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Data Evaluation Report of Vegetative Buffer Study

PMRA Submission Number {.....} EPA MRID Number 46490303

Test material: Fipronil
IUPAC name: 5-amino-1-(2,6-dichloro-α,α,α-trifluoro-*p*-tolyl)-4-trifluoromethylsulfinylpyrazole-3-carbonitrile
CAS name: 5-amino-1-[2,6-dichloro-4-(trifluoromethyl)phenyl]-4-[(trifluoromethyl)sulfinyl]-1*H*-pyrazole-3-carbonitrile

Primary Reviewer: James Hetrick, Ph.D.
EPA
Signature: James G. Hetrick
Date: 4/30/08

Secondary Reviewer: Thuy Nguyen
EPA
Signature:
Date: 5/31/08

EPA PC Code: 129121

CITATION: Braun, D., J. Cappy, and J. W. White. 2004. Effect of Vegetative Buffer Strips on Fipronil Runoff Losses from Tall Fescue Under Simulated Rainfall. Sponsored by BayerCrop Science, RTP, NC. Performed by Stone Environmental, Montpelier, VT ; White Environmental, Lexington, KY; Bayer CropSciences, RTP, NC; and AgVise Laboratories, Northward, ND. MRID 46490303.

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Data Evaluation Report of Vegetative Buffer Study

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EXECUTIVE SUMMARY:

The vegetative buffer effectiveness study (MRID 46490303) provides supplemental data on the impact of a 15 feet grass buffer for controlling runoff of fipronil and its degradation products (MB46136, MB46513, and MB 46950) from the use of granular and liquid formulations of Chipco Topchoice® on a cool-season grass in Bear Fields, NC. The study was submitted to fulfill a condition of registration regarding runoff concerns of fipronil residues from broadcast use of fipronil for control of fire ants. The registrant did not provide any concurrent biological monitoring of an adjacent aquatic environment to assess the impact of fipronil and its degradation products on aquatic invertebrates.

In order to upgrade this study, the registrant should submit additional information on method verification, procedural method verification, and field spike verification for the fipronil residue analytical methods. Additionally, the registrant should submit storage stability data for fipronil residues. These data are needed to confirm the analytical methods are adequate for quantification of fipronil residues in runoff waters.

Two sets of paired-runoff plots were constructed to assess the effectiveness of a 15 feet grass buffer in reducing edge-of- field fipronil residue runoff from 60 feet treated test plots in Bear Fields, NC. The test site was classified as C/D hydrologic group soil. Paired treatment plots consisted of a plot with the 15 feet untreated grass buffer at the top of plot (WST) to serve as a control site with no runoff buffer. The other plot (WSB) had the 15 feet untreated grass buffer at the bottom of the plot to serve as a runoff buffer. The granular and liquid formulation of Chipco Topchoice® was each applied at a rate of 0.0116 lbs ai/A. Rainfall was simulated at an intensity of 1 inch hr^{-1} for a duration of 105 to 114 minutes to promote runoff. Time-paced and flow proportional samples of runoff water were collected at the edge-of-field. Fipronil and its degradation products(MB46136, MB46513, and MB 46950) were analyzed in the runoff samples. The total suspended sediment (TSS) was also measured in runoff samples.

In the WST (control) treatment for the granular formulation, the maximum fipronil concentration during a 114 minute runoff event was 2.091µg/L in time paced samples and 1.838 µg/L in flow proportional samples. The average fipronil concentration for the time-paced samples was 1.735 µg/L. In the WSB (buffer) treatment, the maximum fipronil concentration during a 105 minute runoff event was 1.315 µg/L in time paced samples and 1.138 µg/L in flow proportional samples. The average fipronil concentration for the time-paced samples was 0.989 µg/L.

In the WST (control) treatment for the liquid formulation, the maximum fipronil concentration during a 96 minute runoff event was 1.749 µg/L in time paced samples and 1.305µg/L in flow proportional samples. The average fipronil concentration for the time-paced samples was µg/L. In the WSB (buffer) treatment, the maximum fipronil concentration during a 123 minute runoff event was 0.98 µg/L in time paced samples and 0.89 µg/L in flow proportional samples. The average fipronil concentration for the time-paced samples was 0.624 µg/L

Based on the fipronil mass in runoff, the 15 foot grass buffer reduced runoff of fipronil from 42% to 44% for granular formulations and 33% to 36% for liquid formulations. Similar buffer effectiveness was observed for total fipronil residues.

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: The SETAC-Europe: Procedures for Assessing the Environmental Fate and Ecotoxicity of Pesticides (March 1995; pp. 1, 34) is not applicable.

COMPLIANCE: This study was conducted in compliance with USEPA FIFRA Good Laboratory Practices (40 CFR Part 160), which are consistent with the OECD Principles of GLP (p. 3). Signed and dated GLP, Data Confidentiality, Quality Assurance, and Certificate of Authenticity statements were provided (pp. 2-3, 5-6).

A. MATERIALS:

1. Site Description

The vegetative buffer study was conducted on established tall fescue sod in Bear Fields, NC (**Figure 3**). The site is characterized as a "moderately sloping field in area used for sod production" (**Figure 2**). The soil series on the site is classified as an Cid (fine, mixed, semiactive, thermic Aquic Hapludulf) - Lignum (fine,mixed, semiactive, thermic, Aquic Hapludulf) Complex with a 7.5% slope. Soil characteristics of the site are shown in **Table 4 (page 44)**. The soils are classified a Hydrologic Group C/D soils. A ring infiltrometer was used to measure the soil infiltration rates prior to irrigation. The soil had infiltration rates ranging from 0.9 to 1.8 cm hr^{-1} **(Table 5, pp 45-48)**.

2. Site Preparation and Maintenance

No fipronil treatments were applied to the site prior to the study. The site was mowed a week before the fipronil application and irrigation events. The turf was in poor condition (dry and die back in patches) due to drought conditions prior to the study.

Test site plots were irrigated once immediately after a fipronil application on December 11th for 70 minutes to test plots 3 and 4 and on December 12th, 2001 for 36 minutes to test plots 1 and 2. The simulated rainfall intensity was 1 inch per hour.

3. Rainfall Simulator

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The rainfall simulator was designed according to Coody and Lawrence (1994). The water source for the rainfall simulator was an irrigation pond near the test plots. The water quality of the irrigation water is shown in **Table 3 (pp 43)**. Collection jars were used to gauge rainfall volume and intensity. Rainfall intensity and volume ranged from 1.06 to 1.12 in/hr and 3.61 to 4.10 inches **(Table 7, pp 50)**. Time-dependent flow from the test plots are shown in **Tables 8-to-11 (pp 51 to 62).** Cumulative runoff ranged from 2,165 to 2,345 liters from the WST test plots (buffer at top of plot) and 2,042 to 2,120 liters from the WSB test plots (buffer at bottom of plot) **(Table 12, pp 62)**. Runoff yield, expressed as a percentage of simulated rainfall, was 26.9 to 28.2 % for WST test plot and 25.4 to 25.5 % for the WSB test plot **(Table 12, pp 63)**. The average total suspended sediments (TSS) in the time-paced runoff samples ranged from 39 to 33 mg/L for WST test plots and 41 to 48 mg/L WSB test plots **(Tables 13 and 14, pp 64 and 65)**. In flow proportional runoff samples, the TSS ranged from 39 to 44 mg/L for WST test plots and 37 to 40 mg/L for WSB test plots **(Table 15, pp 66).**

4. Experimental Design

Four adjacent runoff test plots (12 ft X 75 ft) were oriented parallel to the slope using metal flashing to provide hydrologic separation **(Figures 4 and 5)**. Each test plot had an untreated buffer section (12 ft X15 ft) within the test plot. The WST treatments had an untreated buffer section at the top of the plot. The WSB treatments had the untreated buffer section at the bottom of the plot. A pair of WST and WSB plots was used to assess formulation effects on fipronil residue runoff.

On December 11, 2001, the fipronil treated section in a pair of WST and WSB plots (12 ft X 60 ft) was amended with 0.0116 lbs ai/A of liquid formulated CHIPCO ® Topchoice™ using a broadcast ground spray application. On December 12, 2001, the fipronil treated section in a pair of WST and WSB plots (12 ft X 60 ft) was amended with 0.0116 lbs ai/A of granular formulated CHIPCO ® Topchoice™ (87 lbs of formulated product/A) using a rotary broadcast spreader. After the fipronil application, each test plot was irrigated immediately after the fipronil application.

On December 11 and 12, 2001, the test plots were irrigated at rainfall intensity of 1.0 inch per hour. The registrant estimated the simulated rainfall events fall with between a 10 to 25 year return period.

At the downhill side boundary of the test plots, a metal flume and gutter system were installed to direct water into a sampling basin. Each metal flume was equipped with a flow meter. Additionally, each flume was equipped with a stilling well to allow accurate measurement of runoff depth. Runoff flow for the flume system was calculated using the flow equation $Q=1.55H^{2.58}$, where Q = flow rate in cubic feet per second and H = head in feet.

Two autosamplers for each test plot were used to collect time-dependent runoff samples for pesticide analysis. One autosampler was calibrated to collect runoff samples at regular time intervals (75 ml every 3 minutes) from a splash pan. Consecutive samples for three sampling

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times (3, 6, and 9 minutes) were composited from the initial runoff event, mid term runoff events, and the end of the runoff event. The other autosampler was calibrated to collect flow-proportional samples from a 55 gallon drum. One liter samples were collected for each 30 liters of runoff passing through the flume.

The site was instrumented with an electronic weather station. Weather data includes air temperature, soil temperature at 4 inches below-ground surface (BGS), rainfall, wind speed, and solar radiation. Weather data were recorded on 1 minute time intervals and then averaged for hourly and daily time periods.

5. Analytical

Samples of runoff water were collected and stored for chemical analysis. In time- paced samples, the samples were collected and stored in Teflon capped 350 ml glass vessels. In the flow proportional samples, the runoff water in the stainless steel collection drum was mixed and then sampled using agitated and submerged 250 ml HDPE bottles. (Reviewer Note: Samples were not depth integrated.) Five replicate samples were taken for residue analysis. Samples were stored in field coolers prior to transfer to the Bayer CropScience for residue analysis. Additionally, five subsamples (500 ml) of homogenized solution were taken for measurement of total suspended sediments. These samples were shipped under ambient conditions. Water quality characterization and TSS analysis were performed by Agvise Laboratories.

Residues of fipronil in runoff water were analyzed using a LC/MS/MS method entitled "Insecticides, Fipronil: Method of Analysis for Possible Residues of Fipronil, MB46513, MB45950, and MB46136 in Water-Revision 2000-2" issued May 11, 2000. This method has method detection limit (MDL) of 0.004 µg/L and limit of quantification (LOQ) of 0.010 µg/L **No procedural method verification, method verifications and field spike recoveries were presented in the report. No storage stability study was presented in the report.**

B. REPORTED RESULTS

1. <u>Concentration of Fipronil and its Metabolites in Runoff-</u>

Granular Formulation- CHIPCO TopChoice®

The main residue in runoff water was fipronil **(Tables 18 and 19)**. In the WST treatment (plot 1), the maximum concentration in time-paced runoff samples during a 114 minute runoff event was 2.091µg/L for fipronil, 0.008 µg $_{\text{fipronil eq}}$/L (0.007 µg /L) for MB46513, 0.012 µg $_{\text{fipronil eq}}$/L (0.011 µg /L) for MB46950, 0.033 µg $_{\text{fipronil eq}}$/L (0.034 µg /L) for MB46136. Average concentration during the runoff event was 1.735 µg/L for fipronil, no detection of MB46513, 0.009 µg $_{\text{fipronil eq}}$/L (0.008 µg /L) for MB46950, 0.027 µg $_{\text{fipronil eq}}$/L (0.027µg /L) for MB46136.

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In the WSB treatment (Plot 2), the maximum concentration in time-paced samples during a 105 minute runoff event was 1.315 µg/L for fipronil, 0.007 µg fipronil eq/L (0.006 µg /L) for MB46513, 0.008 µg fipronil eq/L (0.007 µg /L) for MB46950, 0.031 µg fipronil eq/L (0.032 µg /L) for MB46136. Average concentration during the runoff event was 0.989 µg/L for fipronil, no detection of MB46513, no detection of MB46950, 0.011 µg fipronil eq/L (0.011 µg /L) for MB46136.

In the WST treatment (plot 1), average concentrations in flow proportioned runoff samples during a 114 minute runoff event was 1.838 µg/L for fipronil, no detection of MB46513, 0.008 µg fipronil eq/L (0.007µg /L) for MB46950, 0.027 µg fipronil eq/L (0.027 µg /L) for MB46136. In the WSB treatment (plot 2), average concentrations in flow proportioned runoff samples during a 105 minute runoff event was 1.138 µg/L for fipronil, no detection of MB46513, no detection of MB46950, 0.001 µg fipronil eq/L (0.001 µg /L) for MB46136

Liquid Formulation

The main residue in runoff water was fipronil **(Tables 17 and 19)**. In the WST treatment (plot 4), the maximum concentration in time-paced runoff samples during a 96 minute runoff event was 1.749 µg/L for fipronil, 0.014 µg fipronil eq/L (0.012 µg /L) for MB46513, 0.010 µg fipronil eq/L (0.009 µg /L) for MB46950, 0.039 µg fipronil eq/L (0.040 µg /L) for MB46136. Average concentration during the runoff event was 1.265 µg/L for fipronil, 0.008 µg fipronil eq/L (0.007 µg /L) for MB46513, 0.006 µg fipronil eq/L (0.005 µg /L) for MB46950, 0.026 µg fipronil eq/L (0.026 µg /L) for MB46136.

In the WSB treatment (Plot 3), the maximum concentration in time-paced samples during a 123 minute runoff event was 0.980 µg/L for fipronil, 0.009 µg fipronil eq/L (0.008 µg /L) for MB46513, 0.008 µg fipronil eq/L (0.007 µg /L) for MB46950, 0.019 µg fipronil eq/L (0.019 µg/L) for MB46136. Average concentration during the runoff event was 0.624 µg/L for fipronil, 0.004 µg/L fipronil eq/L (0.003 µg/L) for MB46513, no detection of MB46950, 0.010 µg fipronil eq/L (0.010 µg/L) for MB46136.

