Monitoring Groundwater Concentrations of Pesticides in Sensitive Areas with High Agricultural Use
Study 228 - Well Network Sampling - Annual Update 2023

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INTRODUCTION

This update summarizes the annual results of pesticide concentrations detected in a network of primarily domestic wells monitored for more than 20 years throughout California's San Joaquin Valley. The Well Network is located throughout Fresno and Tulare counties, in areas vulnerable to groundwater contamination and high agricultural use of pesticides based on historical monitoring (Well Inventory Database) and reported pesticide use (Pesticide Use Reporting) data. In 2023, the California Department of Pesticide Regulation's (DPR) Groundwater Protection Program (GWPP) analyzed groundwater samples from 61 wells for pesticide residues using the Triazine Screen and the Multi-Analyte Screen. Eight wells were also analyzed for pesticides with the Aminopyralid Screen in areas with higher use reported of the active ingredient.

Background

In 1999, DPR initiated the Well Network Study to monitor potential changes in groundwater pesticide concentrations due to new regulations with enforceable management practices designed to minimize pesticide movement to groundwater (Garretson, 1999; Davalos, 2021). When this study was initiated, the selected wells had been previously sampled by DPR and had residues of simazine, bromacil, or diuron. Wells in the Well Network continued to be sampled for at least some triazine pesticides annually. Due to the vulnerability of the study area, the Well Network has also served as an experimental area to monitor for additional pesticides that have the potential to contaminate groundwater.

Troiano et al. (2013) reported a statistical analysis of data collected from 2000 to 2012 in the Well Network, along with a full description of this study, including characterization of the conditions of the vulnerable areas, pesticide use, and the required mitigation measures. Annual summaries of study results have been reported since 2008. More recently, the annual summaries have included a trend analysis of changing pesticide and pesticide degradate residue concentrations since either 1999 or the first year an analyte was sampled for. The analysis in Troiano et al. (2013) and the tables included in the annual summaries suggest that DPR's regulatory actions have resulted in measurable decreases in both

detection frequencies and well water concentrations for many regulated pesticides (Davalos, 2021; Garretson, 1999; Troiano et al., 2013).

This summary of the 2023 Well Network monitoring presents the data in the following order:

- Sampling locations: Figure 1, Table 1, and Table 2
- Pesticides and degradates analyzed: Table 3 through Table 6
- Monitoring results: Table 7 through Table 12
- Historical data: Table 13 through Table 15
- QA/QC results: Table 16 through Table 17

GWPP scientists would like to express their gratitude to the volunteers who have generously allowed us to sample their wells for over 20 years. Their participation has been crucial for monitoring emerging groundwater pesticide contaminants and establishing trends—work that could not have been accomplished without their participation.

METHODS

Sampling Methods

DPR's GWPP scientists conducted the study according to the protocol (Davalos, 2021) and followed the standard operating procedures (SOPs) for collecting samples (Kocis, 2022). Sampling occurred between May 23, 2023, and June 20, 2023.

Study Area

The Well Network's well locations are in areas susceptible to pesticide movement to groundwater within Fresno and Tulare counties (Figure 1, Table 1, and Table 2). Areas vulnerable to groundwater contamination from agricultural use of pesticides are characterized by coarse soils that are susceptible to pesticides leaching through the soil into groundwater or by hardpan soils vulnerable to pesticide runoff into sensitive areas with conduits to groundwater. To regulate pesticide use in vulnerable soil areas of California, DPR designated certain one-square-mile sections of land that were determined to be sensitive to the movement of pesticides to groundwater as Groundwater Protection Areas (GWPAs). In GWPAs, pesticides and their degradates listed in California Code of Regulations, Title 3, Section 6800(a) are regulated to mitigate their movement to groundwater. Three types of GWPAs are designated: leaching, runoff, and combined leaching/runoff. The GWPAs surrounding the Well Network are shown in Figure 1. GWPAs, sections, vulnerability and regulations are described in the 2024 annual well sampling report, Sampling for Pesticide Residues in California Well Water.

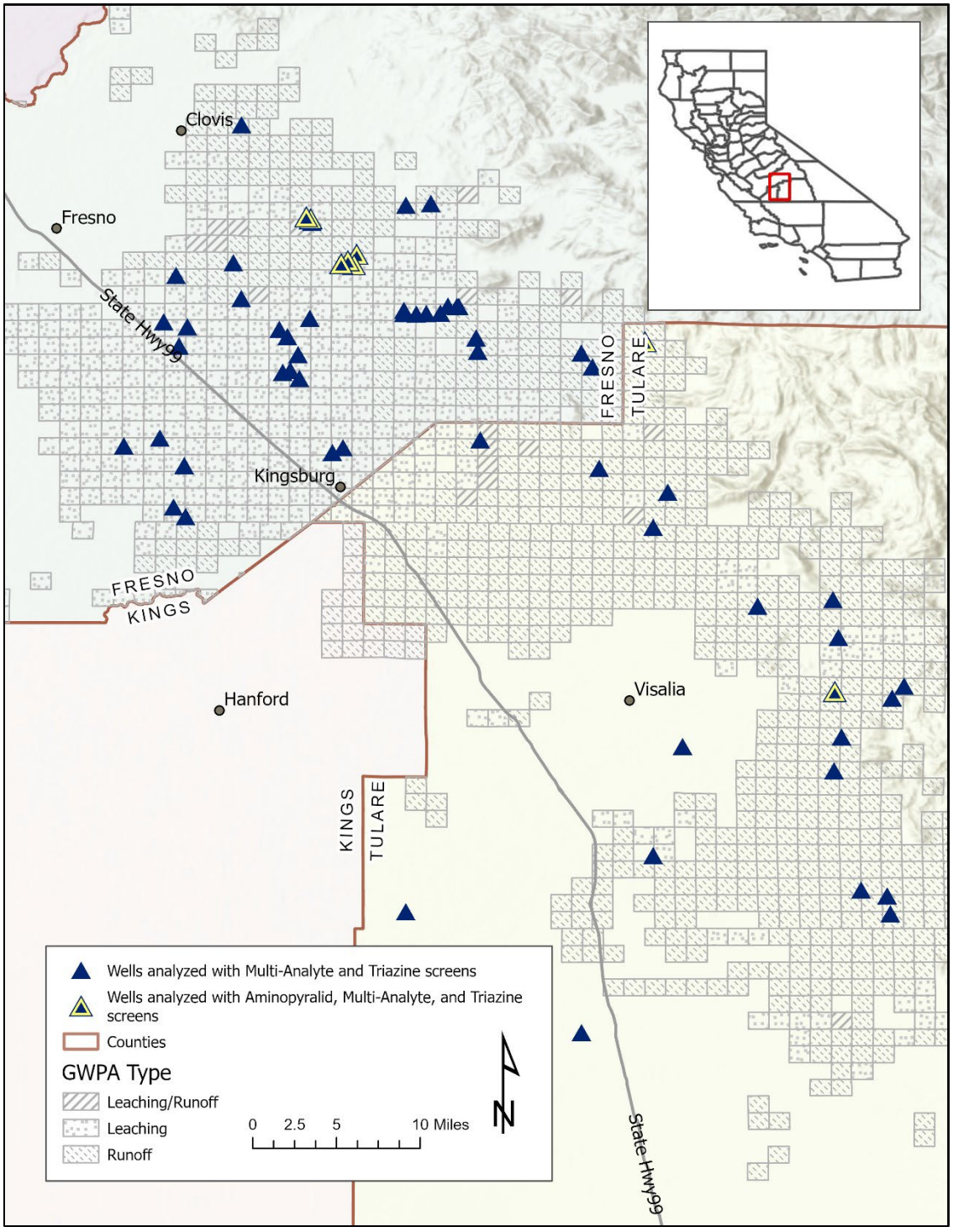

Figure 1. Location of the Well Network wells in Fresno and Tulare counties overlaying Groundwater Protection Areas (GWPAs).

Wells Sampled

Sixty-one wells (Table 1 and Table 2) in the Well Network were sampled in 2023. Four wells were added to the Well Network in 2023; all four wells are located outside currently existing GWPAs. Not all wells in

the Well Network are sampled every year due to changes in participation, wells going dry, and new wells being drilled to replace decommissioned wells. For this reason, well numbers used by DPR to differentiate sampling locations are not consecutive.

Table 1. Well locations in Fresno County.

Well Number	Township/Range-Section
1	13S/21E-01
2*	13S/22E-33
3	13S/23E-28
4	13S/23E-32
5	14S/21E-13
7	14S/21E-21
8	14S/21E-25
12	14S/22E-03
13*	14S/22E-12
14*	14S/22E-13
15*	14S/22E-14
16*	14S/22E-14
19	14S/23E-34
20	14S/23E-32
20B	14S/23E-32
21	14S/23E-33
22	14S/23E-34
23B	14S/23E-35
24	15S/21E-03
25	15S/21E-05
26	15S/21E-09
30A	15S/22E-05
32	15S/22E-09
35	15S/22E-16
36	15S/22E-20
37	15S/22E-21
44A	15S/23E-02
45	15S/23E-12
47	15S/24E-14
50	16S/21E-14
51	16S/21E-07
52	16S/21E-16
53A	16S/21E-33
54	16S/21E-34
56	16S/22E-11
57	16S/22E-11
89*	13S/22E-33
90	15S/22E-05
92	14S/23E-33
94	15S/24E-10
95	14S/22E-33

Table 2. Well locations in Tulare County.

