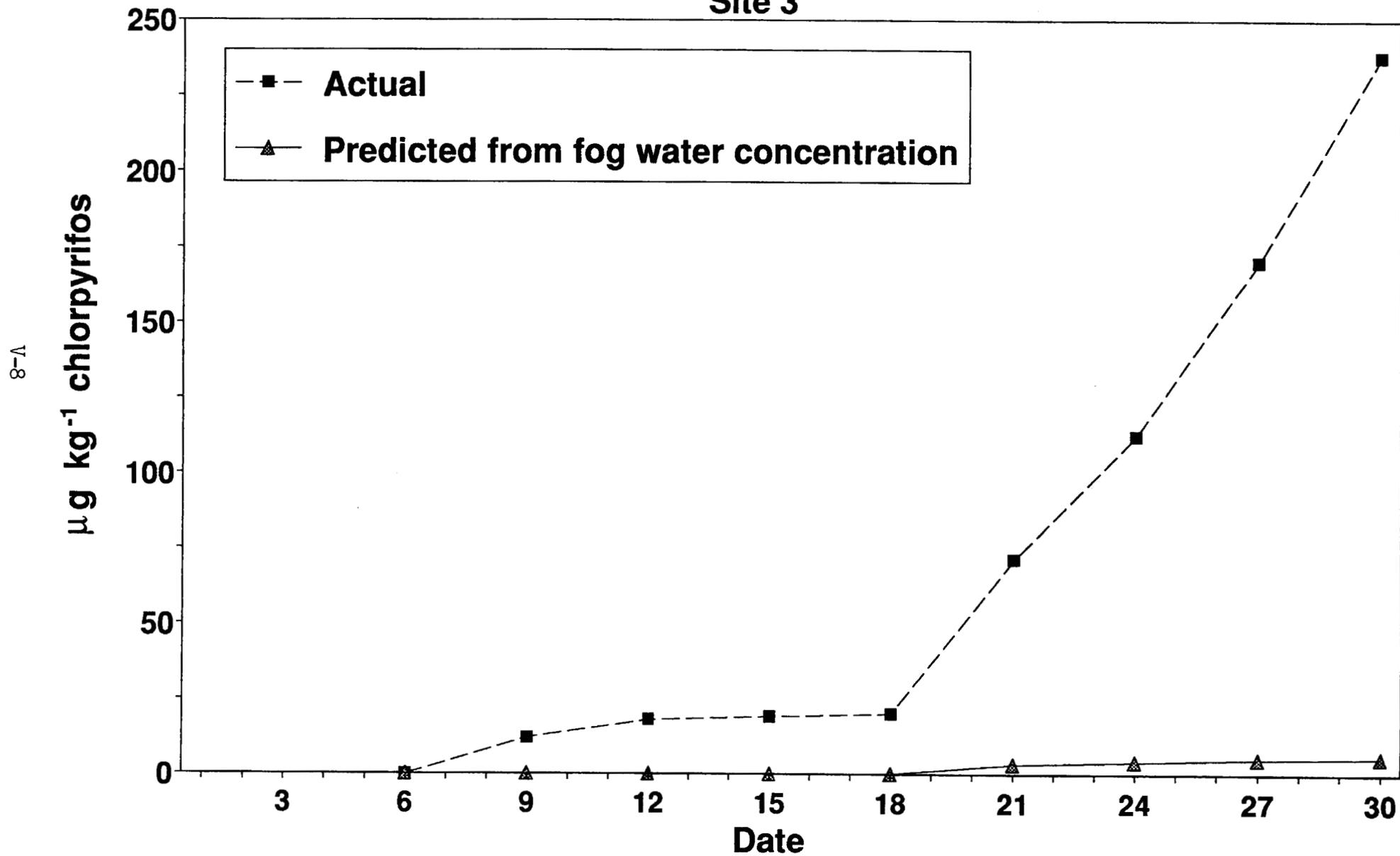


Figure V-7. Comparison of actual and predicted methidathion concentration in dill samples