In the WST treatment (plot 4), average concentrations in flow proportioned runoff samples during a 96 minute runoff event was 1.305 µg/L for fipronil, 0.015 µg fipronil eq/L (0.013 µg /L) for MB46513, 0.014 µg fipronil eq/L (0.013 µg /L) for MB46950, 0.036 µg fipronil eq/L (0.037 µg /L) for MB46136. In the WSB treatment (plot 3), average concentrations in flow proportioned runoff samples during a 123 minute runoff event was 0.890 µg/L for fipronil, no detection of MB46513, no detection of MB46950, and 0.011 µg fipronil eq/L (0.011 µg /L) for MB46136

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2. **Fipronil Mass Transport**

Granular Formulation- CHIPCO TopChoice®

The mass transport calculations, based on the the fipronil mass in runoff, show the 15 foot buffer lowers the mass transport of fipronil from 42% to 44% (**Table 20, p 71**). The percent loss of fipronil was 4.5% of applied for WST treatment and 2.6% for WSB treatment.

The mass transport calculations, based on the the cumulative fipronil residue mass in runoff, show the 15 foot buffer lowers the mass transport of fipronil from 42% to 44% (**Table 21, p 72**). The percent loss of fipronil was 4.6% of applied for WST treatment and 2.6% for WSB treatment.

Liquid Formulation

The mass transport calculations, based on the fipronil concentration and volume of runoff, show the 15 foot buffer reduced mass transport of fipronil from 33% to 36% (**Table 20, p 71**). The percent loss of fipronil was 2.9% of applied for the WST treatment and 1.9% for the WSB treatment.

The mass transport calculations, based on the the fipronil concentration and volume of runoff, show the 15 foot buffer reduced the mass transport of fipronil from 33% to 38% (**Table 21, p 72**). The percent loss of fipronil was 3.1% of applied for the the WST treatment and 2.0% for the WSB treatment.

C. REVIEWER COMMENTS

1. A fixed small plot field study:buffer zone (4.0) ratio was used in the study. Available data suggest the effectiveness of the buffer zone is dependent on numerous factors including runoff flow rate and depth, soil type, antecedent moisture, source area size, rainfall intensity and quantity, etc. (USDA/NRCS, 2000Ω). Sediment filter strip design also is dependent on the rainfall amount and intensity. The Universal Soil Loss Equation rainfall-erosivity factor for the Southeastern United States ranges from 250 to 350 (EPA, 1985ℓ). Under these conditions, effective sediment trapping in filter strips is expected for source area:filter ratios of < 50 (USDA/NRCS, 2000). This information suggest effective sediment trapping would be expected for the proposed source area: buffer ratio of 4.0. More importantly, the use of a low field area to buffer area ratio may bias the assessment of buffer effectiveness

Ω USDA. 2000.Conservation Buffers to Reduce Pesticide Losses. USDA/NRCS

ℓ EPA. 1985 Field Agricultural Runoff Monitoring (FARM) Manual. EPA/600/3-85/043. Athens, GA.

2. The registrant did not attempt to conduct separate analysis of fipronil residues on entrained sediments and dissolved in runoff water. This analysis would be useful in understanding the importance of fipronil sorption on entrained sediments.

3. Fipronil residue concentrations in this study are edge-of-field concentrations in runoff waters from a treated site. They do not account for any off-site attenuation or dilution due to site specific hydrology or topography. The reviewer notes the reported concentrations are expected to be most representative of first-order streams, where water quality characteristics are dominated by runoff.

4. The registrant did not provide any method verification, procedural method verification, or field spike verification for the analytical methods. Additionally, the registrant did not provide any storage stability data. These data are needed to upgrade the study.

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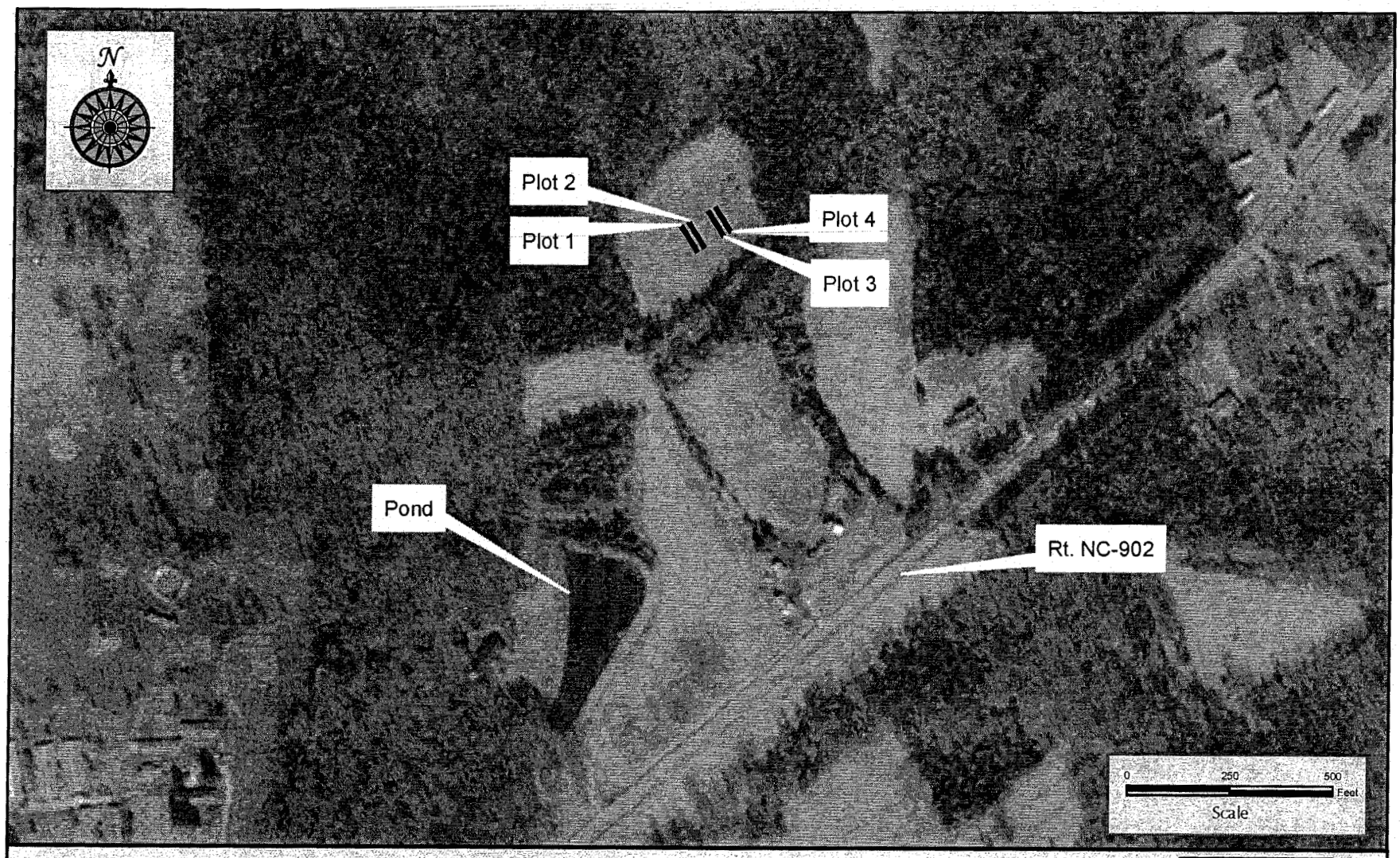

FIGURE 3: STUDY SITE ORTHOPHOTO (CHATHAM COUNTY, NORTH CAROLINA)
Effect of Vegetative Buffer Strips on Fipronil Runoff Losses from Tall Fescue Turf Under Simulated Rainfall
Bear Creek, North Carolina

Sources: Orthophoto from USGS, 1993.
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FIGURE 2: SITE LOCATION MAP (CHATHAM COUNTY, NORTH CAROLINA)
Effect of Vegetative Buffer Strips on Fipronil Runoff Losses from Tall Fescue Turf Under Simulated Rainfall
Bear Creek, North Carolina

Source: Topographic Map from USGS 1:24,000 Scale Series, Bear Creek Quadrangle, 2001
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TABLE 4
Soil Sample Characterization Data

Depth Interval (ft bgs)	Sample ID	Sand (%)	Silt (%)	Clay (%)	USDA Texture	CEC (meq/100g)	Percent Moisture[1] at: 1/3 Bar	15 Bar	OM (%)	pH[2]	Ca (ppm)	Mg (ppm)	K (ppm)	Na (ppm)	H (ppm)
Surface Horizon															
0.0-0.5	35426-A-SC-03-0-0.5'	52	40	8	SANDY LOAM	8.3	24.2	8.8	3.6	6.0	702	196	52	33	29
0.0-1.0	35426-A-SC-04-0-1'	40	46	14	LOAM	10.8	28.0	9.9	2.2	5.7	829	258	59	56	41
0.0-0.5	35426-B-SC-07-0-0.5'	48	40	12	LOAM	8.2	23.9	8.3	2.8	6.2	716	205	90	23	26
0.0-0.6	35426-B-SC-12-0-0.6'	50	40	10	LOAM	9.3	22.9	8.8	3.2	6.1	911	183	59	30	30
	Mean	48	42	11		9.2	24.8	9.0	3.0	6.0	790	211	65	36	32
	Standard Deviation	5	3	3		1.2	2.2	0.7	0.6	0.2	99	33	17	14	7
Second Horizon															
0.5-1.0	35426-A-SC-03-0.5-1'	38	48	14	LOAM	5.7	26.2	7.1	1.4	5.8	315	100	21	34	30
0.5-1.0	35426-B-SC-07-0.5-1'	44	44	12	LOAM	6.7	23.7	7.0	1.7	6.1	502	144	66	22	27
0.6-1.0	35426-B-SC-12-0.6-1'	30	50	20	LOAM	9.8	28.8	10.7	0.8	6.0	877	170	29	66	36
	Mean	37	47	15		7.4	26.2	8.3	1.3	6.0	565	138	39	41	31
	Standard Deviation	7	3	4		2.1	2.6	2.1	0.5	0.2	286	35	24	23	5

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Source: Agvise Laboratories Soil Characterization Report, 12/26/01

Note: 1. Analysis performed on disturbed samples

2. pH determined with a pH electrode in a 1:1 soil:water suspension (Agvise Laboratories SOP NUT.02.05)

Abbreviations: ft bgs = feet below ground surface; ppm = parts per million; CEC = cation exchange capacity; meq/100g = milliequivalents per 100 g; OM = organic matter

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Date/Initials: 2/26/02 DCB; rev. 1/25/04 DCB; rev. 2/18/04 DCB

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TABLE 5
Soil Infiltration Test Results

INFILTRATION TEST ID: IT-A-1

Time (hr:min)	Volume Added (mL)	Cum. Volume (mL)	Cum. Depth[1] (cm)	Cum. Depth[2] (in.)	Elapsed Time (hr:min)
15:42		0	0.00	0.00	0:00
15:48	495	495	0.26	0.10	0:06
15:53	950	1445	0.75	0.30	0:11
15:57	706	2151	1.12	0.44	0:15
16:01	548	2699	1.41	0.56	0:19
16:06	806	3505	1.83	0.72	0:24
16:10	565	4070	2.13	0.84	0:28
16:14	630	4700	2.46	0.97	0:32
16:18	451	5151	2.69	1.06	0:36
16:22	628	5779	3.02	1.19	0:40
16:26	630	6409	3.35	1.32	0:44
16:30	625	7034	3.67	1.45	0:48
16:34	670	7704	4.02	1.58	0:52
16:38	528	8232	4.30	1.69	0:56
16:42	477	8709	4.55	1.79	1:00
16:46	442	9151	4.78	1.88	1:04
16:50	422	9573	5.00	1.97	1:08
16:54	480	10053	5.25	2.07	1:12
16:58	530	10583	5.53	2.18	1:16
17:02	452	11035	5.76	2.27	1:20
17:06	400	11435	5.97	2.35	1:24
17:10	525	11960	6.25	2.46	1:28
17:14	410	12370	6.46	2.54	1:32
17:18	630	13000	6.79	2.67	1:36
17:22	320	13320	6.96	2.74	1:40

Test Method: Single Ring Infiltrometer
Ring Diameter (2): 19 3/8 in.; 19 1/2 in.
Ring Area (in.^{2}): 296.7
Ring Area (cm^2): 1914.2

INFILTRATION RATE RESULTS

Calculation Method	(cm/hr)	(in./hr)
Arithmetic Method[3]	4.2	1.64
Regression Method[4]	3.6	1.44

Source: SEI Field Data Sheets, 12/8/01

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Notes: 1. Cumulative Depth (cm) = Cumulative Volume (ml)/Ring Infiltrometer Area (cm^2)

2. Cumulative Depth (in.) = Cumulative Depth (cm)/2.54

3. Infiltration Rate = Cumulative Depth/Elapsed Time (min) x 60 (min/hr)

4. Infiltration Rate calculated as the slope of the best fit (sum of least squares) line through the cumulative depth (cm)/elapsed time (min) data, multiplied by 60 min/hr. Due to a slight shift in the rate at approximately 52 minutes, the regression line (R^2 = 0.9994) was fit through the data between elapsed time = 52 minutes and the end of the test. Using only these later data points in the analysis provides an estimate for the infiltration rate after the system has fully equilibrated and the soils are saturated.