Well Number	Township/Range-Section
49*	15S/25E-05
58	16S/23E-01
59A	16S/24E-14
61	16S/25E-21
63A	17S/25E-05
65	17S/26E-26
68	18S/26E-02
71*	18S/26E-23
72	18S/27E-21
73	18S/27E-29
74	19S/26E-01
75A	19S/26E-14
80	20S/26E-24
84	20S/27E-20
86	20S/27E-32
96	17S/26E-30
100†	22S/24E-02
101†	20S/23E-28
102†	19S/25E-10
103†	20S/25E-08

*Wells analyzed with the Aminopyralid Screen
†Wells added to the Well Network in 2023 and located outside existing GWPAs

Analytical Methods

The California Department of Food and Agriculture's Center for Analytical Chemistry (CDFA Laboratory) analyzed samples using the Triazine Screen analytical method EMON-SM-62.9, revision 6 (CDFA, 2023a), the Multi-Analyte Screen analytical method EMON-SM-05-032, revision 3 (CDFA, 2023b), and eight well samples with the Aminopyralid Screen analytical method EM-SM-05-053, revision 0 (CDFA, 2022). These methods are highly specific and have been determined by DPR to provide unequivocal identification of the chemicals analyzed (Aggarwal, 2023a; 2023b; 2023c). The reporting limit (RL) for each analyte ranged from 0.01 parts per billion (ppb) to 0.05 ppb (Table 3 through Table 6). The Aminopyralid Screen includes one analyte analyzed by Liquid Chromatography Mass Spectroscopy (LC-MS/MS) (Table 3), the Triazine Screen includes 15 analytes analyzed by LC-MS/MS (Table 4), and the Multi-Analyte Screen includes 16 analytes by Gas Chromatography Mass Spectrometry (GC-MS/MS) and 41 analytes by LC-MS/MS (Table 5 and Table 6).

In 2023, groundwater samples from 61 wells were analyzed using the Triazine and Multi-Analyte Screens. A subset of eight wells were located in areas of high aminopyralid use. Samples from this subset of wells were also analyzed for pesticide residues on the Aminopyralid Screen.

Table 3. Aminopyralid Screen method detection limit (MDL) and RL in ppb (µg/L) (EM-SM-05-053 Rev. 0, CDFA, 2022).

Analyte	MDL	RL
Aminopyralid	0.0169	0.05

Table 4. Triazine Screen MDLs and RLs in ppb (µg/L) (EMON-SM-62.9 Rev.6, CDFA, 2023a).

Analyte	MDL	RL
ACET*	0.00185	0.02
Atrazine	0.00243	0.02
Bromacil	0.00223	0.02
Clothianidin	0.00139	0.02
DACT*	0.00209	0.02
DEA*	0.00141	0.02
Diuron	0.00169	0.02
DSMN*	0.00283	0.01
Hexazinone	0.00174	0.01
Metribuzin	0.00316	0.02
Norflurazon	0.00232	0.02
Prometon	0.00245	0.02
Prometryn	0.00251	0.02
Simazine	0.00267	0.02
Tebuthiuron	0.00182	0.02

*Acronyms are ACET = deethyl-simazine or deisopropyl-atrazine (degradate of atrazine and simazine), DACT = diaminochlorotriazine (degradate of simazine), DEA = deethyl-atrazine (degradate of atrazine), DSMN = desmethylnorflurazon (degradate of norflurazon).

Table 5. Multi-Analyte Screen MDLs and RLs in ppb (µg/L) by GC-MS/MS (EMON-SM-05-032 Rev. 3, CDFA, 2023b).

Analyte	MDL	RL
Benfluralin	0.00400	0.05
Clomazone	0.00600	0.05
Dichloran	0.00500	0.05
Dichlobenil	0.00500	0.03
Disulfoton	0.00600	0.05
EPTC*	0.00300	0.05
Ethoprophos	0.00400	0.03
Fonofos	0.00600	0.03
Malathion	0.00600	0.03
Parathion ethyl	0.00600	0.03
Parathion methyl	0.00400	0.03
Phorate	0.00400	0.03
Piperonyl butoxide	0.00400	0.03
Prometryn	0.00600	0.03
Propanil	0.00600	0.05
Triallate	0.00500	0.03

*EPTC = S-ethyl dispropylthiocarbamate.

Table 6. Multi-Analyte Screen MDLs and RLs in ppb (µg/L) by LC-MS/MS (EMON-SM-05-032 Rev. 3, CDFA, 2023b).

Analyte	MDL	RL
AIBA*	0.00700	0.02
Alachlor	0.00100	0.03
Atrazine	0.00300	0.02
Azinphos-methyl	0.00600	0.05
Azoxystrobin	0.00200	0.02
Bensulide	0.00300	0.02
Bromacil	0.00400	0.02
Carbaryl	0.00300	0.02
Carbofuran	0.00100	0.02
Chlorantraniliprole	0.00200	0.02
Cyprodinil	0.00200	0.02
Diazinon	0.00200	0.03
Dimethenamid	0.00300	0.02
Dimethoate	0.00500	0.02
Diuron	0.00200	0.02
Ethofumesate	0.00400	0.03
Fenamiphos	0.00200	0.03
Fludioxonil	0.00400	0.03
Flupyradifurone	0.00400	0.02
Flutriafol	0.00200	0.02
Imidacloprid	0.00300	0.02
Isoxaben	0.00200	0.02
Linuron	0.00200	0.02
Mefenoxam/metalaxyl*	0.00200	0.02
Methiocarb	0.00300	0.02
Metolachlor	0.00300	0.02
Methomyl	0.00500	0.02
Methoxyfenozide	0.00300	0.03
Metribuzin	0.00200	0.02
Myclobutanil	0.00400	0.02
Napropamide	0.00200	0.02
Norflurazon	0.00200	0.02
Oryzalin	0.00500	0.05
Prometon	0.00300	0.02
Propiconazole	0.00200	0.02
Pyraclostrobin	0.00200	0.02
Simazine	0.00300	0.02
Tebuthiuron	0.00200	0.02
Thiamethoxam	0.00600	0.02
Thiobencarb	0.00200	0.02
Uniconazole	0.00400	0.05

*AIBA=2-amino-N-isopropyl benzamide, mefenoxam and metalaxyl are indistinguishable stereoisomers.

RESULTS

Results in Table 7 through Table 12 have been entered into DPR's Well Inventory Database (DPR, 2025).

Aminopyralid Screen

The monitoring results for the eight wells sampled for the Aminopyralid Screen are shown in Table 7. This subset of wells was selected due to their location in high-use areas. No residues of aminopyralid were detected in the eight wells sampled.

Triazine Screen

The monitoring results for the 61 wells sampled for Triazine Screen analytes are shown in Table 8 and Table 9. Of these, 26 wells were in leaching GWPAs, 30 in runoff GWPAs, 1 in a combined leaching/ runoff GWPA, and 4 were not in a GWPA. Almost all wells (59 out of 61) had detections of one or more pesticides or degradates on the Triazine Screen in the samples collected and analyzed. Excluding metribuzin and prometryn, each analyte on the screen was detected in at least one well. All detected analytes, except hexazinone, are 6800(a) pesticides or degradates on the Groundwater Protection List and are regulated in GWPAs. All four wells added to the Well Network in 2023 are located outside existing GWPAs and had detections of 6800(a) pesticides or degradates. These detections will be evaluated separately by DPR. Hexazinone was determined not to pollute at concentrations detected by DPR (Reardon, 2011).

In 2023, the Triazine Screen method was updated to include clothianidin, a neonicotinoid insecticide. As a result, clothianidin was detected in groundwater for the first time within the Well Network. These detections prompted DPR to initiate a study to conduct statewide sampling in high use areas and assess the extent of its presence (Henda and Hawkins, 2024). Additionally, the reporting limits for ACET, DACT, and metribuzin were all revised lower to 0.02 ppb.

Multi-Analyte Screen

The monitoring results for the 61 wells sampled for Multi-Analyte Screen analytes are shown in Table 10 and Table 11. Both tables include quantifiable and estimated trace detections for pesticides that are unique to the Multi-Analyte Screen. Key findings include:

Analytes with Quantifiable Detections

The following 8 pesticides were detected at or above the RL concentrations in at least one of the wells sampled (Table 10 and Table 11):

- Azoxystrobin
- Chlorantraniliprole
- Fludioxonil
- Flutriafol
- Imidacloprid
- Mefenoxam/metalaxyl
- Methoxyfenozide
- Myclobutanil

Previous detections of imidacloprid were provided as evidence for the formal review process required by the Pesticide Contamination Prevention Act (Davalos, 2022). As per sections 13149 and 13150 of the California Food and Agricultural Code of the Pesticide Contamination Prevention Act, in cases where a pesticide's active ingredient, specified ingredient, or degradation product is initially detected and confirmed in groundwater as a result of legal agricultural use, the law necessitates a formal review to assess whether the pesticide's usage can continue and, if so, under what condition. After formal review, imidacloprid was found not to pollute or threaten to pollute groundwater at concentrations detected in California (Henderson, 2022). DPR will continue to monitor for imidacloprid in groundwater.

Several pesticides detected in the Well Network are being evaluated through ongoing studies:

- Chlorantraniliprole, flutriafol, and methoxyfenozide: Their detection in 2021 prompted ongoing statewide sampling for the three analytes in high use areas (Afyuni and Nordmark, 2022), as well as the decision to analyze all wells in the Well Network with the Multi-Analyte Screen in 2022.
- Fludioxonil: Currently under investigation as part of a separate study (Kocis, 2020).
- Mefenoxam/metalaxyl: Evaluated in a small-scale study (Hawkins, 2025).
- Myclobutanil: Under evaluation in a small-scale study (Study Z617).

Analytes with Trace Detections

The following 4 pesticides were detected at trace levels in at least one of the wells sampled (Table 10 and Table 11):

- Isoxaben
- Propiconazole
- Thiamethoxam
- Thiobencarb

Analytes Not Detected

The following 38 analytes were not detected in any of the samples collected:

AIBA (2-amino-N-isopropyl benzamide), alachlor, azinphos-methyl, benfluralin, bensulide, carbaryl, carbofuran, clomazone, cyprodinil, diazinon, dichlobenil, dichloran, dimethenamid, dimethoate, disulfoton, EPTC (S-ethyl dispropylthiocarbamate), ethofumesate, ethoprophos, fenamiphos, flupyradifurone, fonofos, linuron, malathion, methiocarb, methomyl, metribuzin, metolachlor, napropamide, oryzalin, parathion ethyl, parathion methyl, phorate, piperonyl butoxide, prometryn, propanil, pyraclostrobin, triallate, and uniconazole.

Replicate Analyses in Both Triazine and Multi-Analyte Screens

A comparison of results from common analytes between the Triazine and Multi-Analyte Screens are shown in Table 12. The common analytes are atrazine, bromacil, diuron, norflurazon, prometon, simazine, and tebuthiuron. The results are generally similar between the two analytical methods, with minor differences, especially at lower concentrations. This indicates that the methods are consistent in detecting and quantifying the analytes. A small subset of detection comparisons showed variances exceeding the 30% relative percent difference, likely a result of differences in sensitivity of the two methods. Differences also arise between trace detections, where one method identifies trace

concentrations while the other does not, typically because of differing detection limits.