Site 1

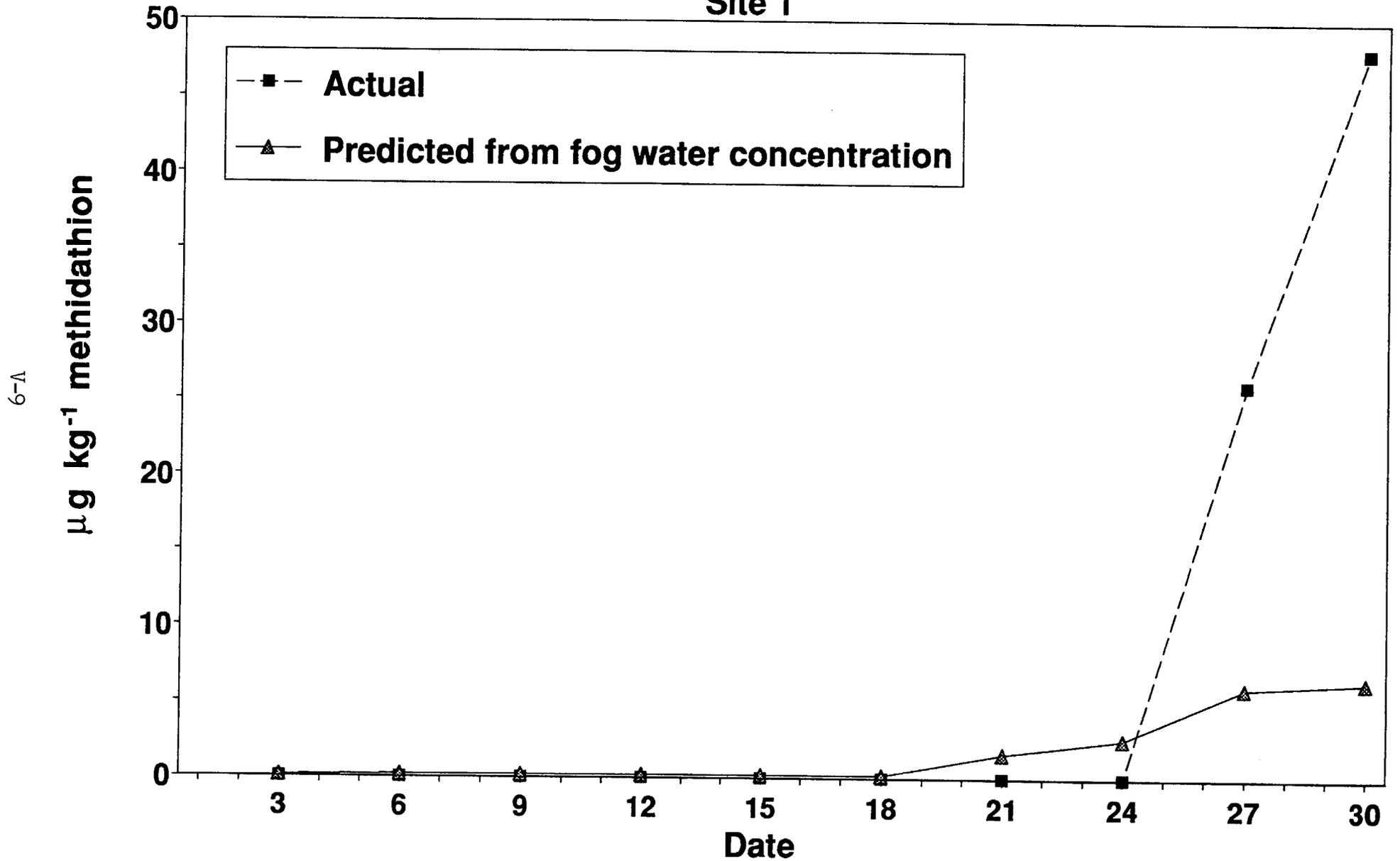


Figure V-8. Comparison of actual and predicted methidathion concentration in dill samples