Abbreviations: cum. = cumulative; cm/hr = centimeters/hour; in./hr = inches/hour

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Date/Initials: 7/25/02 DCB; rev. 12/10/03 DCB

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TABLE 5 (Continued)
Soil Infiltration Test Results

INFILTRATION TEST ID: IT-A-2

Time (hr:min)	Volume Added (mL)	Cum. Volume (mL)	Cum. Depth[1] (cm)	Cum. Depth[2] (in.)	Elapsed Time (hr:min)
16:13		0	0.00	0.00	0:00
16:16	634	634	0.33	0.13	0:03
16:20	965	1599	0.84	0.33	0:07
16:24	1000	2599	1.37	0.54	0:11
16:28	1130	3729	1.96	0.77	0:15
16:32	1292	5021	2.64	1.04	0:19
16:36	855	5876	3.09	1.22	0:23
16:40	960	6836	3.59	1.42	0:27
16:44	890	7726	4.06	1.60	0:31
16:48	832	8558	4.50	1.77	0:35
16:52	970	9528	5.01	1.97	0:39
16:56	970	10498	5.52	2.17	0:43
17:00	750	11248	5.91	2.33	0:47
17:04	730	11978	6.30	2.48	0:51
17:08	830	12808	6.73	2.65	0:55
17:12	900	13708	7.21	2.84	0:59
17:16	728	14436	7.59	2.99	1:03
17:20	860	15296	8.04	3.17	1:07
17:24	975	16271	8.55	3.37	1:11
17:28	765	17036	8.96	3.53	1:15
17:32	550	17586	9.25	3.64	1:19
17:36	640	18226	9.58	3.77	1:23
17:40	800	19026	10.00	3.94	1:27
17:44	880	19906	10.47	4.12	1:31

Test Method: Single Ring Infiltrometer
Ring Diameter (2): 19 1/8 in.; 19 5/8 in.
Ring Area (in.^{2}): 294.8
Ring Area (cm^2): 1901.9

INFILTRATION RATE RESULTS

Calculation Method	(cm/hr)	(in./hr)
Arithmetic Method[3]	6.9	2.72
Regression Method[4]	6.2	2.44

Source: SEI Field Data Sheets, 12/8/01 STONE ENVIRONMENTAL, INC.

Notes: 1. Cumulative Depth (cm) = Cumulative Volume (ml)/Ring Infiltrometer Area (cm^2)

2. Cumulative Depth (in.) = Cumulative Depth (cm)/2.54

3. Infiltration Rate = Cumulative Depth/Elapsed Time (min) x 60 (min/hr)

4. Infiltration Rate calculated as the slope of the best fit (sum of least squares) line through the cumulative depth (cm)/elapsed time (min) data, multiplied by 60 min/hr. Due to a slight shift in the rate at approximately 43 minutes, the regression line (R^2 = 0.9983) was fit through the data between elapsed time = 43 minutes and the end of the test. Using only these later data points in the analysis provides an estimate for the infiltration rate after the system has fully equilibrated and the soils are saturated.

Abbreviations: cum. = cumulative; cm/hr = centimeters/hour; in./hr = inches/hour

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Date/Initials: 7/25/02 DCB; rev. 12/10/03 DCB

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TABLE 5 (Continued)
Soil Infiltration Test Results

INFILTRATION TEST ID: IT-B-1

Time (hr:min)	Volume Added (mL)	Cum. Volume (mL)	Cum. Depth[1] (cm)	Cum. Depth[2] (in.)	Elapsed Time (hr:min)
16:27		0	0.00	0.00	0:00
16:32	770	770	0.40	0.16	0:05
16:37	540	1310	0.68	0.27	0:10
16:42	370	1680	0.88	0.35	0:15
16:47	370	2050	1.07	0.42	0:20
16:52	420	2470	1.29	0.51	0:25
16:57	530	3000	1.57	0.62	0:30
17:02	410	3410	1.78	0.70	0:35
17:07	290	3700	1.93	0.76	0:40
17:12	400	4100	2.14	0.84	0:45
17:17	300	4400	2.30	0.90	0:50
17:22	340	4740	2.48	0.97	0:55
17:27	330	5070	2.65	1.04	1:00
17:32	330	5400	2.82	1.11	1:05
17:37	640	6040	3.16	1.24	1:10
17:42	470	6510	3.40	1.34	1:15
17:47	340	6850	3.58	1.41	1:20
17:52	330	7180	3.75	1.48	1:25
17:57	330	7510	3.92	1.54	1:30
18:02	250	7760	4.05	1.60	1:35
18:07	250	8010	4.18	1.65	1:40
18:12	290	8300	4.34	1.71	1:45
18:17	210	8510	4.45	1.75	1:50
18:22	330	8840	4.62	1.82	1:55

Test Method: Single Ring Infiltrometer
Ring Diameter (2): 19 3/8 in.; 19 1/2 in.
Ring Area (in.^{2}): 296.7
Ring Area (cm^2): 1914.2

INFILTRATION RATE RESULTS

Calculation Method	(cm/hr)	(in./hr)
Arithmetic Method[3]	2.4	0.95
Regression Method[4]	2.2	0.87

Source: SEI Field Data Sheets, 12/9/01 STONE ENVIRONMENTAL, INC.

Notes: 1. Cumulative Depth (cm) = Cumulative Volume (ml)/Ring Infiltrometer Area (cm^2)

2. Cumulative Depth (in.) = Cumulative Depth (cm)/2.54

3. Infiltration Rate = Cumulative Depth/Elapsed Time (min) x 60 (min/hr)

4. Infiltration Rate calculated as the slope of the best fit (sum of least squares) line through the cumulative depth (cm)/elapsed time (min) data, multiplied by 60 min/hr. Due to a slight shift in the rate at approximately 35 minutes, the regression line (R^2 = 0.992) was fit through the data between elapsed time = 35 minutes and the end of the test. Using only these later data points in the analysis provides an estimate for the infiltration rate after the system has fully equilibrated and the soils are saturated.

Abbreviations: cum. = cumulative; cm/hr = centimeters/hour; in./hr = inches/hour

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Date/Initials: 7/25/02 DCB; rev. 12/10/03 DCB

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TABLE 5 (Continued)
Soil Infiltration Test Results

INFILTRATION TEST ID: IT-B-2

Time (hr:min)	Volume Added (mL)	Cum. Volume (mL)	Cum. Depth[1] (cm)	Cum. Depth[2] (in.)	Elapsed Time (hr:min)
16:54		0	0.00	0.00	0:00
16:56	740	740	0.40	0.16	0:02
16:58	710	1450	0.79	0.31	0:04
17:00	610	2060	1.13	0.44	0:06
17:02	580	2640	1.44	0.57	0:08
17:04	630	3270	1.79	0.70	0:10
17:06	640	3910	2.14	0.84	0:12
17:08	690	4600	2.51	0.99	0:14
17:10	510	5110	2.79	1.10	0:16
17:12	750	5860	3.20	1.26	0:18
17:14	430	6290	3.44	1.35	0:20
17:16	480	6770	3.70	1.46	0:22
17:18	590	7360	4.02	1.58	0:24
17:20	540	7900	4.32	1.70	0:26
17:22	470	8370	4.58	1.80	0:28
17:24	620	8990	4.92	1.94	0:30
17:26	490	9480	5.18	2.04	0:32
17:28	580	10060	5.50	2.17	0:34
17:30	620	10680	5.84	2.30	0:36
17:32	610	11290	6.17	2.43	0:38
17:34	670	11960	6.54	2.57	0:40
17:36	650	12610	6.89	2.71	0:42
17:38	800	13410	7.33	2.89	0:44
17:40	390	13800	7.54	2.97	0:46
17:42	350	14150	7.74	3.05	0:48
17:44	550	14700	8.04	3.16	0:50
17:46	420	15120	8.27	3.25	0:52
17:48	550	15670	8.57	3.37	0:54
17:50	450	16120	8.81	3.47	0:56
17:52	510	16630	9.09	3.58	0:58
17:54	570	17200	9.40	3.70	1:00
17:56	550	17750	9.70	3.82	1:02
17:58	500	18250	9.98	3.93	1:04
18:00	510	18760	10.26	4.04	1:06
18:02	550	19310	10.56	4.16	1:08
18:04	460	19770	10.81	4.26	1:10
18:06	490	20260	11.08	4.36	1:12
18:08	570	20830	11.39	4.48	1:14
18:10	350	21180	11.58	4.56	1:16
18:12	410	21590	11.80	4.65	1:18
18:14	460	22050	12.06	4.75	1:20
18:16	400	22450	12.27	4.83	1:22
18:18	466	22916	12.53	4.93	1:24
18:20	550	23466	12.83	5.05	1:26
18:22	450	23916	13.08	5.15	1:28
18:24	430	24346	13.31	5.24	1:30

Test Method: Single Ring Infiltrometer
Ring Diameter (2): 18 7/8 in.; 19 1/8 in.
Ring Area (in.^{2}): 283.5
Ring Area (cm^2): 1829.0

INFILTRATION RATE RESULTS

Calculation Method	(cm/hr)	(in./hr)
Arithmetic Method[3]	8.9	3.49
Regression Method[4]	8.0	3.14

Source: SEI Field Data Sheets, 12/9/01 STONE ENVIRONMENTAL, INC.

Notes: 1. Cumulative Depth (cm) = Cumulative Volume (ml)/Ring Infiltrometer Area (cm^2)

2. Cumulative Depth (in.) = Cumulative Depth (cm)/2.54

3. Infiltration Rate = Cumulative Depth/Elapsed Time (min) x 60 (min/hr)

4. Infiltration Rate calculated as the slope of the best fit (sum of least squares) line through the cumulative depth (cm)/elapsed time (min) data, multiplied by 60 min/hr. Due to a slight shift in the rate at approximately 44 minutes, the regression line (R^2 = 0.999) was fit through the data between elapsed time = 44 minutes and the end of the test. Using only these later data points in the analysis provides an estimate for the infiltration rate after the system has fully equilibrated and the soils are saturated.

Abbreviations: cum. = cumulative; cm/hr = centimeters/hour; in./hr = inches/hour

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Date/Initials: 7/25/02 DCB; rev. 12/10/03 DCB

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TABLE 3
Characterization of Simulator Source Water

Sample ID	Temperature (°C)	pH	Conductivity (mmhos/cm)	Sodium (ppm)	Calcium (ppm)	Magnesium (ppm)	Hardness[1] (ppm)	SAR
35426-WC-01		8.1	0.08	5	2	1	10	0.70
35426-WC-02		6.8	0.06	4	2	1	10	0.57
35426-WC-03		6.8	0.06	4	2	1	10	0.57
Sample Mean		7.2	0.07	5	2	1	10	0.61
Field Measurement[2]	18.1	6.62	0.057					

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Source: SEI field data, 12/8/01; Agvise Laboratories Water Characterization Report, 12/27/01

Notes: 1. Hardness expressed as milligram equivalent $CaCO_3$/L

2. Field measurements recorded on December 8, 2001 immediately prior to sample collection

Abbreviations: mmhos/cm = millimhos per centimeter; ppm = parts per million; ; SAR = Sodium Absorption Ratio;

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Date/Initials: 2/26/02 DCB; rev. 1/25/04 DCB

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TABLE 7
Rainfall Simulator Performance

	December 11, 2001 Event		December 12, 2001 Event	
	Plot 4	Plot 3	Plot 1	Plot 2
Number of Collection Jars (n)	12	12	12	12
Mean Volume (ml)	439	460	498	475
Standard Deviation (ml)	70	85	102	129
Coefficient of Variation (percent)	16	18	21	27
Coefficient of Uniformity (CU) [1]	87	85	85	76
Simulator Start Time (hr:min:sec)	12:40:27	12:40:27	13:36:00	13:36:00
Simulator End Time (hr:min:sec)	16:04:00	16:04:00	17:18:16	17:18:16
Simulated Rainfall Duration (min)	204	204	222	222
Rainfall Delivery (cm) [2]	9.18	9.63	10.42	9.94
Rainfall Delivery (in.) [3]	3.61	3.79	4.10	3.91
Rainfall Intensity (in./hr) [4]	1.06	1.12	1.11	1.06
Total Simulated Rainfall Input (L) [5]	7,674	8,054	8,707	8,306
Percent of 1.0 in./hr Target [6]	106	112	111	106

Source: Stone Environmental field data sheets, 12/11-12/01

STONE ENVIRONMENTAL, INC.

Notes: Diameter of collection jar opening = 7.8 cm; Radius = 3.9 cm

1. CU = 100 (1-D/M), where D = $(1/n)\sum|Xi-M|$, and M= $(1/n)\sum Xi$
2. Rainfall Delivery (cm) = Mean Volume (ml)/pi(3.9 $cm)^2$
3. Rainfall Delivery (in.) = Rainfall Delivery (cm)/(2.54 cm/in.)
4. Rainfall Intensity (in./hr) = Rainfall Delivery (in.)*(60 min/hr)/Event Duration (min)
5. Total Input = Delivery (in.)/12)*(plot length--75 ft)(plot width--12 ft)*(7.48052 gal/ft^3)(3.785 L/gal)
6. Percent of Target = Rainfall Intensity (in./hr)/(1.0 in./hr)*100, where 1.0 in./hr is the target rainfall input

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TABLE 8
Runoff Flow from Plot 4—December 11, 2001 Event

	Elapsed Time			Runoff Flow				
Time[1] (24 hr)	Simulated Rainfall[2] (min)	Runoff Duration[3] (min)	Flume Depth[4] (m)	Rate[5] (L/sec)	Rate[6] (L/min)	Rate[7] (mm/hr)	Cumulative[8] (L)	Sample Interval[9] (L)
14:39	119	0	0.031	0.120	7.20	5.17	0.0	
14:40	120	1	0.034	0.146	8.76	6.29	8.8	
14:41	121	2	0.035	0.168	10.08	7.23	18.8	
14:42	122	3	0.037	0.194	11.64	8.35	30.5	
14:43	123	4	0.038	0.202	12.12	8.70	42.6	
14:44	124	5	0.039	0.218	13.08	9.39	55.7	
14:45	125	6	0.040	0.237	14.22	10.20	69.9	69.9
14:46	126	7	0.041	0.255	15.30	10.98	85.2	
14:47	127	8	0.042	0.263	15.78	11.32	101.0	
14:48	128	9	0.042	0.269	16.14	11.58	117.1	
14:49	129	10	0.043	0.278	16.68	11.97	133.8	
14:50	130	11	0.043	0.288	17.28	12.40	151.1	
14:51	131	12	0.044	0.297	17.82	12.79	168.9	
14:52	132	13	0.045	0.311	18.66	13.39	187.6	
14:53	133	14	0.045	0.311	18.66	13.39	206.2	
14:54	134	15	0.045	0.317	19.02	13.65	225.2	155.3
14:55	135	16	0.045	0.324	19.44	13.95	244.7	
14:56	136	17	0.046	0.331	19.86	14.25	264.5	
14:57	137	18	0.046	0.337	20.22	14.51	284.8	
14:58	138	19	0.046	0.341	20.46	14.68	305.2	
14:59	139	20	0.047	0.353	21.18	15.20	326.4	
15:00	140	21	0.048	0.370	22.20	15.93	348.6	
15:01	141	22	0.048	0.370	22.20	15.93	370.8	
15:02	142	23	0.048	0.366	21.96	15.76	392.8	
15:03	143	24	0.048	0.374	22.44	16.10	415.2	190.0
15:04	144	25	0.047	0.362	21.72	15.59	436.9	
15:05	145	26	0.048	0.381	22.86	16.40	459.8	
15:06	146	27	0.048	0.378	22.68	16.28	482.5	
15:07	147	28	0.049	0.385	23.10	16.58	505.6	
15:08	148	29	0.049	0.389	23.34	16.75	528.9	
15:09	149	30	0.049	0.397	23.82	17.09	552.7	
15:10	150	31	0.049	0.397	23.82	17.09	576.5	
15:11	151	32	0.049	0.404	24.24	17.39	600.8	
15:12	152	33	0.049	0.404	24.24	17.39	625.0	209.8
15:13	153	34	0.050	0.408	24.48	17.57	649.5	
15:14	154	35	0.050	0.412	24.72	17.74	674.2	
15:15	155	36	0.050	0.408	24.48	17.57	698.7	
15:16	156	37	0.050	0.412	24.72	17.74	723.4	
15:17	157	38	0.050	0.416	24.96	17.91	748.4	
15:18	158	39	0.050	0.412	24.72	17.74	773.1	