Summary of Previous Years' Monitoring Results

Aminopyralid Screen

Wells in the Well Network were not previously analyzed using the Aminopyralid Screen.

Triazine Screen

Triazine Screen results from 1999 through 2023 are presented in Table 13 and Table 14 as the percent of wells with detections above the RL and the means of those detections. In 2023, the reporting limits for ACET, DACT, and metribuzin were revised lower to 0.02 ppb. The lower reporting limits contributed to lower mean concentrations observed for ACET and DACT in 2023 (Table 14). A comprehensive report similar to Troiano, et al. (2013) is currently being drafted to evaluate long-term trends.

Multi-Analyte Screen

An overview of the Multi-Analyte Screen detections from 2014 through 2023 is presented in Table 15, not including analytes reported on the Triazine Screen. The Multi-Analyte Screen method has been updated in recent years to add new analytes. Results vary year to year depending on the version of the method used and the number of wells analyzed using this method.

Tables

Table 7. Aminopyralid Screen from 2023. Concentrations in ppb (µg/L).

Compound	Concentrations in ppb (µg/L)							
Aminopyralid	**Well Number 2**	**Well Number 13**	**Well Number 14**	**Well Number 15**	**Well Number 16**	**Well Number 49**	**Well Number 71**	**Well Number 89**
	ND	ND	ND	ND	ND	ND	ND	ND

ND = not detected (below the method detection limit listed in Table 3).

Table 8. Triazine Screen sampling results from 2023 (part 1). Concentrations in ppb (µg/L). Concentrations at or above the reporting limit are bolded. Trace detections are noted with "Trace" with the estimated concentration in parenthesis.

Well Number	ACET	Atrazine	Bromacil	Clothianidin	DACT	DEA	Diuron	DSMN
1	**0.0211**	ND	ND	ND	**0.0741**	Trace (0.00145)	Trace (0.00336)	ND
2	Trace (0.0153)	ND	ND	ND	Trace (0.0115)	ND	ND	Trace (0.00350)
3	**0.0552**	ND	ND	**0.0536*****	**0.0563**	ND	ND	**0.0702**
4	**0.267**	Trace (0.0135)	**2.49**	Trace (0.00626)	**1.56**	Trace (0.0183)	**0.0200**	**0.284**
5	**0.156**	ND	ND	Trace (0.00328)	**0.428**	Trace (0.00530)	Trace (0.00178)	**0.218**
7	**0.125**	Trace (0.00477)	ND	ND	**0.377**	Trace (0.0160)	Trace (0.0107)	**0.023**
8	**0.126**	Trace (0.00992)	Trace (0.0133)	ND	**0.209**	**0.0261**	**0.0259**	**0.0123**
12	**0.155**	ND	**0.188**	ND	**0.194**	ND	**0.0205**	Trace (0.00615)
13	**0.0901**	ND	**0.117**	ND	**0.250**	Trace (0.00226)	Trace (0.0163)	**0.108**
14	ND	ND	ND	ND	ND	ND	ND	ND
15	**0.0302**	ND	ND	ND	**0.0460**	ND	Trace (0.00735)	**0.0449**
16	**0.139**	ND	**0.0922**	ND	**0.265**	ND	Trace (0.0196)	**0.195**
19	**0.0777**	ND	ND	ND	**0.107**	ND	Trace (0.00404)	**0.200**
20	Trace (0.00840)	ND	ND	Trace (0.00347)	Trace (0.00218)	ND	ND	ND
20B	ND	ND	ND	**0.119**	ND	ND	ND	ND
21	Trace (0.00224)	ND	ND	ND	Trace (0.00292)	ND	Trace (0.00408)	**0.0202**
22	**0.148**	ND	ND	ND	**0.423**	Trace (0.00228)	ND	**0.0726**
23B	**0.171**	ND	**0.245**	ND	**0.400**	Trace (0.00237)	**0.0411**	**0.0933**
24	Trace (0.00202)	ND	ND	Trace (0.00184)	Trace (0.00541)	ND	ND	**0.0673**
25	**0.0335**	ND	ND	ND	**0.0313**	ND	ND	**0.0317**
26	Trace (0.0103)***	ND	ND	**0.317*****	**0.0204**	ND	ND	**0.0535*****
30A	**0.130**	Trace (0.00290)	ND	ND	**0.237**	Trace (0.00667)	**0.0228**	**0.0446**
32	**0.103**	ND	ND	ND	**0.209**	ND	Trace (0.00207)	**0.285**
35	**0.0707**	ND	ND	ND	**0.139**	ND	Trace (0.0149)	**0.115**
36	Trace (0.00591)	ND	ND	ND	Trace (0.0121)	ND	ND	ND
37	Trace (0.00864)	ND	ND	ND	Trace (0.0144)	ND	ND	**0.0132**
44A	**0.0766**	ND	Trace (0.0107)	ND	**0.131**	ND	Trace (0.0151)	**0.0129**
45	Trace (0.0179)	Trace (0.00306)	ND	ND	**0.0255**	Trace (0.00657)	**0.0225**	**0.0197**
47	**0.376**	Trace (0.0101)	**0.0468**	Trace (0.00287)	**0.945**	**0.0461**	Trace (0.0114)	**0.0250**
49	**0.359**	ND	ND	Trace (0.00195)	**2.76**	Trace (0.00584)	ND	**0.217**
50	Trace (0.00265)	ND	ND	Trace (0.00174)	Trace (0.00355)	ND	ND	ND
51	**0.0363**	ND	ND	Trace (0.00261)	**0.0826**	ND	ND	**0.0153**

Well Number	ACET	Atrazine	Bromacil	Clothianidin	DACT	DEA	Diuron	DSMN
52	**0.0369**	ND	ND	Trace (0.00173)	**0.0642**	Trace (0.00156)	Trace (0.00239)	Trace (0.00542)
53A	ND	ND	ND	ND	ND	ND	ND	ND
54	**0.0214**	ND	ND	ND	**0.0507**	Trace (0.00165)	ND	ND
56	**0.307**	ND	ND	ND	**0.939**	Trace (0.00214)	ND	ND
57	**0.117**	ND	ND	ND	**0.292**	Trace (0.00160)	ND	**0.0219**
58	Trace (0.0125)	ND	ND	ND	Trace (0.00339)	ND	ND	Trace (0.00763)
59A	**0.287**	Trace (0.00767)	**0.705**	ND	**0.0644**	Trace (0.0152)	**0.0329**	**1.87**
61	**0.281**	Trace (0.00362)	**0.950**	ND	**1.64**	Trace (0.0169)	**0.0360**	**0.0190**
63A	Trace (0.0131)	Trace (0.0105)	ND	ND	**0.0316**	Trace (0.0102)	Trace (0.00849)	ND
65	Trace (0.00610)	ND	ND	ND	**0.124**	ND	ND	ND
68	ND	ND	ND	Trace (0.00186)	Trace (0.00316)	ND	ND	ND
71	**0.336**	ND	**0.402**	Trace (0.00160)	**1.21**	Trace (0.00650)	Trace (0.0180)	**0.992**
72	**0.488**	Trace (0.00330)	**0.0236**	Trace (0.00222)	**2.03**	Trace (0.00773)	Trace (0.0137)	**0.0369**
73	**0.117**	Trace (0.00465)	ND	Trace (0.00441)	**1.12**	**0.0217**	Trace (0.00618)	**0.0683**
74	**0.479**	ND	**0.423**	ND	**1.12**	Trace (0.0124)	**0.0269**	**0.0296**
75A	**0.631**	ND	**0.428**	ND	**0.904**	Trace (0.00560)	**0.0291**	**0.0105**
80	**0.0734**	ND	Trace (0.0145)	ND	**0.312**	Trace (0.00271)	Trace (0.00435)	Trace (0.00639)
84	Trace (0.0149)	ND	**0.0274**	ND	**0.0449**	ND	ND	ND
86	**0.170**	Trace (0.00616)	Trace (0.00254)	ND	**1.27**	**0.0213**	Trace (0.00254)	ND
89	**0.0399**	ND	Trace (0.0137)	ND	**0.0654**	ND	Trace (0.0166)	**0.0790**
90	**0.0885**	**0.0412**	Trace (0.0134)	ND	**0.154**	**0.0862**	**0.0256**	**0.0146**
92	**0.256**	ND	ND	ND	**0.298**	Trace (0.00295)	**0.0431**	**0.150**
94	**0.445*****	ND	ND	Trace (0.0151)***	**3.17*****	Trace (0.00385)	Trace (0.00237)***	**0.461*****
95	ND	ND	ND	ND	Trace (0.00629)	ND	ND	ND
96	**0.305**	ND	**0.206**	ND	**1.75**	Trace (0.00449)	**0.0215**	**0.0296**
100	Trace (0.00870)	Trace (0.00691)	Trace (0.00255)	ND	Trace (0.0104)	Trace (0.0138)	Trace (0.0196)	ND
101	**0.251**	Trace (0.00256)	ND	Trace (0.00338)	**1.56**	ND	Trace (0.0144)	ND
102	**0.0364**	Trace (0.00256)	ND	ND	**0.0319**	Trace (0.00690)	ND	ND
103	**0.0359 *****	ND	ND	Trace (0.0143)***	**0.0362*****	ND	Trace (0.0150)	**0.0164**

ND = not detected (below the method detection limit listed in Table 4).

***Replicate sample is reported because it was higher.

Table 9. Triazine Screen sampling results from 2023 (part 2). Concentrations in ppb (µg/L). Concentrations at or above the reporting limit are bolded. Trace detections are noted with "Trace" with the estimated concentration in parenthesis. Propazine was added as a surrogate and is reported as % recovery.