Site 2

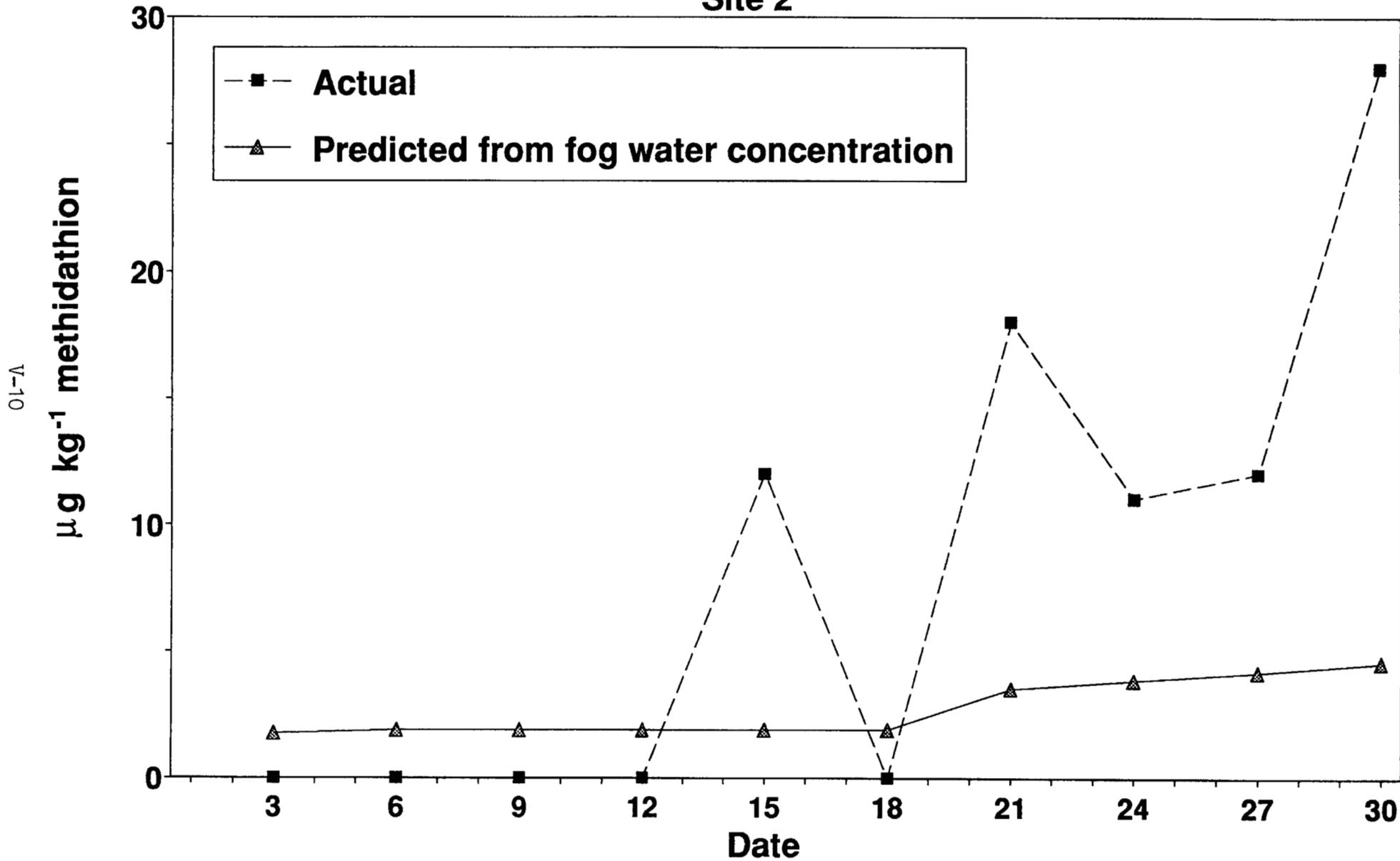


Figure V-9. Comparison of actual and predicted methidathion concentration in dill samples

Site 3