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TABLE 8 (Continued)
Runoff Flow from Plot 4—December 11, 2001 Event

	Elapsed Time			Runoff Flow				
Time[1] (24 hr)	Simulated Rainfall[2] (min)	Runoff Duration[3] (min)	Flume Depth[4] (m)	Rate[5] (L/sec)	Rate[6] (L/min)	Rate[7] (mm/hr)	Cumulative[8] (L)	Sample Interval[9] (L)
15:19	159	40	0.050	0.416	24.96	17.91	798.1	
15:20	160	41	0.050	0.412	24.72	17.74	822.8	
15:21	161	42	0.050	0.421	25.26	18.13	848.0	223.0
15:22	162	43	0.050	0.425	25.50	18.30	873.5	
15:23	163	44	0.051	0.432	25.92	18.60	899.5	
15:24	164	45	0.051	0.436	26.16	18.77	925.6	
15:25	165	46	0.051	0.436	26.16	18.77	951.8	
15:26	166	47	0.051	0.445	26.70	19.16	978.5	
15:27	167	48	0.052	0.452	27.12	19.46	1005.6	
15:28	168	49	0.052	0.452	27.12	19.46	1032.7	
15:29	169	50	0.052	0.465	27.90	20.02	1060.6	
15:30	170	51	0.052	0.465	27.90	20.02	1088.5	240.5
15:31	171	52	0.052	0.461	27.66	19.85	1116.2	
15:32	172	53	0.053	0.477	28.62	20.54	1144.8	
15:33	173	54	0.052	0.465	27.90	20.02	1172.7	
15:34	174	55	0.052	0.465	27.90	20.02	1200.6	
15:35	175	56	0.052	0.465	27.90	20.02	1228.5	
15:36	176	57	0.052	0.465	27.90	20.02	1256.4	
15:37	177	58	0.052	0.470	28.20	20.24	1284.6	
15:38	178	59	0.052	0.470	28.20	20.24	1312.8	
15:39	179	60	0.053	0.475	28.50	20.45	1341.3	252.8
15:40	180	61	0.053	0.477	28.62	20.54	1369.9	
15:41	181	62	0.053	0.477	28.62	20.54	1398.5	
15:42	182	63	0.053	0.482	28.92	20.75	1427.5	
15:43	183	64	0.053	0.477	28.62	20.54	1456.1	
15:44	184	65	0.053	0.477	28.62	20.54	1484.7	
15:45	185	66	0.053	0.482	28.92	20.75	1513.6	
15:46	186	67	0.053	0.477	28.62	20.54	1542.2	
15:47	187	68	0.053	0.477	28.62	20.54	1570.9	
15:48	188	69	0.053	0.477	28.62	20.54	1599.5	258.2
15:49	189	70	0.053	0.482	28.92	20.75	1628.4	
15:50	190	71	0.053	0.482	28.92	20.75	1657.3	
15:51	191	72	0.053	0.487	29.22	20.97	1686.5	
15:52	192	73	0.053	0.482	28.92	20.75	1715.5	
15:53	193	74	0.053	0.477	28.62	20.54	1744.1	
15:54	194	75	0.053	0.492	29.52	21.18	1773.6	
15:55	195	76	0.054	0.496	29.76	21.36	1803.4	
15:56	196	77	0.054	0.496	29.76	21.36	1833.1	
15:57	197	78	0.054	0.504	30.24	21.70	1863.4	263.9
15:58	198	79	0.054	0.496	29.76	21.36	1893.1	

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TABLE 8 (Continued)
Runoff Flow from Plot 4—December 11, 2001 Event

	Elapsed Time			Runoff Flow				
Time[1] (24 hr)	Simulated Rainfall[2] (min)	Runoff Duration[3] (min)	Flume Depth[4] (m)	Rate[5] (L/sec)	Rate[6] (L/min)	Rate[7] (mm/hr)	Cumulative[8] (L)	Sample Interval[9] (L)
15:59	199	80	0.054	0.501	30.06	21.57	1923.2	
16:00	200	81	0.054	0.508	30.48	21.87	1953.7	
16:01	201	82	0.054	0.508	30.48	21.87	1984.1	
16:02	202	83	0.052	0.470	28.20	20.24	2012.3	
16:03	203	84	0.050	0.416	24.96	17.91	2037.3	
16:04	204	85	0.047	0.362	21.72	15.59	2059.0	
16:05	205	86	0.045	0.311	18.66	13.39	2077.7	
16:06	206	87	0.042	0.269	16.14	11.58	2093.8	230.5
16:07	207	88	0.040	0.231	13.86	9.95	2107.7	
16:08	208	89	0.038	0.197	11.82	8.48	2119.5	
16:09	209	90	0.035	0.168	10.08	7.23	2129.6	
16:10	210	91	0.033	0.142	8.52	6.11	2138.1	
16:11	211	92	0.031	0.121	7.26	5.21	2145.4	
16:12	212	93	0.030	0.106	6.36	4.56	2151.7	
16:13	213	94	0.028	0.088	5.28	3.79	2157.0	
16:14	214	95	0.026	0.073	4.38	3.14	2161.4	
16:15	215	96	0.024	0.065	3.90	2.80	2165.3	71.5

Source: Automated flow data collection with ISCO 3230 flowmeter STONE ENVIRONMENTAL, INC.

Notes: 1. Clock time recorded in flow meter memory during runoff event

2. Elapsed Time since start of simulated rainfall event

3. Elapsed Time since first observation of runoff from plot

4. Flume Depth (m) recorded in flow meter memory during runoff event

5. Flow Rate (L/sec) calculated using Isco's Flowlink ver. 3.22 software

6. Flow Rate (L/min) calculated as: Flow Rate (L/sec) x 60 sec/min

7. Flow Rate (mm/hr) calculated as: (Flow Rate (L/min) x 60 min/hr x 1000 ml/L x cm^3/ml x 10 mm/cm) /(900 ft^2 x (30.48 cm/f

8. Cumulative Runoff Flow (L) = previous minutes cumulative flow (L) + current flow rate (L/min). The flow total was reset to zero at the start of the first minute of runoff

9. Sample Interval runoff flow (L) =current cumulative flow (L) - cumulative flow of previous sample (L)

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Date/Initials: 3/2/02 DCB; rev. 1/25/04 DCB

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TABLE 9

Runoff Flow from Plot 3—December 11, 2001 Event

	Elapsed Time			Runoff Flow				
Time[1] (24 hr)	Simulated Rainfall[2] (min)	Runoff Duration[3] (min)	Flume Depth[4] (m)	Rate[5] (L/sec)	Rate[6] (L/min)	Rate[7] (mm/hr)	Cumulative[8] (L)	Sample Interval[9] (L)
14:12	92	0	0.008	0.000	0.00	0.00	0.0	
14:13	93	1	0.013	0.023	1.38	0.99	1.4	
14:14	94	2	0.013	0.023	1.38	0.99	2.8	
14:15	95	3	0.013	0.023	1.38	0.99	4.1	
14:16	96	4	0.014	0.024	1.44	1.03	5.6	
14:17	97	5	0.014	0.024	1.44	1.03	7.0	
14:18	98	6	0.014	0.024	1.44	1.03	8.5	8.5
14:19	99	7	0.014	0.024	1.44	1.03	9.9	
14:20	100	8	0.014	0.024	1.44	1.03	11.3	
14:21	101	9	0.014	0.024	1.44	1.03	12.8	
14:22	102	10	0.014	0.024	1.44	1.03	14.2	
14:23	103	11	0.014	0.025	1.50	1.08	15.7	
14:24	104	12	0.014	0.025	1.50	1.08	17.2	
14:25	105	13	0.015	0.026	1.56	1.12	18.8	
14:26	106	14	0.015	0.026	1.56	1.12	20.3	
14:27	107	15	0.015	0.026	1.56	1.12	21.9	13.4
14:28	108	16	0.015	0.025	1.50	1.08	23.4	
14:29	109	17	0.014	0.025	1.50	1.08	24.9	
14:30	110	18	0.015	0.026	1.56	1.12	26.5	
14:31	111	19	0.015	0.026	1.56	1.12	28.0	
14:32	112	20	0.015	0.026	1.56	1.12	29.6	
14:33	113	21	0.015	0.026	1.56	1.12	31.1	
14:34	114	22	0.016	0.028	1.68	1.21	32.8	
14:35	115	23	0.016	0.029	1.74	1.25	34.6	
14:36	116	24	0.016	0.030	1.80	1.29	36.4	14.5
14:37	117	25	0.017	0.030	1.80	1.29	38.2	
14:38	118	26	0.017	0.032	1.92	1.38	40.1	
14:39	119	27	0.018	0.034	2.04	1.46	42.1	
14:40	120	28	0.019	0.037	2.22	1.59	44.3	
14:41	121	29	0.020	0.042	2.52	1.81	46.9	
14:42	122	30	0.020	0.043	2.58	1.85	49.4	
14:43	123	31	0.021	0.048	2.88	2.07	52.3	
14:44	124	32	0.023	0.057	3.42	2.45	55.7	
14:45	125	33	0.027	0.087	5.22	3.75	61.0	24.6
14:46	126	34	0.030	0.112	6.72	4.82	67.7	
14:47	127	35	0.033	0.140	8.40	6.03	76.1	
14:48	128	36	0.035	0.165	9.90	7.10	86.0	
14:49	129	37	0.036	0.179	10.74	7.71	96.7	
14:50	130	38	0.037	0.194	11.64	8.35	108.4	
14:51	131	39	0.039	0.215	12.90	9.26	121.3	
14:52	132	40	0.040	0.228	13.68	9.82	134.9	
14:53	133	41	0.040	0.234	14.04	10.08	149.0	
14:54	134	42	0.041	0.245	14.70	10.55	163.7	102.7
14:55	135	43	0.042	0.260	15.60	11.19	179.3	
14:56	136	44	0.042	0.269	16.14	11.58	195.4	
14:57	137	45	0.043	0.278	16.68	11.97	212.1	
14:58	138	46	0.044	0.295	17.70	12.70	229.8	
14:59	139	47	0.044	0.300	18.00	12.92	247.8	
15:00	140	48	0.045	0.307	18.42	13.22	266.2	
15:01	141	49	0.045	0.317	19.02	13.65	285.2	
15:02	142	50	0.045	0.317	19.02	13.65	304.3	
15:03	143	51	0.046	0.337	20.22	14.51	324.5	160.8

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TABLE 9 (Continued)
Runoff Flow from Plot 3—December 11, 2001 Event

	Elapsed Time			Runoff Flow				
Time[1] (24 hr)	Simulated Rainfall[2] (min)	Runoff Duration[3] (min)	Flume Depth[4] (m)	Rate[5] (L/sec)	Rate[6] (L/min)	Rate[7] (mm/hr)	Cumulative[8] (L)	Sample Interval[9] (L)
15:04	144	52	0.046	0.341	20.46	14.68	344.9	
15:05	145	53	0.046	0.341	20.46	14.68	365.4	
15:06	146	54	0.047	0.353	21.18	15.20	386.6	
15:07	147	55	0.047	0.345	20.70	14.85	407.3	
15:08	148	56	0.047	0.353	21.18	15.20	428.5	
15:09	149	57	0.047	0.353	21.18	15.20	449.6	
15:10	150	58	0.047	0.358	21.48	15.41	471.1	
15:11	151	59	0.047	0.358	21.48	15.41	492.6	
15:12	152	60	0.048	0.370	22.20	15.93	514.8	190.3
15:13	153	61	0.048	0.381	22.86	16.40	537.7	
15:14	154	62	0.049	0.385	23.10	16.58	560.8	
15:15	155	63	0.049	0.397	23.82	17.09	584.6	
15:16	156	64	0.049	0.397	23.82	17.09	608.4	
15:17	157	65	0.049	0.397	23.82	17.09	632.2	
15:18	158	66	0.050	0.408	24.48	17.57	656.7	
15:19	159	67	0.050	0.408	24.48	17.57	681.2	
15:20	160	68	0.050	0.412	24.72	17.74	705.9	
15:21	161	69	0.050	0.421	25.26	18.13	731.2	216.4
15:22	162	70	0.050	0.416	24.96	17.91	756.1	
15:23	163	71	0.051	0.441	26.46	18.99	782.6	
15:24	164	72	0.051	0.432	25.92	18.60	808.5	
15:25	165	73	0.051	0.427	25.62	18.38	834.1	
15:26	166	74	0.050	0.425	25.50	18.30	859.6	
15:27	167	75	0.050	0.425	25.50	18.30	885.1	
15:28	168	76	0.051	0.436	26.16	18.77	911.3	
15:29	169	77	0.051	0.436	26.16	18.77	937.4	
15:30	170	78	0.051	0.441	26.46	18.99	963.9	232.7
15:31	171	79	0.051	0.441	26.46	18.99	990.4	
15:32	172	80	0.051	0.441	26.46	18.99	1016.8	
15:33	173	81	0.052	0.452	27.12	19.46	1043.9	
15:34	174	82	0.052	0.452	27.12	19.46	1071.1	
15:35	175	83	0.051	0.445	26.70	19.16	1097.8	
15:36	176	84	0.052	0.452	27.12	19.46	1124.9	
15:37	177	85	0.052	0.456	27.36	19.63	1152.2	
15:38	178	86	0.052	0.452	27.12	19.46	1179.4	
15:39	179	87	0.052	0.456	27.36	19.63	1206.7	242.8
15:40	180	88	0.052	0.456	27.36	19.63	1234.1	
15:41	181	89	0.052	0.470	28.20	20.24	1262.3	
15:42	182	90	0.052	0.470	28.20	20.24	1290.5	
15:43	183	91	0.053	0.477	28.62	20.54	1319.1	
15:44	184	92	0.053	0.487	29.22	20.97	1348.3	
15:45	185	93	0.053	0.492	29.52	21.18	1377.8	
15:46	186	94	0.053	0.487	29.22	20.97	1407.1	
15:47	187	95	0.053	0.487	29.22	20.97	1436.3	
15:48	188	96	0.053	0.487	29.22	20.97	1465.5	258.8
15:49	189	97	0.053	0.492	29.52	21.18	1495.0	
15:50	190	98	0.053	0.487	29.22	20.97	1524.2	
15:51	191	99	0.053	0.492	29.52	21.18	1553.8	
15:52	192	100	0.053	0.487	29.22	20.97	1583.0	
15:53	193	101	0.053	0.492	29.52	21.18	1612.5	
15:54	194	102	0.053	0.492	29.52	21.18	1642.0	
15:55	195	103	0.053	0.487	29.22	20.97	1671.2	