Well Number**	Hexazinone	Metribuzin	Norflurazon	Prometon	Prometryn	Simazine	Tebuthiuron	Propazine %*
1	ND	ND	ND	ND	ND	ND	ND	81.5
2	ND	ND	ND	ND	ND	Trace (0.0182)	ND	69.0
3	ND	ND	Trace (0.00468)	ND	ND	**0.0654**	ND	**66.5**
4	ND	ND	**0.186**	Trace (0.0111)	ND	**0.0597**	ND	71.5
5	ND	ND	Trace (0.00613)	ND	ND	**0.0682**	ND	69.5
7	Trace (0.00898)	ND	ND	ND	ND	**0.0511**	ND	**65.0**
8	Trace (0.00422)	ND	Trace (0.00257)	ND	ND	**0.0725**	ND	86.5
12	ND	ND	ND	ND	ND	Trace (0.0136)	ND	**66.5**
13	ND	ND	**0.0720**	ND	ND	**0.0218**	ND	69.0
14	ND	ND	ND	ND	ND	ND	ND	**66.0**
15	ND	ND	Trace (0.00671)	ND	ND	**0.0421**	ND	**63.5**
16	ND	ND	**0.0513**	ND	ND	**0.0618**	ND	**65.5**
19	ND	ND	**0.0216**	ND	ND	**0.0536**	ND	76.0
20	ND	ND	ND	ND	ND	Trace (0.0140)	ND	82.0
20B	ND	ND	ND	ND	ND	ND	ND	75.5
21	ND	ND	ND	ND	ND	Trace (0.00289)	ND	68.5
22	ND	ND	Trace (0.00317)	ND	ND	**0.0792**	ND	73.5
23B	ND	ND	Trace (0.0136)	ND	ND	**0.0564**	ND	86.0
24	ND	ND	Trace (0.00916)	ND	ND	Trace (0.00307)	ND	75.5
25	ND	ND	Trace (0.00262)	ND	ND	**0.0351**	ND	74.0
26	ND	ND	Trace (0.00271)***	ND	ND	Trace (0.00669)***	ND	70.0
30A	Trace (0.00241)	ND	**0.0503**	ND	ND	**0.0688**	ND	74.3
32	ND	ND	**0.144**	ND	ND	**0.046**	ND	71.0
35	ND	ND	**0.0266**	Trace (0.00490)	ND	**0.0571**	ND	75.0
36	ND	ND	ND	Trace (0.00542)	ND	Trace (0.0137)	ND	**102.0**
37	ND	ND	Trace (0.00678)	ND	ND	Trace (0.0116**)**	ND	73.5
44A	ND	ND	Trace (0.00378)	ND	ND	**0.0308**	ND	**66.5**
45	ND	ND	Trace (0.00654)	ND	ND	Trace (0.00841)	ND	78.5
47	Trace (0.00394)	ND	Trace (0.00324)	ND	ND	**0.0282**	ND	98.5
49	ND	ND	**0.0204**	ND	ND	**0.0663**	ND	**64.0**
50	Trace (0.00201)	ND	ND	ND	ND	ND	ND	**105.0**
51	ND	ND	ND	ND	ND	**0.0261**	ND	72.0

Well Number**	Hexazinone	Metribuzin	Norflurazon	Prometon	Prometryn	Simazine	Tebuthiuron	Propazine %*
52	Trace (0.00214)	ND	Trace (0.0159)	ND	ND	Trace (0.0103)	ND	96.0
53A	ND	ND	ND	ND	ND	ND	ND	**103.0**
54	ND	ND	ND	Trace (0.00483)	ND	**0.0408**	ND	96.0
56	ND	ND	ND	ND	ND	**0.0973**	ND	80.0
57	ND	ND	ND	ND	ND	**0.0271**	ND	96.0
58	ND	ND	ND	ND	ND	Trace (0.0170)	ND	86.5
59A	ND	ND	**0.455**	ND	ND	Trace (0.0171)	ND	88.0
61	ND	ND	Trace (0.00807)	ND	ND	**0.0431**	ND	82.5
63A	ND	ND	ND	ND	ND	ND	ND	94.5
65	ND	ND	ND	ND	ND	Trace (0.00664)	Trace (0.00403)	68.5
68	ND	ND	ND	ND	ND	ND	ND	73.0
71	ND	ND	**0.171**	ND	ND	**0.0692**	ND	73.0
72	ND	ND	**0.0382**	ND	ND	**0.0691**	ND	72.8
73	ND	ND	ND	ND	ND	Trace (0.00753)	ND	**65.8**
74	ND	ND	**0.0390**	ND	ND	**0.0616**	ND	69.3
75A	ND	ND	Trace (0.00844)	ND	ND	**0.0617**	ND	73.8
80	ND	ND	ND	ND	ND	Trace (0.0104)	ND	68.5
84	ND	ND	ND	ND	ND	Trace (0.00487)	ND	75.0
86	ND	ND	ND	ND	ND	Trace (0.0151)	ND	**66.5**
89	ND	ND	Trace (0.0126)	ND	ND	**0.0350**	ND	**65.5**
90	**0.0374**	ND	Trace (0.0150)	Trace (0.00393)	ND	**0.0625**	Trace (0.0193)	73.0
92	ND	ND	**0.0569**	ND	ND	**0.0529**	ND	72.5
94	ND	ND	**0.0895**	ND	ND	**0.0309**	ND	73.0
95	ND	ND	ND	ND	ND	ND	ND	69.0
96	ND	ND	Trace (0.0171)	ND	ND	**0.0192**	ND	73.3
100	ND	ND	ND	ND	ND	Trace (0.00267)	ND	70.5
101	ND	ND	ND	ND	ND	Trace (0.0119)	ND	71.0
102	ND	ND	ND	ND	ND	**0.0220**	ND	72.0
103	ND	ND	Trace (0.00516)	Trace (0.00283)***	ND	**0.0456**	ND	83.0

ND = not detected (below the method detection limit listed in Table 4).

*Propazine was added as a surrogate for QA/QC purposes.

**Well numbers used by DPR to differentiate sampling locations are not consecutive for reasons including changes in participation and wells going dry.

***Replicate sample is reported because it was higher.

Table 10. Sampling results for 2023 of the twelve analytes (part 1) with detections in at least one well that are unique to the Multi-Analyte Screen (CDFA, 2023b). Concentrations in ppb (µg/L). Thirty-eight analytes were not detected in any well and are not shown in this table. Concentrations at or above the reporting limit are bolded. Trace detections are noted with "Trace" with the estimated concentration in parenthesis.

Well Number	Analytes Unique to the Multi-Analyte Screen with Detections in at Least One Well					
	Azoxystrobin	**Chlorantraniliprole**	**Fludioxonil**	**Flutriafol**	**Imidacloprid**	**Isoxaben**
1	ND	ND	ND	ND	ND	ND
2	ND	ND	ND	ND	Trace（0.0154)	ND
3	ND	Trace (0.00253)	ND	ND	Trace (0.00397)	ND
4	ND	ND	ND	ND	Trace (0.00364)	ND
5	ND	ND	ND	ND	**0.0412****	ND
7	ND	ND	ND	ND	**0.0229**	ND
8	**0.0318**	ND	ND	ND	ND	ND
12	ND	ND	ND	ND	ND	ND
13	ND	ND	ND	ND	Trace (0.00765)	ND
14	ND	Trace (0.00397)	ND	ND	ND	ND
15	ND	Trace (0.0119)	ND	ND	**0.0293**	ND
16	ND	ND	ND	ND	Trace (0.0181)	ND
19	ND	**0.337**	ND	**1.13**	ND	ND
20	ND	**0.0316**	ND	ND	Trace (0.00345) **	ND
20B	ND	**0.202****	ND	ND	Trace (0.00409) **	ND
21	ND	Trace (0.0168)	ND	Trace (0.00327)	ND	Trace (0.00373)
22	ND	**0.0318**	ND	**0.0568**	Trace (0.00331)	ND
23B	ND	ND	ND	ND	**0.0370**	ND
24	ND	ND	ND	ND	**0.0431****	ND
25	ND	ND	ND	ND	ND	ND
26	ND	ND	ND	ND	**0.0374****	ND
30A	ND	ND	**0.667****	ND	ND	ND
32	ND	ND	ND	ND	ND	ND
35	ND	ND	ND	ND	ND	ND
36	ND	ND	ND	ND	Trace (0.00575)	ND
37	ND	ND	ND	ND	ND	ND
44A	ND	ND	ND	ND	ND	ND
45	ND	ND	ND	ND	Trace (0.0152)	ND
47	ND	ND	ND	ND	ND	ND
49	ND	Trace (0.00718)	ND	ND	**0.0604**	ND
50	ND	ND	ND	ND	ND	ND

Well Number	Analytes Unique to the Multi-Analyte Screen with Detections in at Least One Well					
	Azoxystrobin	Chlorantraniliprole	Fludioxonil	Flutriafol	Imidacloprid	Isoxaben
51	ND	ND	ND	ND	ND	ND
52	ND	ND	ND	ND	ND	ND
53A	ND	ND	ND	ND	ND	ND
54	ND	ND	ND	ND	**0.0235**	ND
56	ND	ND	ND	ND	ND	ND
57	ND	ND	ND	ND	ND	ND
58	ND	ND	ND	ND	ND	ND
59A	ND	ND	ND	ND	ND	ND
61	ND	ND	ND	ND	ND	ND
63A	ND	ND	ND	ND	ND	ND
65	ND	Trace (0.00687)	ND	ND	ND	ND
68	ND	Trace (0.00283)	ND	ND	ND	ND
71	ND	ND	ND	ND	ND	ND
72	ND	ND	ND	ND	Trace (0.00369)	ND
73	ND	Trace (0.00785)	ND	ND	Trace (0.00932)	ND
74	ND	ND	ND	ND	ND	ND
75A	ND	ND	ND	ND	ND	ND
80	ND	ND	ND	ND	ND	ND
84	ND	ND	ND	ND	ND	ND
86	ND	ND	ND	ND	ND	ND
89	ND	ND	ND	ND	ND	ND
90	ND	ND	ND	ND	ND	ND
92	ND	ND	ND	ND	ND	ND
94	ND	Trace (0.00737)	ND	Trace (0.0174)	ND	ND
95	ND	Trace (0.00321) **	ND	ND	ND	ND
96	ND	ND	ND	ND	ND	ND
100	ND	ND	ND	ND	ND	ND
101	ND	ND	ND	ND	ND	ND
102	ND	ND	ND	ND	ND	ND
103	ND	ND	ND	ND	ND	ND

ND = not detected (below the method detection limit listed in Table 5 and Table 6).