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TABLE 9 (Continued)
Runoff Flow from Plot 3—December 11, 2001 Event

	Elapsed Time			Runoff Flow				
Time[1] (24 hr)	Simulated Rainfall[2] (min)	Runoff Duration[3] (min)	Flume Depth[4] (m)	Rate[5] (L/sec)	Rate[6] (L/min)	Rate[7] (mm/hr)	Cumulative[8] (L)	Sample Interval[9] (L)
15:56	196	104	0.053	0.492	29.52	21.18	1700.8	
15:57	197	105	0.053	0.487	29.22	20.97	1730.0	264.5
15:58	198	106	0.053	0.492	29.52	21.18	1759.5	
15:59	199	107	0.053	0.487	29.22	20.97	1788.7	
16:00	200	108	0.053	0.492	29.52	21.18	1818.2	
16:01	201	109	0.054	0.501	30.06	21.57	1848.3	
16:02	202	110	0.054	0.501	30.06	21.57	1878.4	
16:03	203	111	0.051	0.441	26.46	18.99	1904.8	
16:04	204	112	0.048	0.381	22.86	16.40	1927.7	
16:05	205	113	0.046	0.331	19.86	14.25	1947.5	
16:06	206	114	0.044	0.291	17.46	12.53	1965.0	235.0
16:07	207	115	0.041	0.248	14.88	10.68	1979.9	
16:08	208	116	0.039	0.215	12.90	9.26	1992.8	
16:09	209	117	0.037	0.185	11.10	7.97	2003.9	
16:10	210	118	0.034	0.155	9.30	6.67	2013.2	
16:11	211	119	0.032	0.132	7.92	5.68	2021.1	
16:12	212	120	0.030	0.109	6.54	4.69	2027.6	
16:13	213	121	0.028	0.092	5.52	3.96	2033.2	
16:14	214	122	0.027	0.082	4.92	3.53	2038.1	
16:15	215	123	0.024	0.066	3.96	2.84	2042.0	77.0

Source: Automated flow data collection with ISCO 3230 flowmeter STONE ENVIRONMENTAL, INC.

Notes: 1. Clock time recorded in flow meter memory during runoff event

2. Elapsed Time since start of simulated rainfall event

3. Elapsed Time since first observation of runoff from plot

4. Flume Depth (m) recorded in flow meter memory during runoff event

5. Flow Rate (L/sec) calculated using Isco's Flowlink ver. 3.22 software

6. Flow Rate (L/min) calculated as: Flow Rate (L/sec) x 60 sec/min

7. Flow Rate (mm/hr) calculated as: (Flow Rate (L/min) x 60 min/hr x 1000 ml/L x cm ^{3}/ml x 10 mm/cm) /(900 ft ^{2} x (30.48 cm/

8. Cumulative Runoff Flow (L) = previous minutes cumulative flow (L) + current flow rate (L/min). The flow total was reset to zero at the start of the first minute of runoff

9. Sample Interval runoff flow (L) =current cumulative flow (L) - cumulative flow of previous sample (L)

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Date/Initials: 3/2/02 DCB; rev. 1/25/04 DCB

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TABLE 10
Runoff Flow from Plot 1—December 12, 2001 Event

	Elapsed Time			Runoff Flow				
Time[1] (24 hr)	Simulated Rainfall[2] (min)	Runoff Duration[3] (min)	Flume Depth[4] (m)	Rate[5] (L/sec)	Rate[6] (L/min)	Rate[7] (mm/hr)	Cumulative[8] (L)	Sample Interval[9] (L)
15:37	121	0	0.012	0.022	1.32	0.95	0.0	
15:38	122	1	0.012	0.022	1.32	0.95	1.3	
15:39	123	2	0.013	0.023	1.38	0.99	2.7	
15:40	124	3	0.014	0.024	1.44	1.03	4.1	
15:41	125	4	0.014	0.024	1.44	1.03	5.6	
15:42	126	5	0.014	0.025	1.50	1.08	7.1	
15:43	127	6	0.015	0.025	1.50	1.08	8.6	8.6
15:44	128	7	0.015	0.026	1.56	1.12	10.1	
15:45	129	8	0.023	0.059	3.54	2.54	13.7	
15:46	130	9	0.033	0.140	8.40	6.03	22.1	
15:47	131	10	0.036	0.171	10.26	7.36	32.3	
15:48	132	11	0.037	0.194	11.64	8.35	44.0	
15:49	133	12	0.038	0.209	12.54	9.00	56.5	
15:50	134	13	0.040	0.228	13.68	9.82	70.2	
15:51	135	14	0.041	0.245	14.70	10.55	84.9	
15:52	136	15	0.042	0.258	15.48	11.11	100.4	91.8
15:53	137	16	0.042	0.269	16.14	11.58	116.5	
15:54	138	17	0.043	0.281	16.86	12.10	133.4	
15:55	139	18	0.044	0.291	17.46	12.53	150.8	
15:56	140	19	0.044	0.304	18.24	13.09	169.1	
15:57	141	20	0.045	0.307	18.42	13.22	187.5	
15:58	142	21	0.045	0.317	19.02	13.65	206.5	
15:59	143	22	0.046	0.331	19.86	14.25	226.4	
16:00	144	23	0.046	0.328	19.68	14.12	246.1	
16:01	145	24	0.046	0.341	20.46	14.68	266.5	166.1
16:02	146	25	0.046	0.341	20.46	14.68	287.0	
16:03	147	26	0.047	0.345	20.70	14.85	307.7	
16:04	148	27	0.047	0.353	21.18	15.20	328.9	
16:05	149	28	0.047	0.356	21.36	15.33	350.2	
16:06	150	29	0.048	0.366	21.96	15.76	372.2	
16:07	151	30	0.048	0.366	21.96	15.76	394.1	
16:08	152	31	0.048	0.370	22.20	15.93	416.3	
16:09	153	32	0.048	0.366	21.96	15.76	438.3	
16:10	154	33	0.048	0.378	22.68	16.28	461.0	194.5
16:11	155	34	0.048	0.381	22.86	16.40	483.8	
16:12	156	35	0.048	0.381	22.86	16.40	506.7	
16:13	157	36	0.049	0.393	23.58	16.92	530.3	
16:14	158	37	0.049	0.385	23.10	16.58	553.4	
16:15	159	38	0.049	0.393	23.58	16.92	577.0	
16:16	160	39	0.049	0.397	23.82	17.09	600.8	
16:17	161	40	0.049	0.401	24.06	17.27	624.8	
16:18	162	41	0.049	0.401	24.06	17.27	648.9	
16:19	163	42	0.050	0.408	24.48	17.57	673.4	212.4
16:20	164	43	0.050	0.408	24.48	17.57	697.9	
16:21	165	44	0.050	0.416	24.96	17.91	722.8	
16:22	166	45	0.050	0.416	24.96	17.91	747.8	
16:23	167	46	0.050	0.421	25.26	18.13	773.0	
16:24	168	47	0.050	0.421	25.26	18.13	798.3	
16:25	169	48	0.050	0.416	24.96	17.91	823.3	

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TABLE 10 (Continued)
Runoff Flow from Plot 1—December 12, 2001 Event

	Elapsed Time			Runoff Flow				
Time[1] (24 hr)	Simulated Rainfall[2] (min)	Runoff Duration[3] (min)	Flume Depth[4] (m)	Rate[5] (L/sec)	Rate[6] (L/min)	Rate[7] (mm/hr)	Cumulative[8] (L)	Sample Interval[9] (L)
16:26	170	49	0.051	0.427	25.62	18.38	848.9	
16:27	171	50	0.050	0.425	25.50	18.30	874.4	
16:28	172	51	0.051	0.436	26.16	18.77	900.5	227.2
16:29	173	52	0.051	0.441	26.46	18.99	927.0	
16:30	174	53	0.051	0.445	26.70	19.16	953.7	
16:31	175	54	0.051	0.445	26.70	19.16	980.4	
16:32	176	55	0.051	0.445	26.70	19.16	1007.1	
16:33	177	56	0.051	0.445	26.70	19.16	1033.8	
16:34	178	57	0.051	0.445	26.70	19.16	1060.5	
16:35	179	58	0.052	0.452	27.12	19.46	1087.6	
16:36	180	59	0.051	0.441	26.46	18.99	1114.1	
16:37	181	60	0.051	0.441	26.46	18.99	1140.5	240.0
16:38	182	61	0.051	0.445	26.70	19.16	1167.2	
16:39	183	62	0.051	0.445	26.70	19.16	1193.9	
16:40	184	63	0.051	0.445	26.70	19.16	1220.6	
16:41	185	64	0.052	0.452	27.12	19.46	1247.8	
16:42	186	65	0.051	0.445	26.70	19.16	1274.5	
16:43	187	66	0.051	0.445	26.70	19.16	1301.2	
16:44	188	67	0.051	0.445	26.70	19.16	1327.9	
16:45	189	68	0.052	0.452	27.12	19.46	1355.0	
16:46	190	69	0.052	0.461	27.66	19.85	1382.6	242.1
16:47	191	70	0.052	0.452	27.12	19.46	1409.8	
16:48	192	71	0.052	0.452	27.12	19.46	1436.9	
16:49	193	72	0.052	0.452	27.12	19.46	1464.0	
16:50	194	73	0.052	0.452	27.12	19.46	1491.1	
16:51	195	74	0.052	0.461	27.66	19.85	1518.8	
16:52	196	75	0.052	0.456	27.36	19.63	1546.1	
16:53	197	76	0.052	0.461	27.66	19.85	1573.8	
16:54	198	77	0.052	0.452	27.12	19.46	1600.9	
16:55	199	78	0.051	0.445	26.70	19.16	1627.6	245.0
16:56	200	79	0.051	0.445	26.70	19.16	1654.3	
16:57	201	80	0.051	0.441	26.46	18.99	1680.8	
16:58	202	81	0.052	0.452	27.12	19.46	1707.9	
16:59	203	82	0.052	0.456	27.36	19.63	1735.3	
17:00	204	83	0.051	0.441	26.46	18.99	1761.7	
17:01	205	84	0.051	0.445	26.70	19.16	1788.4	
17:02	206	85	0.051	0.445	26.70	19.16	1815.1	
17:03	207	86	0.052	0.452	27.12	19.46	1842.2	
17:04	208	87	0.052	0.452	27.12	19.46	1869.4	241.7
17:05	209	88	0.051	0.441	26.46	18.99	1895.8	
17:06	210	89	0.051	0.441	26.46	18.99	1922.3	
17:07	211	90	0.051	0.436	26.16	18.77	1948.4	
17:08	212	91	0.052	0.452	27.12	19.46	1975.6	
17:09	213	92	0.052	0.452	27.12	19.46	2002.7	
17:10	214	93	0.052	0.456	27.36	19.63	2030.0	
17:11	215	94	0.051	0.445	26.70	19.16	2056.7	
17:12	216	95	0.051	0.441	26.46	18.99	2083.2	
17:13	217	96	0.052	0.461	27.66	19.85	2110.9	241.5
17:14	218	97	0.053	0.477	28.62	20.54	2139.5	

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TABLE 10 (Continued)
Runoff Flow from Plot 1—December 12, 2001 Event

	Elapsed Time			Runoff Flow				
Time[1] (24 hr)	Simulated Rainfall[2] (min)	Runoff Duration[3] (min)	Flume Depth[4] (m)	Rate[5] (L/sec)	Rate[6] (L/min)	Rate[7] (mm/hr)	Cumulative[8] (L)	Sample Interval[9] (L)
17:15	219	98	0.053	0.475	28.50	20.45	2168.0	
17:16	220	99	0.052	0.470	28.20	20.24	2196.2	
17:17	221	100	0.050	0.416	24.96	17.91	2221.1	
17:18	222	101	0.047	0.362	21.72	15.59	2242.9	
17:19	223	102	0.045	0.315	18.90	13.56	2261.8	
17:20	224	103	0.042	0.269	16.14	11.58	2277.9	
17:21	225	104	0.040	0.228	13.68	9.82	2291.6	
17:22	226	105	0.037	0.187	11.22	8.05	2302.8	191.9
17:23	227	106	0.035	0.159	9.54	6.85	2312.3	
17:24	228	107	0.032	0.125	7.50	5.38	2319.8	
17:25	229	108	0.029	0.102	6.12	4.39	2326.0	
17:26	230	109	0.027	0.080	4.80	3.44	2330.8	
17:27	231	110	0.025	0.068	4.08	2.93	2334.8	
17:28	232	111	0.023	0.055	3.30	2.37	2338.1	
17:29	233	112	0.020	0.041	2.46	1.77	2340.6	
17:30	234	113	0.018	0.035	2.10	1.51	2342.7	
17:31	235	114	0.017	0.031	1.86	1.33	2344.6	41.8

Source: Automated flow data collection with ISCO 3230 flowmeter STONE ENVIRONMENTAL, INC.

Notes: 1. Clock time recorded in flow meter memory during runoff event

2. Elapsed Time since start of simulated rainfall event

3. Elapsed Time since first observation of runoff from plot

4. Flume Depth (m) recorded in flow meter memory during runoff event

5. Flow Rate (L/sec) calculated using Isco's Flowlink ver. 3.22 software

6. Flow Rate (L/min) calculated as: Flow Rate (L/sec) x 60 sec/min

7. Flow Rate (mm/hr) calculated as: (Flow Rate (L/min) x 60 min/hr x 1000 ml/L x cm^3/ml x 10 mm/cm) /(900 ft^2 x (30.48 cm

8. Cumulative Runoff Flow (L) = previous minutes cumulative flow (L) + current flow rate (L/min). The flow total was reset to zero at the start of the first minute of runoff

9. Sample Interval runoff flow (L) =current cumulative flow (L) - cumulative flow of previous sample (L)

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Date/Initials: 3/2/02 DCB; rev. 1/25/04 DCB

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TABLE 11
Runoff Flow from Plot 2—December 12, 2001 Event

	Elapsed Time			Runoff Flow				
Time[1] (24 hr)	Simulated Rainfall[2] (min)	Runoff Duration[3] (min)	Flume Depth[4] (m)	Rate[5] (L/sec)	Rate[6] (L/min)	Rate[7] (mm/hr)	Cumulative[8] (L)	Sample Interval[9] (L)
15:50	134	0	0.018	0.034	2.04	1.46	0.0	
15:51	135	1	0.021	0.047	2.82	2.02	2.8	
15:52	136	2	0.024	0.065	3.90	2.80	6.7	
15:53	137	3	0.026	0.077	4.62	3.32	11.3	
15:54	138	4	0.028	0.093	5.58	4.00	16.9	
15:55	139	5	0.029	0.105	6.30	4.52	23.2	
15:56	140	6	0.030	0.114	6.84	4.91	30.1	30.1
15:57	141	7	0.032	0.127	7.62	5.47	37.7	
15:58	142	8	0.033	0.140	8.40	6.03	46.1	
15:59	143	9	0.034	0.146	8.76	6.29	54.8	
16:00	144	10	0.034	0.157	9.42	6.76	64.3	
16:01	145	11	0.035	0.164	9.84	7.06	74.1	
16:02	146	12	0.036	0.179	10.74	7.71	84.8	
16:03	147	13	0.038	0.197	11.82	8.48	96.7	
16:04	148	14	0.039	0.221	13.26	9.52	109.9	
16:05	149	15	0.042	0.260	15.60	11.19	125.5	95.5
16:06	150	16	0.043	0.273	16.38	11.75	141.9	
16:07	151	17	0.044	0.291	17.46	12.53	159.4	
16:08	152	18	0.044	0.300	18.00	12.92	177.4	
16:09	153	19	0.044	0.300	18.00	12.92	195.4	
16:10	154	20	0.045	0.307	18.42	13.22	213.8	
16:11	155	21	0.045	0.311	18.66	13.39	232.4	
16:12	156	22	0.045	0.324	19.44	13.95	251.9	
16:13	157	23	0.046	0.328	19.68	14.12	271.6	
16:14	158	24	0.046	0.337	20.22	14.51	291.8	166.3
16:15	159	25	0.046	0.337	20.22	14.51	312.0	
16:16	160	26	0.047	0.349	20.94	15.03	332.9	
16:17	161	27	0.047	0.356	21.36	15.33	354.3	
16:18	162	28	0.047	0.356	21.36	15.33	375.7	
16:19	163	29	0.047	0.356	21.36	15.33	397.0	
16:20	164	30	0.047	0.362	21.72	15.59	418.7	
16:21	165	31	0.048	0.370	22.20	15.93	440.9	
16:22	166	32	0.049	0.385	23.10	16.58	464.0	
16:23	167	33	0.049	0.385	23.10	16.58	487.1	195.4
16:24	168	34	0.049	0.393	23.58	16.92	510.7	
16:25	169	35	0.049	0.397	23.82	17.09	534.5	
16:26	170	36	0.049	0.401	24.06	17.27	558.6	
16:27	171	37	0.049	0.404	24.24	17.39	582.8	
16:28	172	38	0.049	0.404	24.24	17.39	607.1	
16:29	173	39	0.049	0.404	24.24	17.39	631.3	
16:30	174	40	0.050	0.408	24.48	17.57	655.8	
16:31	175	41	0.049	0.404	24.24	17.39	680.0	
16:32	176	42	0.050	0.416	24.96	17.91	705.0	217.9
16:33	177	43	0.050	0.416	24.96	17.91	730.0	

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TABLE 11 (Continued)
Runoff Flow from Plot 2—December 12, 2001 Event

	Elapsed Time			Runoff Flow				
Time[1] (24 hr)	Simulated Rainfall[2] (min)	Runoff Duration[3] (min)	Flume Depth[4] (m)	Rate[5] (L/sec)	Rate[6] (L/min)	Rate[7] (mm/hr)	Cumulative[8] (L)	Sample Interval[9] (L)
16:34	178	44	0.050	0.421	25.26	18.13	755.2	
16:35	179	45	0.050	0.421	25.26	18.13	780.5	
16:36	180	46	0.051	0.427	25.62	18.38	806.1	
16:37	181	47	0.051	0.432	25.92	18.60	832.0	
16:38	182	48	0.051	0.432	25.92	18.60	857.9	
16:39	183	49	0.051	0.436	26.16	18.77	884.1	
16:40	184	50	0.051	0.441	26.46	18.99	910.6	
16:41	185	51	0.051	0.441	26.46	18.99	937.0	232.0
16:42	186	52	0.052	0.452	27.12	19.46	964.1	
16:43	187	53	0.051	0.445	26.70	19.16	990.8	
16:44	188	54	0.052	0.450	27.00	19.38	1017.8	
16:45	189	55	0.052	0.452	27.12	19.46	1045.0	
16:46	190	56	0.052	0.450	27.00	19.38	1072.0	
16:47	191	57	0.052	0.452	27.12	19.46	1099.1	
16:48	192	58	0.052	0.452	27.12	19.46	1126.2	
16:49	193	59	0.051	0.445	26.70	19.16	1152.9	
16:50	194	60	0.052	0.452	27.12	19.46	1180.0	243.0
16:51	195	61	0.052	0.465	27.90	20.02	1207.9	
16:52	196	62	0.052	0.470	28.20	20.24	1236.1	
16:53	197	63	0.052	0.461	27.66	19.85	1263.8	
16:54	198	64	0.052	0.461	27.66	19.85	1291.4	
16:55	199	65	0.052	0.465	27.90	20.02	1319.3	
16:56	200	66	0.052	0.470	28.20	20.24	1347.5	
16:57	201	67	0.053	0.477	28.62	20.54	1376.2	
16:58	202	68	0.053	0.477	28.62	20.54	1404.8	
16:59	203	69	0.053	0.475	28.50	20.45	1433.3	253.3
17:00	204	70	0.053	0.477	28.62	20.54	1461.9	
17:01	205	71	0.053	0.477	28.62	20.54	1490.5	
17:02	206	72	0.053	0.477	28.62	20.54	1519.1	
17:03	207	73	0.053	0.475	28.50	20.45	1547.6	
17:04	208	74	0.052	0.470	28.20	20.24	1575.8	
17:05	209	75	0.053	0.475	28.50	20.45	1604.3	
17:06	210	76	0.053	0.477	28.62	20.54	1633.0	
17:07	211	77	0.053	0.482	28.92	20.75	1661.9	
17:08	212	78	0.053	0.482	28.92	20.75	1690.8	257.5
17:09	213	79	0.053	0.492	29.52	21.18	1720.3	
17:10	214	80	0.053	0.492	29.52	21.18	1749.8	
17:11	215	81	0.054	0.496	29.76	21.36	1779.6	
17:12	216	82	0.054	0.508	30.48	21.87	1810.1	
17:13	217	83	0.054	0.501	30.06	21.57	1840.1	
17:14	218	84	0.054	0.504	30.24	21.70	1870.4	
17:15	219	85	0.054	0.501	30.06	21.57	1900.4	
17:16	220	86	0.053	0.482	28.92	20.75	1929.4	
17:17	221	87	0.051	0.436	26.16	18.77	1955.5	264.7

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TABLE 11 (Continued)
Runoff Flow from Plot 2—December 12, 2001 Event

	Elapsed Time			Runoff Flow				
Time[1] (24 hr)	Simulated Rainfall[2] (min)	Runoff Duration[3] (min)	Flume Depth[4] (m)	Rate[5] (L/sec)	Rate[6] (L/min)	Rate[7] (mm/hr)	Cumulative[8] (L)	Sample Interval[9] (L)
17:18	222	88	0.048	0.381	22.86	16.40	1978.4	
17:19	223	89	0.046	0.335	20.10	14.42	1998.5	
17:20	224	90	0.044	0.295	17.70	12.70	2016.2	
17:21	225	91	0.042	0.260	15.60	11.19	2031.8	
17:22	226	92	0.040	0.228	13.68	9.82	2045.5	
17:23	227	93	0.037	0.194	11.64	8.35	2057.1	
17:24	228	94	0.035	0.168	10.08	7.23	2067.2	
17:25	229	95	0.034	0.146	8.76	6.29	2075.9	
17:26	230	96	0.032	0.125	7.50	5.38	2083.4	127.9
17:27	231	97	0.030	0.110	6.60	4.74	2090.0	
17:28	232	98	0.028	0.094	5.64	4.05	2095.7	
17:29	233	99	0.027	0.082	4.92	3.53	2100.6	
17:30	234	100	0.025	0.071	4.26	3.06	2104.9	
17:31	235	101	0.024	0.062	3.72	2.67	2108.6	
17:32	236	102	0.023	0.056	3.36	2.41	2111.9	
17:33	237	103	0.022	0.049	2.94	2.11	2114.9	
17:34	238	104	0.020	0.043	2.58	1.85	2117.5	
17:35	239	105	0.019	0.039	2.34	1.68	2119.8	36.4

Source: Automated flow data collection with ISCO 3230 flowmeter STONE ENVIRONMENTAL, INC.

Notes: 1. Clock time recorded in flow meter memory during runoff event

2. Elapsed Time since start of simulated rainfall event

3. Elapsed Time since first observation of runoff from plot

4. Flume Depth (m) recorded in flow meter memory during runoff event

5. Flow Rate (L/sec) calculated using Isco's Flowlink ver. 3.22 software

6. Flow Rate (L/min) calculated as: Flow Rate (L/sec) x 60 sec/min

7. Flow Rate (mm/hr) calculated as: (Flow Rate (L/min) x 60 min/hr x 1000 ml/L x cm^3/ml x 10 mm/cm) /(900 ft^2 x (30.48

8. Cumulative Runoff Flow (L) = previous minutes cumulative flow (L) + current flow rate (L/min). The flow total was reset to zero at the start of the first minute of runoff

9. Sample Interval runoff flow (L) =current cumulative flow (L) - cumulative flow of previous sample (L)

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Date/Initials: 3/2/02 DCB; rev. 1/25/04 DCB

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TABLE 12
Rainfall Input and Runoff Yield

Simulated Rainfall Event	Plot	Buffer Position	Rainfall Intensity (in./hr)	Total Simulated Rainfall Input (in.)	Total Simulated Rainfall Input (L)	Total Runoff Volume (L)	Runoff Yield[1] (%)
December 11, 2001							
	4	Top	1.06	3.61	7,674	2,165	28.2
	3	Bottom	1.12	3.79	8,054	2,042	25.4
	Percent difference between top buffer and bottom buffer plots[2]			-5%	-5%	6%	10%
December 12, 2001							
	1	Top	1.11	4.10	8,707	2,345	26.9
	2	Bottom	1.06	3.91	8,306	2,120	25.5
	Percent difference between top buffer and bottom buffer plots[2]			5%	5%	10%	5%

Sources: Stone Environmental field data sheets (12/11-12/01) and ISCO 3230 flowmeter data

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Notes: 1. Runoff yield (%) calculated as: 100 x total runoff volume (L)/total simulated rainfall input (L)

2. Percent difference calculated as: 100 x (Plot 4 value - Plot 3 value)/Plot 4 value or 100 x (Plot 1 value - Plot 2 value)/Plot 1 value

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Date/Initials: 3/2/02 DCB; rev. 1/25/04 DCB