**Replicate sample is reported because it was higher.

Table 11. Sampling results for 2023 of the twelve analytes (part 2) with detections in at least one well that are unique to the Multi-Analyte Screen (CDFA, 2023b). Concentrations in ppb (µg/L). Thirty-eight analytes were not detected in any well and are not shown in this table. Concentrations at or above the reporting limit are bolded. Trace detections are noted with "Trace" with the estimated concentration in parenthesis.

Well Number	Analytes Unique to the Multi-Analyte Screen with Detections in at Least One Well					
	Mefenoxam/Metalaxyl*	**Methoxyfenozide**	**Myclobutanil**	**Propiconazole**	**Thiamethoxam**	**Thiobencarb**
1	ND	ND	ND	ND	ND	ND
2	ND	Trace (0.00461)	ND	ND	ND	ND
3	ND	ND	ND	ND	Trace (0.0164)	ND
4	ND	ND	ND	ND	ND	ND
5	ND	ND	ND	ND	ND	ND
7	ND	ND	ND	ND	ND	ND
8	ND	ND	ND	ND	ND	ND
12	ND	ND	ND	ND	ND	ND
13	ND	ND	ND	ND	ND	ND
14	ND	ND	ND	ND	ND	ND
15	ND	ND	ND	ND	ND	ND
16	ND	ND	ND	ND	ND	ND
19	ND	**0.126**	**0.0500****	Trace (0.00248)	ND	ND
20	ND	ND	ND	ND	ND	ND
20B	ND	Trace (0.0130)	ND	ND	ND	ND
21	ND	Trace (0.00786)	ND	Trace (0.00299)	ND	ND
22	ND	**0.0533**	ND	ND	ND	ND
23B	ND	ND	ND	ND	ND	ND
24	ND	ND	ND	ND	ND	ND
25	ND	ND	ND	ND	ND	ND
26	ND	ND	ND	ND	ND	ND
30A	ND	**0.119****	ND	ND	ND	ND
32	ND	ND	ND	ND	ND	ND
35	ND	ND	ND	ND	ND	ND
36	Trace (0.00874)	ND	ND	ND	ND	ND
37	ND	ND	ND	ND	ND	ND
44A	ND	ND	ND	ND	ND	ND
45	ND	ND	ND	ND	ND	ND
47	ND	ND	ND	ND	ND	ND
49	Trace (0.00624)	Trace (0.00848)	ND	ND	ND	ND

Well Number	Analytes Unique to the Multi-Analyte Screen with Detections in at Least One Well					
	Mefenoxam/Metalaxyl*	Methoxyfenozide	Myclobutanil	Propiconazole	Thiamethoxam	Thiobencarb
50	ND	Trace (0.00544)	ND	ND	ND	ND
51	ND	ND	ND	ND	ND	ND
52	ND	ND	ND	ND	ND	ND
53A	ND	ND	ND	ND	ND	ND
54	Trace (0.00375)	ND	ND	ND	ND	ND
56	ND	ND	ND	ND	ND	ND
57	ND	ND	ND	ND	ND	ND
58	ND	ND	ND	ND	ND	ND
59A	ND	ND	ND	ND	ND	ND
61	ND	ND	ND	ND	ND	ND
63A	ND	ND	ND	ND	ND	ND
65	ND	Trace (0.0115) **	ND	ND	ND	ND
68	ND	Trace (0.00907)	ND	ND	ND	ND
71	ND	ND	ND	ND	ND	ND
72	ND	ND	ND	ND	ND	Trace (0.00372)
73	ND	Trace (0.00757) **	ND	ND	ND	ND
74	**0.0465****	ND	ND	ND	ND	ND
75A	ND	ND	ND	ND	ND	ND
80	ND	ND	ND	ND	ND	ND
84	ND	ND	ND	ND	ND	ND
86	ND	ND	ND	ND	ND	ND
89	ND	ND	ND	ND	ND	ND
90	ND	ND	ND	ND	ND	ND
92	ND	ND	ND	ND	ND	ND
94	ND	**0.0241**	ND	ND	ND	ND
95	ND	ND	ND	ND	ND	ND
96	**0.156****	ND	ND	ND	ND	ND
100	ND	ND	ND	ND	ND	ND
101	ND	ND	ND	ND	ND	ND
102	ND	ND	ND	ND	ND	ND
103	ND	ND	ND	ND	ND	ND

ND = not detected (below the method detection limit listed in Table 5 and Table 6).

*Mefenoxam and metalaxyl are stereoisomers and cannot be analytically distinguished.

**Replicate sample is reported because it was higher.

Table 12. Comparison of 2023 results for replicate analyses in the Multi-Analyte and Triazine Screens. Concentrations in ppb (µg/L). The table includes results for the seven analytes detected out of the nine analytes analyzed in both methods.

	Analytes in Both the Multi-Analyte and Triazine Screens*													
	Atrazine		**Bromacil**		**Diuron**		**Norflurazon**		**Prometon**		**Simazine**		**Tebuthiuron**	
Well Number	**Multi-Analyte**	**Triazine**	**Multi-Analyte**	**Triazine**	**Multi-Analyte**	**Triazine**	**Multi-Analyte**	**Triazine**	**Multi-Analyte**	**Triazine**	**Multi-Analyte**	**Triazine**	**Multi-Analyte**	**Triazine**
1	ND	ND	ND	ND	Trace (0.00353)	Trace (0.00336)	ND	ND	ND	ND	ND	ND	ND	ND
2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Trace (0.0115)	Trace (0.0182)	ND	ND
3	ND	ND	ND	ND	ND	ND	Trace (0.00570)	Trace (0.00468)	ND	ND	**0.0725**	**0.0654**	ND	ND
4	Trace (0.00933)	Trace (0.0135)	**1.71**	**2.49**	Trace (0.0161)	**0.0200**	**0.122**	**0.186**	Trace (0.00738)	Trace (0.0111)	**0.0456**	**0.0597**	ND	ND
5	ND	ND	ND	ND	Trace (0.00266) **	Trace (0.00178)	Trace (0.00776)	Trace (0.00613)	ND	ND	**0.0930****	**0.0682**	ND	ND
7	Trace (0.00404)	Trace (0.00477)	ND	ND	Trace (0.0109)	Trace (0.0107)	ND	ND	ND	ND	**0.0453**	**0.0511**	ND	ND
8	Trace (0.0102)	Trace (0.00992)	Trace (0.0170)	Trace (0.0133)	**0.0350**	**0.0259**	Trace (0.00279) **	Trace (0.00257)	ND	ND	**0.0881**	**0.0725**	ND	ND
12	ND	ND	**0.194**	**0.188**	**0.0224**	**0.0205**	ND	ND	ND	ND	Trace (0.0150)	Trace (0.0136)	ND	ND
13	ND	ND	**0.148**	**0.117**	**0.0224**	Trace (0.0163)	**0.0898**	**0.0720**	ND	ND	**0.0246**	**0.0218**	ND	ND
14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
15	ND	ND	ND	ND	Trace (0.0107)	Trace (0.00735)	Trace (0.00924)	Trace (0.00671)	ND	ND	**0.0544**	**0.0421**	ND	ND
16	ND	ND	**0.115**	**0.0922**	**0.0269**	Trace (0.0196)	**0.0624**	**0.0513**	ND	ND	**0.0775**	**0.0618**	ND	ND
19	ND	ND	ND	ND	Trace (0.00573)	Trace (0.00404)	**0.0281**	**0.0216**	ND	ND	**0.0707**	**0.0536**	ND	ND
20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Trace (0.0158)	Trace (0.0140)	ND	ND
20B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

	Analytes in Both the Multi-Analyte and Triazine Screens*													
	Atrazine		Bromacil		Diuron		Norflurazon		Prometon		Simazine		Tebuthiuron	
Well Number	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine
21	ND	ND	ND	ND	Trace (0.00524)	Trace (0.00408)	ND	ND	ND	ND	Trace (0.00346)	Trace (0.00289)	ND	ND
22	ND	ND	ND	ND	ND	ND	ND	Trace (0.00317)	ND	ND	**0.0336**	**0.0792**	ND	ND
23B	ND	ND	**0.263**	**0.245**	**0.0434**	**0.0411**	Trace (0.0132)	Trace (0.0136)	ND	ND	**0.0579**	**0.0564**	ND	ND
24	ND	ND	ND	ND	ND	ND	Trace (0.0105)	Trace (0.00916)	ND	ND	Trace (0.00365) **	Trace (0.00307)	ND	ND
25	ND	ND	ND	ND	ND	ND	Trace (0.00322)	Trace (0.00262)	ND	ND	**0.0429**	**0.0351**	ND	ND
26	ND	ND	ND	ND	ND	ND	Trace (0.00314) **	Trace (0.00271) **	ND	ND	Trace (0.00814) **	Trace (0.00669) **	ND	ND
30A	ND	Trace (0.00290)	ND	ND	**0.0344****	**0.0228**	**0.0676****	**0.0503**	ND	ND	**0.0967****	**0.0688**	ND	ND
32	ND	ND	ND	ND	Trace (0.00252)	Trace (0.00207)	**0.181**	**0.144**	ND	ND	**0.0609**	**0.0460**	ND	ND
35	ND	ND	ND	ND	**0.0203**	Trace (0.0149)	**0.0328**	**0.0266**	Trace (0.00445)	Trace (0.00490)	**0.0716**	**0.0571**	ND	ND
36	ND	ND	ND	ND	ND	ND	ND	ND	Trace (0.00497) **	Trace (0.00542)	Trace (0.0145)**	Trace (0.0137)	ND	ND
37	ND	ND	ND	ND	ND	ND	Trace (0.00939)	Trace (0.00678)	ND	ND	Trace (0.0152)	Trace (0.0116)	ND	ND
44A	ND	ND	Trace (0.0151)	Trace (0.0107)	**0.0217**	Trace (0.0151)	Trace (0.00468)	Trace (0.00378)	ND	ND	**0.0347**	**0.0308**	ND	ND
45	ND	Trace (0.00306)	ND	ND	**0.0290**	**0.0225**	Trace (0.00738)	Trace (0.00654)	ND	ND	Trace (0.00979)	Trace (0.00841)	ND	ND
47	Trace (0.00980)	Trace (0.0101)	**0.0521**	**0.0468**	Trace (0.0128)	Trace (0.0114)	Trace (0.00283)	Trace (0.00324)	ND	ND	**0.0320**	**0.0282**	ND	ND
49	ND	ND	ND	ND	ND	ND	**0.0277**	**0.0204**	ND	ND	**0.0749**	**0.0663**	ND	ND
50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
51	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.0254**	**0.0261**	ND	ND