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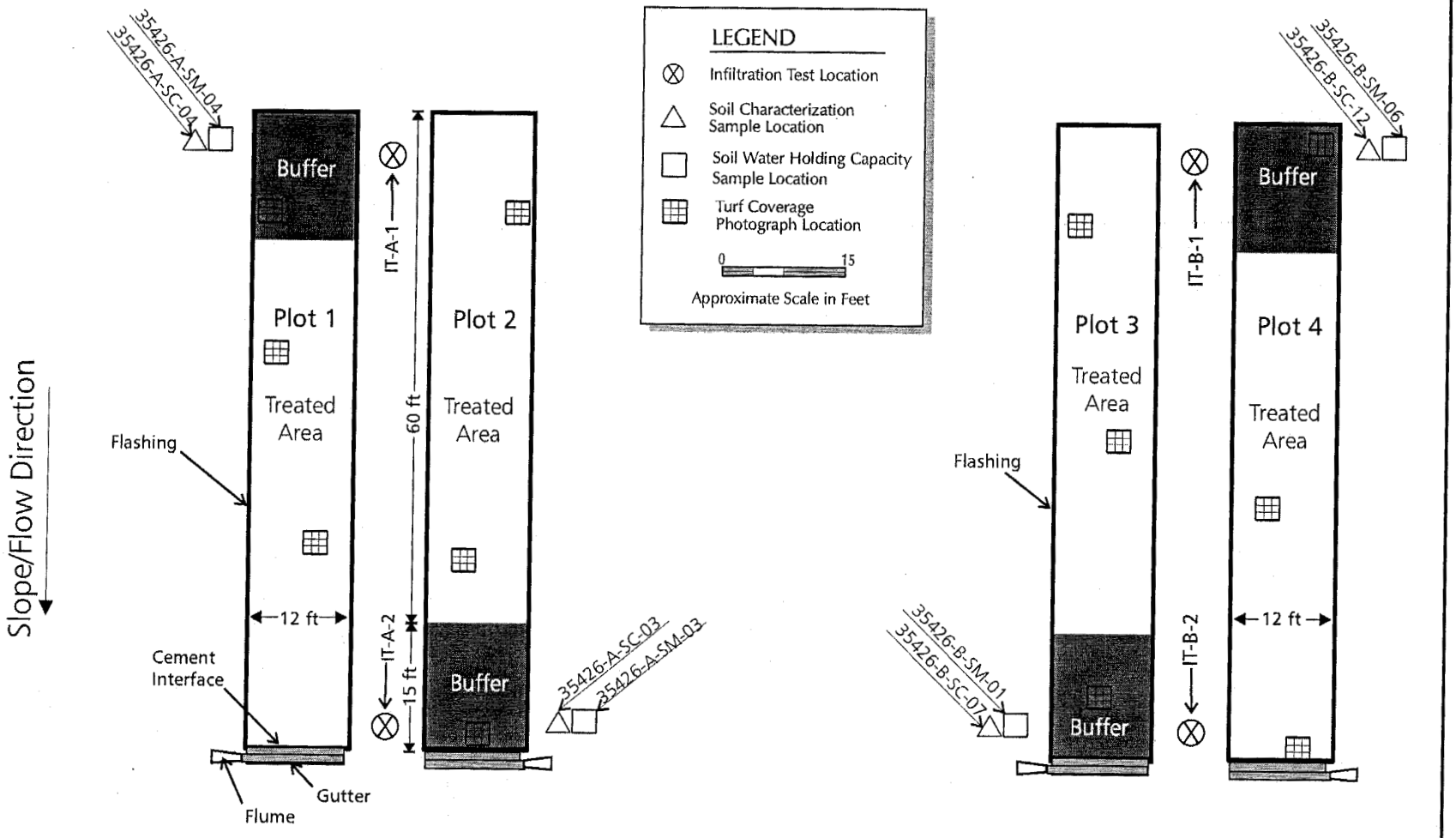

FIGURE 5: SITE CHARACTERIZATION PLAN
Effect of Vegetative Buffer Strips on Fipronil Runoff Losses from Tall Fescue Turf Under Simulated Rainfall
Bear Creek, North Carolina

Source: SEI Field Notes
O:\Proj-01\1254-F-FipRO\Reports\Figures\SiteChar.cdr
Date/Initials: 1/30/04 DCB; rev. 2/29/04 DCB

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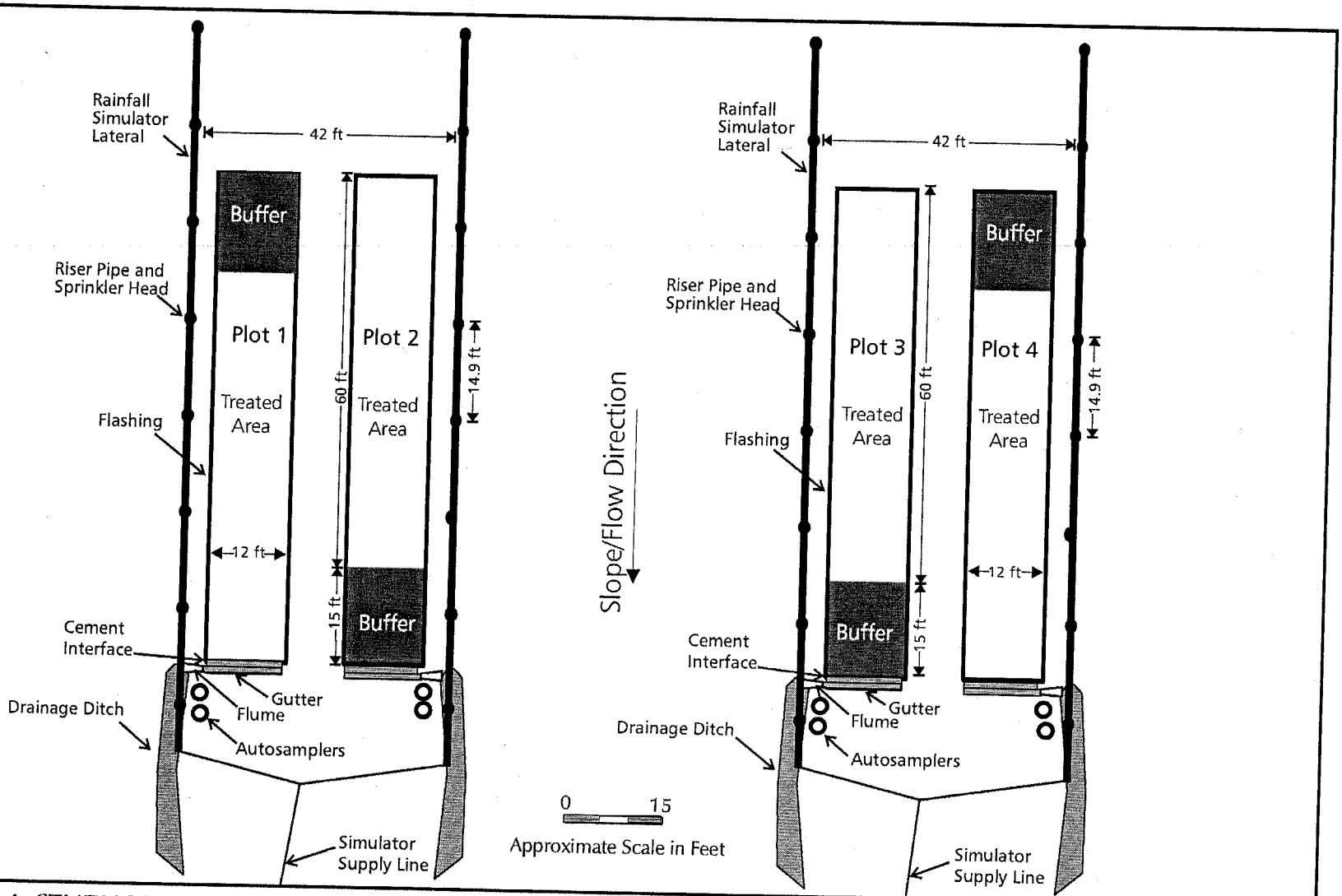

FIGURE 4: STUDY SITE PLAN
Effect of Vegetative Buffer Strips on Fipronil Runoff Losses from Tall Fescue Turf Under Simulated Rainfall
Bear Creek, North Carolina

Source: SEI Field Notes
O:\Proj-01\1254-F-FipRO\Reports\Figures\siteplan.cdr
Date/Initials: 12-23-03 mnd; rev. 1/29/04 DCB

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TABLE 13
Total Suspended Solids in Time-Paced Runoff Samples
December 11, 2001 Event

Plot	Sample ID	Runoff Duration[1] (minutes)	Interval Flow[2] (L)	TSS[3] (ppm)
Plot 4				
	35426-4-TS-01	6	69.9	94
	35426-4-TS-02	15	155.3	62
	35426-4-TS-03	24	190.0	52
	35426-4-TS-04	33	209.8	40
	35426-4-TS-05	42	223.0	34
	35426-4-TS-06	51	240.5	28
	35426-4-TS-07	60	252.8	34
	35426-4-TS-08	69	258.2	38
	35426-4-TS-09	78	263.9	28
	35426-4-TS-10	87	230.5	8
	35426-4-TS-11	96	71.5	6
	max			94
	mean			39
Plot 3				
	35426-3-TS-01	6	8.5	92
	35426-3-TS-02	15	13.4	64
	35426-3-TS-03	24	14.5	74
	35426-3-TS-04	33	24.6	70
	35426-3-TS-05	42	102.7	70
	35426-3-TS-06	51	160.8	52
	35426-3-TS-07	60	190.3	38
	35426-3-TS-08	69	216.4	36
	35426-3-TS-09	78	232.7	46
	35426-3-TS-10	87	242.8	38
	35426-3-TS-11	96	258.8	24
	35426-3-TS-12	105	264.5	30
	35426-3-TS-13	114	235.0	18
	35426-3-TS-14	123	77.0	24
	max			92
	mean			48

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Source: Agvise Laboratories Water Characterization Report, 12/27/01

Notes: 1. Elapsed time since first observation of runoff from plot

2. Interval runoff flow (L) =current cumulative flow (L) - cumulative flow (L) of previous sample

3. TSS = Total Suspended Solids (parts per million)

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Date/Initials: 3/2/02 DCB; 1/25/04 DCB

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TABLE 14
Total Suspended Solids in Time-Paced Runoff Samples
December 12, 2001 Event

Plot	Sample ID	Runoff Duration[1] (minutes)	Interval Flow[2] (L)	TSS[3] (ppm)
Plot 1				
	35426-1-TS-01	6	8.6	94
	35426-1-TS-02	15	91.8	50
	35426-1-TS-03	24	166.1	40
	35426-1-TS-04	33	194.5	50
	35426-1-TS-05	42	212.4	32
	35426-1-TS-06	51	227.2	24
	35426-1-TS-07	60	240.0	34
	35426-1-TS-08	69	242.1	20
	35426-1-TS-09	78	245.0	16
	35426-1-TS-10	87	241.7	26
	35426-1-TS-11	96	241.5	22
	35426-1-TS-12	105	191.9	6
	35426-1-TS-13	114	41.8	10
	max			94
	mean			33
Plot 2				
	35426-2-TS-01	6	30.1	82
	35426-2-TS-02	15	95.5	72
	35426-2-TS-03	24	166.3	46
	35426-2-TS-04	33	195.4	42
	35426-2-TS-05	42	217.9	28
	35426-2-TS-06	51	232.0	32
	35426-2-TS-07	60	243.0	36
	35426-2-TS-08	69	253.3	28
	35426-2-TS-09	78	257.5	30
	35426-2-TS-10	87	264.7	24
	35426-2-TS-11	96	127.9	14
	35426-2-TS-12	105	36.4	60
	max			82
	mean			41

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Source: Agvise Laboratories Water Characterization Report, 12/26/01

Notes: 1. Elapsed time since first observation of runoff from plot

2. Interval runoff flow (L) =current cumulative flow (L) - cumulative flow (L) of previous sample

3. TSS = Total Suspended Solids (parts per million)

Path: O:\Proj-01\1254-F-FipRO\Reports\Tables\CollectedTables.xls~TSS_TP_Dec12

Date/Initials: 3/2/02 DCB; rev. 1/25/04 DCB

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TABLE 15
Total Suspended Solids in Flow Proportional Runoff Samples

December 11, 2001 Simulated Rainfall Event

Plot 4		Plot 3	
Sample ID	TSS (ppm)[1]	Sample ID	TSS (ppm)[1]
35426-4-QS-01	30	35426-3-QS-01	40
35426-4-QS-02	46	35426-3-QS-02	50
35426-4-QS-03	42	35426-3-QS-03	28
35426-4-QS-04	50	35426-3-QS-04	44
35426-4-QS-05	50	35426-3-QS-05	40
mean	44	*mean*	40
standard deviation	8.3	*standard deviation*	8.0

December 12, 2001 Simulated Rainfall Event

Plot 1		Plot 2	
Sample ID	TSS (ppm)[1]	Sample ID	TSS (ppm)[1]
35426-1-QS-01	46	35426-2-QS-01	36
35426-1-QS-02	38	35426-2-QS-02	38
35426-1-QS-03	32	35426-2-QS-03	38
35426-1-QS-04	32	35426-2-QS-04	36
35426-1-QS-05	46	35426-2-QS-05	36
mean	39	*mean*	37
standard deviation	7.0	*standard deviation*	1.1

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Source: Agvise Laboratories Water Characterization Reports, 12/26/01 & 12/27/01

Notes: 1. TSS = Total Suspended Solids (parts per million)

Path: O:\Proj-01\1254-F-FipRO\Reports\Tables\CollectedTables.xls~TSS_QP

Date/Initials: 3/2/02 DCB; rev. 1/25/04 DCB

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TABLE 17
Fipronil and Metabolite Residues in Time-Paced Runoff Samples Following Application of Liquid Formulation to Plots 3 and 4

Plot	Buffer Position	Sample ID	Runoff Duration[1] (minutes)	Interval Flow[2] (L)	Residue Concentration (ppb) Fipronil	MB46513	MB45950	MB46136	Total[3]
4	Top								
		35426-4-TR-1	6	69.9	1.667	0.014	0.010	0.039	1.731
		35426-4-TR-2	15	155.3	1.749	0.012	(0.009)	0.036	1.807
		35426-4-TR-3	24	190.0	1.608	0.011	(0.009)	0.033	1.662
		35426-4-TR-4	33	209.8	1.433	(0.009)	(0.006)	0.029	1.478
		35426-4-TR-5	42	223.0	1.349	(0.007)	(0.006)	0.026	1.390
		35426-4-TR-6	51	240.5	1.230	(0.008)	(0.005)	0.026	1.270
		35426-4-TR-7	60	252.8	1.134	(0.007)	(0.004)	0.024	1.169
		35426-4-TR-8	69	258.2	1.051	(0.007)	(0.004)	0.022	1.084
		35426-4-TR-9	78	263.9	0.985	(0.005)	(0.004)	0.020	1.015
		35426-4-TR-10	87	230.5	0.816	ND	ND	0.017	0.837
		35426-4-TR-11	96	71.5	0.887	(0.005)	ND	0.014	0.908
		max			1.749	0.014	0.010	0.039	1.807
		mean			1.265	(0.008)	(0.006)	0.026	1.305
3	Bottom								
		35426-3-TR-1	6	8.5	(0.006)	ND	ND	(0.004)	0.014
		35426-3-TR-2	15	13.4	(0.006)	ND	ND	ND	0.012
		35426-3-TR-3	24	14.5	(0.007)	ND	ND	ND	0.014
		35426-3-TR-4	33	24.6	0.021	ND	ND	ND	0.027
		35426-3-TR-5	42	102.7	0.430	(0.006)	(0.008)	0.011	0.456
		35426-3-TR-6	51	160.8	0.834	ND	ND	(0.008)	0.846
		35426-3-TR-7	60	190.3	0.976	(0.005)	ND	0.012	0.995
		35426-3-TR-8	69	216.4	0.977	(0.004)	ND	0.013	0.997
		35426-3-TR-9	78	232.7	0.980	(0.005)	ND	0.013	1.000
		35426-3-TR-10	87	242.8	0.957	(0.004)	ND	0.014	0.977
		35426-3-TR-11	96	258.8	0.931	(0.006)	(0.005)	0.015	0.958
		35426-3-TR-12	105	264.5	0.902	(0.009)	(0.008)	0.019	0.938
		35426-3-TR-13	114	235.0	0.869	(0.004)	ND	0.013	0.889
		35426-3-TR-14	123	77.0	0.835	ND	ND	0.011	0.849
		max			0.980	(0.009)	(0.008)	0.019	1.000
		mean			0.624	(0.004)	ND	0.010	0.641

Source: Bayer CropScience analytical data, January 29, 2004 STONE ENVIRONMENTAL, INC.

Abbreviations: ppb = parts per billion; ND = none detected

Notes: Method Detection Limit (MDL) = 0.004 ppb; Limit of Quantitation (LOQ) = 0.010 ppb

Values in parentheses are greater than or equal to the MDL and less than the LOQ

1. Elapsed time since first observation of runoff from plot
2. Interval runoff flow (L) =current cumulative flow (L) - cumulative flow (L) at previous sample
3. Calculated in parent equivalents as follows: Total (ppb) = A + (B*C1) + (D*C2) + (E*C3), where:
   A = fipronil (ppb), B = MB46513 (ppb), D = MB45950 (ppb), E = MB46136 (ppb),
   C1 = molecular wt. of fipronil (437.1 g/mole)/molecular wt. of MB46513 (389.02 g/mole),
   C2 = molecular wt. of fipronil (437.1 g/mole)/molecular wt. of MB45950 (421.16 g/mole),
   C3 = molecular wt. of fipronil (437.1 g/mole)/molecular wt. of MB46136 (453.1 g/mole)
   For analytes with ND residues, a value of ½ the MDL was assumed in the Total Residue calculations

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Date/Initials: 3/2/02 DCB; 2/29/04 DCB

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TABLE 18
Fipronil and Metabolite Residues in Time-Paced Runoff Samples Following Application of CHIPCO® TopChoice™ to Plots 1 and 2

Plot	Buffer Position	Sample ID	Runoff Duration[1] (minutes)	Interval Flow[2] (L)	Residue Concentration (ppb) Fipronil	MB46513	MB45950	MB46136	Total[3]
1	Top								
		35426-1-TR-1	6	8.6	0.957	(0.005)	0.011	0.021	0.994
		35426-1-TR-2	15	91.8	1.981	(0.008)	0.010	0.032	2.032
		35426-1-TR-3	24	166.1	2.091	ND	(0.008)	0.030	2.130
		35426-1-TR-4	33	194.5	2.047	ND	0.012	0.033	2.094
		35426-1-TR-5	42	212.4	1.932	ND	(0.009)	0.028	1.971
		35426-1-TR-6	51	227.2	1.869	ND	(0.007)	0.027	1.905
		35426-1-TR-7	60	240.0	1.765	ND	0.010	0.026	1.803
		35426-1-TR-8	69	242.1	1.728	ND	(0.008)	0.027	1.765
		35426-1-TR-9	78	245.0	1.536	ND	(0.008)	0.024	1.570
		35426-1-TR-10	87	241.7	1.654	ND	(0.009)	0.024	1.690
		35426-1-TR-11	96	241.5	1.689	ND	(0.009)	0.025	1.725
		35426-1-TR-12	105	191.9	1.516	ND	(0.008)	0.022	1.547
		35426-1-TR-13	114	41.8	1.793	ND	(0.008)	0.025	1.828
		max			2.091	(0.008)	0.012	0.033	2.130
		mean			1.735	ND	(0.009)	0.027	1.773
2	Bottom								
		35426-2-TR-1	6	30.1	0.025	(0.007)	(0.008)	(0.004)	0.045
		35426-2-TR-2	15	95.5	0.211	ND	ND	ND	0.217
		35426-2-TR-3	24	166.3	0.828	ND	ND	(0.006)	0.838
		35426-2-TR-4	33	195.4	1.121	ND	ND	0.031	1.156
		35426-2-TR-5	42	217.9	1.221	ND	ND	(0.008)	1.233
		35426-2-TR-6	51	232.0	1.284	ND	ND	0.011	1.299
		35426-2-TR-7	60	243.0	1.298	ND	ND	0.012	1.314
		35426-2-TR-8	69	253.3	1.263	ND	(0.006)	0.012	1.282
		35426-2-TR-9	78	257.5	1.315	ND	(0.008)	0.015	1.340
		35426-2-TR-10	87	264.7	1.192	ND	(0.004)	0.010	1.208
		35426-2-TR-11	96	127.9	1.244	ND	ND	0.013	1.261
		35426-2-TR-12	105	36.4	0.866	ND	ND	(0.008)	0.877
		max			1.315	(0.007)	(0.008)	0.031	1.340
		mean			0.989	ND	ND	0.011	1.006

Source: Bayer CropScience analytical data, January 29, 2004 STONE ENVIRONMENTAL, INC.

Abbreviations: ppb = parts per billion; ND = none detected

Notes: Method Detection Limit (MDL) = 0.004 ppb; Limit of Quantitation (LOQ) = 0.010 ppb

Values in parentheses are greater than or equal to the MDL and less than the LOQ

1. Elapsed time since first observation of runoff from plot
2. Interval runoff flow (L) =current cumulative flow (L) - cumulative flow (L) at previous sample
3. Calculated in parent equivalents as follows: Total (ppb) = A + (B*C1) + (D*C2) + (E*C3), where:
   A = fipronil (ppb), B = MB46513 (ppb), D = MB45950 (ppb), E = MB46136 (ppb),
   C1 = molecular wt. of fipronil (437.1 g/mole)/molecular wt. of MB46513 (389.02 g/mole),
   C2 = molecular wt. of fipronil (437.1 g/mole)/molecular wt. of MB45950 (421.16 g/mole),
   C3 = molecular wt. of fipronil (437.1 g/mole)/molecular wt. of MB46136 (453.1 g/mole)
   For analytes with ND residues, a value of ½ the MDL was assumed in the Total Residue calculations

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TABLE 19
Fipronil and Metabolite Residues in Flow Proportional Runoff Samples

Plot	Buffer Position	Sample ID	Residue Concentration (ppb)				
			Fipronil	MB46513	MB45950	MB46136	Total[1]
			Liquid Formulation				
4	Top	35426-4-QR-1	1.306	0.014	0.012	0.035	1.367
		35426-4-QR-2	1.318	0.015	0.015	0.037	1.387
		35426-4-QR-3	1.291	0.015	0.016	0.035	1.359
		35426-4-QR-4	1.290	0.017	0.017	0.039	1.365
		35426-4-QR-5	1.320	0.014	0.012	0.035	1.381
		mean	1.305	0.015	0.014	0.036	1.372
		standard deviation	0.014	0.001	0.001	0.001	0.012
3	Bottom	35426-3-QR-1	0.890	ND	ND	0.011	0.905
		35426-3-QR-2	0.877	ND	ND	0.011	0.892
		35426-3-QR-3	0.890	ND	ND	0.011	0.905
		35426-3-QR-4	0.886	ND	ND	0.011	0.902
		35426-3-QR-5	0.909	ND	ND	0.011	0.923
		mean	0.890	ND	ND	0.011	0.905
		standard deviation	0.011	ND	ND	0.000	0.011
			CHIPCO® TopChoice™				
1	Top	35426-1-QR-1	1.816	ND	(0.008)	0.028	1.853
		35426-1-QR-2	1.835	ND	(0.008)	0.028	1.873
		35426-1-QR-3	1.880	ND	0.010	0.028	1.919
		35426-1-QR-4	1.768	ND	(0.007)	0.026	1.802
		35426-1-QR-5	1.892	ND	(0.008)	0.027	1.928
		mean	1.838	ND	(0.008)	0.027	1.875
		standard deviation	0.050	ND	0.001	0.001	0.051
2	Bottom	35426-2-QR-1	1.167	ND	ND	(0.007)	1.178
		35426-2-QR-2	1.134	ND	ND	(0.007)	1.145
		35426-2-QR-3	1.166	ND	ND	0.010	1.180
		35426-2-QR-4	1.097	ND	ND	(0.009)	1.110
		35426-2-QR-5	1.127	ND	ND	0.010	1.142
		mean	1.138	ND	ND	(0.009)	1.151
		standard deviation	0.029	ND	ND	0.001	0.029

Source: Bayer CropScience analytical data, January 29, 2004 — STONE ENVIRONMENTAL, INC.

Abbreviations: ppb = parts per billion; ND = none detected

Notes: Method Detection Limit (MDL) = 0.004 ppb; Limit of Quantitation (LOQ) = 0.010 ppb

Values in parentheses are greater than or equal to the MDL and less than the LOQ

1. Calculated in parent equivalents as follows: Total (ppb) = A + (B*C1) + (D*C2) + (E*C3), where:
A = fipronil (ppb), B = MB46513 (ppb), D = MB45950 (ppb), E = MB46136 (ppb),
C1 = molecular wt. of fipronil (437.1 g/mole)/molecular wt. of MB46513 (389.02 g/mole),
C2 = molecular wt. of fipronil (437.1 g/mole)/molecular wt. of MB45950 (421.16 g/mole),
C3 = molecular wt. of fipronil (437.1 g/mole)/molecular wt. of MB46136 (453.1 g/mole)
For analytes with ND residues, a value of ½ the MDL was assumed in the Total Residue calculations

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TABLE 20
Fipronil Concentration and Yield Calculated From Time-Paced and Flow Proportional Samples

Product Formulation	Plot	Buffer Position	Mean Fipronil Concentration[1] (ppb)	Maximum Fipronil Concentration[2] (ppb)	Cumulative Fipronil Export: Time-Paced Method[3] (mg)	Cumulative Fipronil Export: Flow Proportional Method[4] (mg)	Cumulative Fipronil Export: Method Average (mg)	Percent of Applied Fipronil[5]
Liquid Formulation								
	4	Top	1.305	1.749	2.7	2.8	2.7	2.9
	3	Bottom	0.890	0.980	1.8	1.8	1.8	1.9
	Percent difference between top buffer and bottom buffer plot[6]							
			32%	44%	33%	36%	34%	34%
CHIPCO® TopChoice™								
	1	Top	1.838	2.091	4.2	4.3	4.2	4.5
	2	Bottom	1.138	1.315	2.4	2.4	2.4	2.6
	Percent difference between top buffer and bottom buffer plots[6]							
			38%	37%	42%	44%	43%	43%

STONE ENVIRONMENTAL, INC.

Sources: Stone Environmental, Inc. field data sheets and electronic flow data, 12/11/01 and 12/12/01; Bayer CropScience analytical data, 1/29/04

Notes: 1. Calculated as the mean of the fipronil concentrations of the flow proportional composite subsamples

2. The maximum fipronil concentration for each plot is the maximum among the time-paced sample data

3. Calculated as the sum of the products of time-paced sample concentration multiplied by cumulative flow for the interval preceding collection of the sample

4. Calculated as the product of the mean fipronil concentration in the flow proportional subsamples and total runoff volume

5. Calculated as: 100 x cumulative fipronil export ("Method Average")/(mass active ingredient applied/plot). Calculation assumes target application rate (5.64 g a.i./A or 93.3 mg a.i./plot) on treated area of 720 square feet

6. Percent difference calculated as: 100 x (Plot 4 value - Plot 3 value)/Plot 4 value or 100 x (Plot 1 value - Plot 2 value)/Plot 1 value

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TABLE 21

Total Fipronil Residue Concentration and Yield Calculated From Time-Paced and Flow Proportional Samples

Product Formulation	Plot	Buffer Position	Mean Total Fipronil Residue Concentration[1] (ppb)	Maximum Total Fipronil Residue Concentration[2] (ppb)	Cumulative Total Fipronil Residue Export: Time-Paced Method[3] (mg)	Flow Proportional Method[4] (mg)	Method Average (mg)	Percent of Applied Fipronil[5]
Liquid Formulation								
	4	Top	1.372	1.807	2.7	3.0	2.9	3.1
	3	Bottom	0.905	1.000	1.8	1.8	1.8	2.0
	Percent difference between top buffer and bottom buffer plot[6]		34%	45%	33%	38%	36%	36%
CHIPCO® TopChoice™								
	1	Top	1.875	2.130	4.3	4.4	4.3	4.6
	2	Bottom	1.151	1.340	2.5	2.4	2.4	2.6
	Percent difference between top buffer and bottom buffer plots[6]		39%	37%	42%	44%	43%	43%

STONE ENVIRONMENTAL, INC.

Sources: Stone Environmental, Inc. field data sheets and electronic flow data, 12/11/01 and 12/12/01; Bayer CropScience analytical data, 1/29/04

Notes: 1. Calculated as the mean of the total fipronil residue concentrations of the flow proportional composite subsamples

2. The maximum total fipronil residue concentration for each plot is the maximum among the time-paced sample data

3. Calculated as the sum of the products of time-paced sample concentration multiplied by cumulative flow for the interval preceding collection of the sample

4. Calculated as the product of the mean total fipronil residue concentration in the flow proportional subsamples and total runoff volume

5. Calculated as: 100 x cumulative total fipronil residue export ("Method Average")/(mass active ingredient applied/plot). Calculation assumes target application rate (5.64 g a.i./A or 93.3 mg a.i./plot) on treated area of 720 square feet

6. Percent difference calculated as: 100 x (Plot 4 value - Plot 3 value)/Plot 4 value or 100 x (Plot 1 value - Plot 2 value)/Plot 1 value

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