	Analytes in Both the Multi-Analyte and Triazine Screens*													
	Atrazine		Bromacil		Diuron		Norflurazon		Prometon		Simazine		Tebuthiuron	
Well Number	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine
52	ND	ND	ND	ND	ND	Trace (0.00239)	**0.0211**	Trace (0.0159)	ND	ND	Trace (0.0122)	Trace (0.0103)	ND	ND
53A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
54	ND	ND	ND	ND	ND	ND	ND	ND	Trace (0.00521)	Trace (0.00483)	**0.0547**	**0.0408**	ND	ND
56	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.107**	**0.0973**	ND	ND
57	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.0311**	**0.0271**	ND	ND
58	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Trace (0.0196)	Trace (0.0170)	ND	ND
59A	Trace (0.00861)	Trace (0.00767)	**0.801**	**0.705**	**0.0418**	**0.0329**	**0.594**	**0.455**	ND	ND	**0.0216**	Trace (0.0171)	ND	ND
61	ND	Trace (0.00362)	**0.657**	**0.950**	**0.0304**	**0.0360**	Trace (0.00659)	Trace (0.00807)	ND	ND	**0.0378**	**0.0431**	ND	ND
63A	Trace (0.0110)	Trace (0.0105)	ND	ND	Trace (0.0114)	Trace (0.00849)	ND	ND	ND	ND	ND	ND	ND	ND
65	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Trace (0.00887) **	Trace (0.00664)	Trace (0.00627) **	Trace (0.00403)
68	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
71	ND	ND	**0.493**	**0.402**	**0.0226**	Trace (0.0180)	**0.198**	**0.171**	ND	ND	**0.0715**	**0.0692**	ND	ND
72	ND	Trace (0.00330)	**0.0277****	**0.0236**	Trace (0.0193)**	Trace (0.0137)	**0.0458****	**0.0382**	ND	ND	**0.0907****	**0.0691**	ND	ND
73	Trace (0.00528) **	Trace (0.00465)	ND	ND	Trace (0.00872) **	Trace (0.00618)	ND	ND	ND	ND	Trace (0.0107)**	Trace (0.00753)	ND	ND
74	ND	ND	**0.473**	**0.423**	**0.0388****	**0.0269**	**0.0514**	**0.0390**	ND	ND	**0.0798****	**0.0616**	ND	ND
75A	ND	ND	**0.444**	**0.428**	**0.0371**	**0.0291**	Trace (0.00993)	Trace (0.00844)	ND	ND	**0.0741**	**0.0617**	ND	ND
80	ND	ND	Trace (0.0142)	Trace (0.0145)	Trace (0.00584)	Trace (0.00435)	ND	ND	ND	ND	Trace (0.0109)	Trace (0.0104)	ND	ND
84	ND	ND	**0.0305**	**0.0274**	ND	ND	ND	ND	ND	ND	Trace (0.00652)	Trace (0.00487)	ND	ND

	Analytes in Both the Multi-Analyte and Triazine Screens*													
	Atrazine		Bromacil		Diuron		Norflurazon		Prometon		Simazine		Tebuthiuron	
Well Number	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine	Multi-Analyte	Triazine
86	Trace (0.00798)	Trace (0.00616)	ND	Trace (0.00254)	Trace (0.00687)	Trace (0.00254)	ND	ND	ND	ND	**0.0476**	Trace (0.0151)	ND	ND
89	ND	ND	Trace (0.0102)	Trace (0.0137)	Trace (0.0117)	Trace (0.0166)	Trace (0.00782)	Trace (0.0126)	ND	ND	**0.0239**	**0.0350**	ND	ND
90	**0.0480**	**0.0412**	Trace (0.0141)	Trace (0.0134)	**0.0323**	**0.0256**	Trace (0.0175)	Trace (0.0150)	Trace (0.00360)	Trace (0.00393)	**0.0747**	**0.0625**	**0.0245**	Trace (0.0193)
92	ND	ND	ND	ND	**0.0543**	**0.0431**	**0.0675**	**0.0569**	ND	ND	**0.0587**	**0.0529**	ND	ND
94	ND	ND	ND	ND	Trace (0.00291)	Trace (0.00237) **	**0.107**	**0.0895**	ND	ND	**0.0379**	**0.0309**	ND	ND
95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Trace (0.00317) **	ND	ND	ND
96	ND	ND	**0.253**	**0.206**	**0.0303****	**0.0215**	**0.0223****	Trace (0.0171)	ND	ND	**0.0253****	Trace (0.0192)	ND	ND
100	Trace (0.00797)	Trace (0.00691)	ND	Trace (0.00255)	**0.0284**	Trace (0.0196)	ND	ND	ND	ND	Trace (0.00369)	Trace (0.00267)	ND	ND
101	ND	Trace (0.00256)	ND	ND	**0.0205**	Trace (0.0144)	ND	ND	ND	ND	Trace (0.0159)	Trace (0.0119)	ND	ND
102	ND	Trace (0.00256)	ND	ND	ND	ND	ND	ND	ND	ND	**0.0292**	**0.0220**	ND	ND
103	ND	ND	ND	ND	Trace (0.0179)	Trace (0.0150)	Trace (0.00584)	Trace (0.00516)	ND	Trace (0.00283) **	**0.0529**	**0.0456**	ND	ND

ND = not detected (below the method detection limit listed in Table 4 through Table 6).

*The following two analytes were duplicated in both screens but were not detected in any of the samples: metribuzin, prometryn.

**Replicate sample is reported because it was higher.

Table 13. Yearly percent (%) of wells with detections above the reporting limit (RL) for each analyte on the Triazine Screen.

Year	ACET	Atrazine	Bromacil	Clothianidin	DACT	DEA	Diuron	DSMN	Hexazinone	Norflurazon	Prometon	Simazine
1999	94.7	5.3	40	NA	85.3	8	60	NA	0	17.3	1.3	86.7
2000	89.2	4.1	37.8	NA	89.2	4.1	50	NA	1	17.6	1.4	82.4
2001	94.4	4.2	39.4	NA	85.9	8.5	59.2	NA	1.4	22.5	1.4	85.9
2002	94.3	4.3	38.6	NA	88.6	12.9	64.3	NA	0	15.7	1.4	92.9
2003	88.9	4.2	40.3	NA	86.1	9.7	61.1	NA	0	20.8	1.4	86.1
2004	86.8	4.4	33.8	NA	85.3	8.8	57.4	44.1	0	25	1.5	80.9
2005	88.2	4.4	33.8	NA	75	5.9	54.4	45.6	0	23.5	1.5	70.6
2006	83.3	4.5	37.9	NA	83.3	7.6	51.5	44	0	22.7	1.5	72.7
2007	85.5	2.9	31.9	NA	85.5	5.8	46.4	44.9	0	29	1.4	76.8
2008	85.3	4.4	33.8	NA	85.3	5.9	50	44	0	20.6	1.5	69.1
2009	88.2	2.9	30.9	NA	85.3	4.4	45.6	47.1	0	20.6	1.5	60.3
2010	80.9	2.9	29.4	NA	85.3	4.4	38.2	50	1.5	27.9	1.5	63.2
2011	76.5	4.4	30.9	NA	79.4	5.9	32.4	52.9	1.5	27.9	0	55.9
2012	82.4	2.9	25	NA	80.9	4.4	36.8	50	0	27.9	0	58.8
2013	76.1	1.5	26.9	NA	83.6	6	13.4	41.8	0	20.9	0	58.2
2014	75	3.1	31.3	NA	79.7	6.3	15.6	45.3	1.6	21.9	1.6	57.8
2015	76.2	1.6	23.8	NA	84.1	3.2	9.5	34.9	0	19	1.6	49.2
2016	78.7	1.6	26.2	NA	82	3.3	16.4	41	0	21.3	1.6	50.8
2017	60.7	1.6	23	NA	70.5	1.6	6.6	36.1	0	21.3	0	39.3
2018	57.4	1.6	23	NA	65.6	4.9	4.9	36.1	0	21.3	0	36.1
2019	61.7	1.7	20	NA	63.3	1.7	1.7	35	0	13.3	0	31.7
2020	59.3	1.7	22	NA	67.8	3.4	6.8	35.6	0	16.9	0	39
2021*	61.7	1.7	23.3	NA	65.0	8.3	28.3	60.0	3.3	26.7	1.7	63.3
2022	69.5	3.4	30.5	NA	69.5	15.3	33.9	61.0	1.7	28.8	1.7	66.1
2023	68.9	1.6	23.0	4.9	77.0	8.2	19.7	62.3	1.6	23.0	0	55.7
Mean	78.6	3.1	30.3	4.9	79.5	6.3	34.6	45.6	0.5	22.1	1.0	63.6
SD	11.7	1.3	6.4	0	8.0	3.2	20.8	8.5	0.9	4.3	0.7	17.0

NA = Not analyzed - DSMN was included in the analysis in 2004. Metribuzin and prometryn were included in 2021 but were not detected. Clothianidin was added in 2023.

*Higher number of detections beginning in 2021 was due to the lower RLs for the analytical methods.

Table 14. Yearly mean concentrations above the reporting limit (RL) in ppb (µg/L) for each analyte on the Triazine Screen.

Year	ACET	Atrazine	Bromacil	Clothianidin	DACT	DEA	Diuron	DSMN	Hexazinone	Norflurazon	Prometon	Simazine
1999	0.48	0.08	0.96	NA	0.82	0.11	0.35	NA	ND	0.16	0.07	0.13
2000	0.47	0.08	1.31	NA	0.75	0.13	0.35	NA	0.07	0.14	0.06	0.11
2001	0.5	0.1	1.12	NA	0.97	0.13	0.33	NA	0.05	0.11	0.1	0.12
2002	0.58	0.08	0.85	NA	1.08	0.09	0.31	NA	ND	0.28	0.09	0.13
2003	0.55	0.11	0.99	NA	0.89	0.12	0.31	NA	ND	0.18	0.08	0.14
2004	0.5	0.12	1.12	NA	0.85	0.15	0.28	0.22	ND	0.21	0.09	0.10
2005	0.38	0.1	0.95	NA	0.66	0.17	0.25	0.25	ND	0.24	0.09	0.10
2006	0.42	0.09	0.88	NA	0.82	0.13	0.28	0.27	ND	0.23	0.06	0.10
2007	0.40	0.07	0.85	NA	0.80	0.1	0.26	0.26	ND	0.13	0.06	0.10
2008	0.38	0.07	0.81	NA	0.68	0.1	0.21	0.25	ND	0.24	0.07	0.09
2009	0.39	0.07	0.79	NA	0.67	0.12	0.2	0.23	ND	0.21	0.06	0.09
2010	0.41	0.11	0.83	NA	0.70	0.15	0.17	0.27	0.05	0.19	0.09	0.10
2011	0.4	0.09	0.82	NA	0.71	0.15	0.12	0.23	0.07	0.19	ND	0.09
2012	0.39	0.09	0.65	NA	0.82	0.12	0.1	0.24	ND	0.19	ND	0.09
2013	0.39	0.08	0.82	NA	0.75	0.08	0.13	0.25	ND	0.19	ND	0.09
2014	0.35	0.1	0.67	NA	0.68	0.06	0.13	0.26	ND	0.2	0.1	0.08
2015	0.32	0.06	0.64	NA	0.69	0.12	0.13	0.22	ND	0.19	0.11	0.08
2016	0.36	0.08	0.71	NA	0.90	0.14	0.07	0.24	ND	0.18	0.09	0.08
2017	0.24	0.07	0.83	NA	0.85	0.12	0.06	0.19	ND	0.11	ND	0.07
2018	0.28	0.08	0.59	NA	0.87	0.09	0.08	0.24	ND	0.13	ND	0.07
2019	0.25	0.08	0.38	NA	0.72	0.16	0.08	0.19	ND	0.13	ND	0.07
2020	0.24	0.09	1.24	NA	0.77	0.1	0.07	0.24	ND	0.15	ND	0.07
2021	0.24	0.06	0.53	NA	0.76	0.05	0.03	0.18	0.03	0.13	0.07	0.05
2022	0.25	0.04	0.58	NA	0.73	0.04	0.03	0.19	0.04	0.13	0.03	0.05
2023	0.18*	0.04	0.45	0.16†	0.58*	0.04	0.03	0.16	0.04	0.10	ND	0.05
Mean	0.37	0.08	0.81	0.16	0.78	0.11	0.17	0.23	0.05	0.17	0.08	0.09
SD	0.105	0.020	0.232	0	0.110	0.036	0.109	0.032	0.015	0.047	0.020	0.024

*Lower mean concentrations for ACET and DACT were due to lower reporting limits for both analytes in 2023.

†Clothianidin was added to the Triazine Screen in 2023 and detected for the first time in the Well Network.

Table 15. Summary of wells with Multi-Analyte Screen detections (other than Triazine Screen analytes) from 2014 through 2023. Concentrations in ppb (µg/L).

Well #	Township/ Range-Section	Analyte	Sample Year									
			2014	2015	2016	2017	2018	2019	2020	2021**	2022	2023
8	14S/21E-03	Azoxystrobin	ND	ND	ND	ND	ND	ND	-	-	ND	0.0318
2	13S/22E-33	Imidacloprid	ND	ND	ND	ND	Trace	Trace	ND	0.024**	Trace	Trace
3	13S/23E-28	Imidacloprid	ND	ND	ND	ND	ND	ND	-	-	Trace	Trace
4	13S/23E-32	Imidacloprid	ND	ND	ND	Trace	ND	ND	-	-	Trace	Trace
5	14S/21E-13	Imidacloprid	ND	ND	ND	Trace	Trace	Trace	ND	Trace	0.0699	0.0412***
7	14S/21E-21	Imidacloprid	ND	ND	ND	ND	ND	ND	-	-	ND	0.0229
13	14S/22E-12	Imidacloprid	ND	ND	ND	ND	ND	ND	-	-	Trace	Trace
15	14S/22E-14	Imidacloprid	ND	ND	ND	0.066	0.091	0.085	0.106	0.126	0.102	0.0293
16	14S/22E-14	Imidacloprid	ND	ND	ND	ND	ND	ND	-	-	0.0440	Trace
18	14S/22E-31	Imidacloprid	0.059	0.665	-	-	-	-	-	-	-	-
20	14S/23E-32	Imidacloprid	-	ND	ND	ND	ND	ND	-	-	Trace	Trace***
20B	14S/23E-32	Imidacloprid	-	-	-	-	-	-	-	-	0.0388***	Trace***
21	14S/23E-33	Imidacloprid	-	0.065	ND	ND	ND	ND	-	-	0.0242	ND
22	14S/23E-34	Imidacloprid	-	0.120	0.080	0.090	Trace	Trace	-	Trace	Trace***	Trace
23	14S/23E-35	Imidacloprid	-	0.218	0.209	0.534	0.536	0.470	0.073	-	-	-
23B	14S/23E-35	Imidacloprid	-	-	-	-	-	-	-	0.0253***	0.0720	0.0370
24	15S/21E-03	Imidacloprid	ND	ND	ND	Trace	Trace	Trace	0.112	0.088	0.0668	0.0431***
25	15S/21-05	Imidacloprid	ND	ND	ND	ND	ND	ND	-	-	Trace	ND
26	15S/21E-09	Imidacloprid	Trace	0.051	0.072	0.167	0.053	ND	-	0.0348	0.0368	0.0374***
29	15S/22E-03	Imidacloprid	ND	Trace	ND	5.970	0.095	Trace	0.053	0.046**	-	-
36	15S/22E-20	Imidacloprid	ND	ND	ND	ND	ND	ND	-	-	Trace	Trace
45	15S/23E-12	Imidacloprid	-	ND	ND	ND	ND	ND	-	-	ND	Trace
47	15S/24E-14	Imidacloprid	-	ND	0.644	ND	ND	ND	-	ND	ND	ND
48	15S/24E-36	Imidacloprid	-	ND	Trace	Trace	-	-	-	-	-	-
49	15S/25E-05	Imidacloprid	-	ND	ND	ND	ND	ND	-	-	ND	0.0604
54	16S/21E-34	Imidacloprid	-	ND	ND	ND	ND	ND	-	-	0.0304	0.0235
72	18S/27E-21	Imidacloprid	-	ND	ND	ND	ND	ND	-	-	ND	Trace
73	18S/27E-29	Imidacloprid	-	ND	ND	ND	ND	ND	-	-	ND	Trace
94	15S/24E-10	Imidacloprid	-	ND	ND	ND	ND	ND	-	-	Trace	ND
95	14S/22E-33	Imidacloprid	ND	ND	ND	ND	ND	ND	-	-	Trace	ND
37	15S/22E-21	Oryzalin	Trace	ND	ND	ND	ND	ND	-	-	ND	ND
44	15S/23E-02	Oryzalin	-	Trace	ND	ND	ND	ND	-	-	ND	-
4	13S/23E-32	Mefenoxam/Metalaxyl*	ND	ND	ND	ND	ND	ND	-	-	Trace	ND
29	15S/22E-03	Mefenoxam/Metalaxyl*	ND	Trace	ND	ND	ND	ND	ND	Trace	-	-
36	15S/22E-20	Mefenoxam/Metalaxyl*	ND	ND	ND	ND	ND	ND	-	-	Trace	Trace
49	15S/25E-05	Mefenoxam/Metalaxyl*	-	ND	ND	ND	ND	ND	-	-	ND	Trace
54	16S/21E-34	Mefenoxam/Metalaxyl*	-	ND	ND	ND	ND	ND	-	-	Trace	Trace
74	19S/26E-01	Mefenoxam/Metalaxyl*	-	ND	ND	ND	ND	ND	-	-	ND	0.0465***
96	27S/26E-30	Mefenoxam/Metalaxyl*	-	-	-	-	-	-	-	-	0.173	0.156***
74	19S/26E-01	Metolachlor	-	Trace	ND	ND	ND	ND	-	-	ND	ND
30A	15S/22E-05	Fludioxonil	-	ND	Trace	0.066	0.165	0.380	0.333	0.316***	0.484	0.667***
4	13S/23E-32	Propanil	ND	ND	ND	0.060	ND	ND	-	-	ND	ND
2	13S/22E-33	Methoxyfenozide	-	-	-	-	-	-	-	ND	ND	Trace
19	14S/23E-34	Methoxyfenozide	-	-	-	-	-	-	-	-	0.162	0.126
20B	14S/23E-32	Methoxyfenozide	-	-	-	-	-	-	-	-	Trace	Trace
21	14S/23E-33	Methoxyfenozide	-	-	-	-	-	-	-	-	ND	Trace
22	14S/23E-34	Methoxyfenozide	-	-	-	-	-	-	-	0.201	0.229	0.0533

Well #	Township/ Range-Section	Analyte	Sample Year									
			2014	2015	2016	2017	2018	2019	2020	2021**	2022	2023
26	15S/21E-09	Methoxyfenozide	-	-	-	-	-	-	-	Trace**	ND	ND
29	15S/22E-03	Methoxyfenozide	-	-	-	-	-	-	-	Trace	-	-
30A	15S/22E-05	Methoxyfenozide	-	-	-	-	-	-	-	0.0872***	0.122	0.119***
49	15S/25E-05	Methoxyfenozide	-	-	-	-	-	-	-	-	ND	Trace
50	16S/21E-14	Methoxyfenozide	-	-	-	-	-	-	-	-	ND	Trace
65	17S/26E-26	Methoxyfenozide	-	-	-	-	-	-	-	-	ND	Trace***
68	18S/26E-02	Methoxyfenozide	-	-	-	-	-	-	-	-	ND	Trace
73	18S/27E-29	Methoxyfenozide	-	-	-	-	-	-	-	-	ND	Trace***
94	15S/24E-10	Methoxyfenozide	-	-	-	-	-	-	-	-	ND	0.0241
3	13S/23E-28	Chlorantraniliprole	-	-	-	-	-	-	-	-	ND	Trace
14	14S/22E-13	Chlorantraniliprole	-	-	-	-	-	-	-	-	ND	Trace
15	14S/22E-14	Chlorantraniliprole	-	-	-	-	-	-	-	Trace	Trace	Trace
19	14S/23E-34	Chlorantraniliprole	-	-	-	-	-	-	-	-	0.220	0.337
20	14S/23E-32	Chlorantraniliprole	-	-	-	-	-	-	-	-	0.0445	0.0316
20B	14S/23-32	Chlorantraniliprole	-	-	-	-	-	-	-	-	0.0820	0.202***
21	14S/23-33	Chlorantraniliprole	-	-	-	-	-	-	-	-	Trace	Trace
22	14S/23E-34	Chlorantraniliprole	-	-	-	-	-	-	-	0.266	0.0978***	0.0318
49	15S/25E-05	Chlorantraniliprole	-	-	-	-	-	-	-	-	ND	Trace
65	17S/26E-26	Chlorantraniliprole	-	-	-	-	-	-	-	-	ND	Trace
68	18S/26E-02	Chlorantraniliprole	-	-	-	-	-	-	-	-	Trace	Trace
73	18S/27E-29	Chlorantraniliprole	-	-	-	-	-	-	-	-	ND	Trace
94	15S/24E-10	Chlorantraniliprole	-	-	-	-	-	-	-	-	ND	Trace
95	14S/22E-33	Chlorantraniliprole	-	-	-	-	-	-	-	-	ND	Trace***
19	14S/23E-34	Flutriafol	-	-	-	-	-	-	-	-	0.0754	1.13
21	14S/23E-33	Flutriafol	-	-	-	-	-	-	-	-	ND	Trace
22	14S/23E-34	Flutriafol	-	-	-	-	-	-	-	0.226	0.209	0.0568
94	15S/24E-10	Flutriafol	-	-	-	-	-	-	-	-	ND	Trace
21	14S/23E-33	Isoxaben	-	-	-	-	-	-	-	-	ND	Trace
19	14S/23E-34	Myclobutanil	-	-	-	-	-	-	-	-	-	0.0500***
19	14S/23E-34	Propiconazole	-	-	-	-	-	-	-	-	ND	Trace
21	14S/23E-33	Propiconazole	-	-	-	-	-	-	-	-	ND	Trace
72	18S/27E-21	Thiobencarb	-	ND	ND	ND	ND	ND	-	-	ND	Trace
3	13S/23E-28	Thiamethoxam	ND	ND	ND	ND	ND	ND	-	-	ND	Trace
20B	14S/23-32	Thiamethoxam	-	-	-	-	-	-	-	-	Trace	ND

ND = Not detected (below the method detection limit listed in Table 5 and Table 6).

Trace = result is < RL but > MDL.

[-] = Not sampled because the well was not available for sampling, or not analyzed because the analyte was not part of the method. Some analytes (e.g., methoxyfenozide, chlorantraniliprole, and flutriafol) were not analyzed for until 2021.

*Mefenoxam and metalaxyl are stereoisomers and cannot be analytically distinguished.

**RL from 2014–2020 was 0.05 ppb; from 2021–2022 the RL was 0.02 ppb for chlorantraniliprole, imidacloprid, flutriafol, and mefenoxam, and 0.03 ppb for fludioxonil and methoxyfenozide.

***Replicate sample is reported because it was higher.

QUALITY CONTROL RESULTS

Laboratory and field quality control were conducted according to the Chemistry Laboratory Quality Control SOP (Peoples, 2019) and the results are summarized in Table 16. All quality control (QC) results are available upon request.

For samples and matrix spikes, the CDFA Laboratory evaluates recoveries for control limits established when the method was developed, as well as ongoing control limits. The CDFA Laboratory and the Environmental Monitoring Branch (EM) Quality Assurance (QA) Officer conducted a detailed review of the QC data and the associated sample results and determined that the recoveries outside of control limits in the spiked sample sets do not significantly impact the reported data.

Matrix Spikes

Aminopyralid Screen

One matrix spike was analyzed with a set of samples using the Aminopyralid Screen. The analyte was spiked at 0.5 ppb. The recovery for the analyte was 97.4%, and recovery was within control limits.

Triazine Screen

Eighteen total matrix spikes were analyzed in duplicate for the Triazine Screen. All analytes were spiked at 0.2 ppb, except in one batch where the analyst spiked at 0.4 ppb. This deviation from the standard process was approved for that specific batch. The mean recoveries for the 15 analytes and the propazine surrogate analyte ranged from 70.8 to 85.8%. The standard deviation of the recoveries ranged from 3.6 to 6.9%. Three out of 270 total spiked analytes were below the lower control limits. Propazine surrogate recoveries were within control limits for all continuing QC and in 46 out of 60 samples analyzed (Table 9).

Multi-Analyte Screen

For the Multi-Analyte Screen, matrix spikes were extracted and split to be analyzed along with sets of samples for both the LC-MS/MS and GC-MS/MS instruments. Ten matrix spikes were analyzed along with ten sets of samples using LC-MS/MS. All analytes were spiked at 0.2 ppb, except for two batches where they were spiked at 0.1 ppb. The mean recoveries for the 41 analytes, as well as the atrazine-d5 and imidacloprid-d4 surrogate analytes, ranged from 45.1 to 112.0%. The standard deviation of the recoveries ranged from 7.9 to 37.9%. Out of 410 spiked analytes on the LC/MS screen, 80 were outside the control limits. Imidacloprid-d4 surrogate recoveries were within control limits in all continuing QC but fell below the lower control limits in 7 out of 60 samples analyzed. Five out of ten atrazine-d5 surrogate recoveries in continuing QC were above the upper control limits, while in 7 out of 60 samples analyzed, the atrazine-d5 surrogate recoveries were below the lower control limits.

Eight matrix spikes were analyzed along with sets of samples using GC-MS/MS for the Multi-Analyte Screen. All analytes were spiked at 0.1 ppb. The mean recoveries for the 16 analytes ranged from 76.4 to 103.4%. The standard deviation of the recoveries ranged from 10.2 to 26.5%. Recoveries for all 128 spiked analytes were within control limits.

Blind Spikes

A blind spike consists of analyte-free groundwater (matrix-blank sample) fortified with the chosen analytes and spiked by a chemist other than the chemist extracting and analyzing that screen. The EM

QA Officer submitted the blind spike to the laboratory disguised as a field sample according to the SOP (Ganapathy, 2005). One Aminopyralid, four Triazine, and four Multi-Analyte blind spikes were submitted throughout the study period (Table 16). Results are presented based on the blind spikes prepared by the laboratory. Of the 37 analytes spiked, recoveries of 33 analytes (89.2%) were within the control limits, while recoveries of four analytes were outside the control limits. All blind spike results are presented in Table 17.

Laboratory and Field Blanks

A laboratory matrix blank and deionized water field blanks were part of the QAQC for this study as described in Davalos (2021) and Peoples (2019). All laboratory matrix blanks had no detections. Prometon was detected at trace concentrations in two field blanks (Table 16).

Table 16. Laboratory and field quality control (QC) summary.

QC Type	Triazine Screen	Multi-Analyte Screen	Aminopyralid Screen	Total Number	QC Summary
Continuing QC matrix-spikes	19	10	1	30	88 out of 719 analytes were outside the control limits: 3 Triazine spikes and 85 Multi-Analyte spikes
Blind spikes	4	4	1	9	4 out of 37 analytes were outside the control limits
Laboratory matrix-blanks	9	10	1	20	All non-detected
Field blanks	11	11	0	22	Out of 616 analytes, 2 showed trace detections of prometon* while the remaining analytes were non-detected

*Prometon has been detected intermittently but rarely in field blanks at very low levels near the MDL, in this case 0.00250 and 0.00253 ppb, and is suspected to be a method sensitivity error.

Table 17. Blind spike levels and recoveries.

Analysis Date	Analysis	Analyte	Spike Level (ppb)	Result (ppb)	% Recovery	Control limit exceeded*
7/5/2023	Multi-Analyte	Chlorantraniliprole	0.10	0.104	104.0	no
		Diuron	0.10	0.0979	97.9	no
		Flutriafol	0.10	0.0987	98.7	no
		Methoxyfenozide	0.15	0.135	90.0	no
		Simazine	0.15	0.145	96.7	no
6/2/2023	Triazine	Atrazine	0.10	0.0734	73.4	no
		Diuron	0.10	0.0715	71.5	no
		DSMN	0.10	0.0801	80.1	no
		Simazine	0.10	0.115	115.0	**YES**
7/10/2023	Multi-Analyte	Chlorantraniliprole	0.10	0.100	100.0	no
		Dichlobenil	0.15	0.146	97.3	no
		Fludioxonil	0.15	0.151	100.7	no
		Mefenoxam	0.10	0.0898	89.8	no
		Simazine	0.10	0.0958	95.8	no
6/7/2023	Triazine	ACET	0.10	0.0657	65.7	no
		DACT	0.10	0.00351	3.51	**YES**
		DSMN	0.05	0.0419	83.8	no
		Simazine	0.10	0.0841	84.1	no
7/3/2023	Multi-Analyte	Chlorantraniliprole	0.10	0.0973	97.3	no
		Dichlobenil	0.15	0.113	75.3	no
		Fludioxonil	0.20	0.205	102.5	no
		Mefenoxam	0.15	0.125	83.3	no
		Simazine	0.15	0.137	91.3	no
7/6/2023	Triazine	ACET	0.15	0.118	78.7	no
		DACT	0.15	0.00695	4.63	**YES**
		Diuron	0.10	0.0753	75.3	no
		Simazine	0.15	0.134	89.3	no
6/19/2023	Aminopyralid	Aminopyralid	0.10	0.111	111.0	no
7/7/2023	Multi-Analyte	Chlorantraniliprole	0.10	0.0776	77.6	no
		Fludioxonil	0.15	0.114	76.0	no
		Flutriafol	0.10	0.0816	81.6	no
		Imidacloprid	0.10	0.0693	69.3	**YES**
		Methoxyfenozide	0.15	0.0901	60.1	no
7/10/2023	Triazine	Atrazine	0.10	0.0705	70.5	no
		Diuron	0.10	0.0762	76.2	no
		DSMN	0.15	0.133	88.7	no
		Simazine	0.20	0.177	88.5	no

*Control limits are available in the analytical methods (CDFA, 2022; 2023a; 2023b)

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