EVIDENCE REQUESTED BY THE SUBCOMMITTEE FOR PHASE 2 OF THE HEARING ON IMIDACLOPRID DETECTIONS IN GROUNDWATER

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INTRODUCTION

This evidence was prepared by the Environmental Monitoring (EM) Branch and Human Health Assessment (HHA) Branch of the California Department of Pesticide Regulation (DPR) in response to questions from the Subcommittee of DPR's Pesticide Evaluation and Registration Committee (Subcommittee) during Phase 1 of the Public Hearing Pertaining to Imidacloprid Product Residue Detections in Groundwater (the Hearing) held on March 22 and 23, 2022.

BACKGROUND

The purpose of the Pesticide Contamination Prevention Act (PCPA) of 1985 (Assembly Bill 2021, Food and Agricultural Code [FAC] sections 13141 through 13152) is to prevent pesticide pollution of groundwater used for drinking water supplies. When DPR detects a new pesticide in groundwater with an unequivocal analytical method and determines that the groundwater contamination is from legal agricultural use of the pesticide, DPR initiates the pesticide detection response process. This process includes a requirement that the registrant submit a report and evidence to the Subcommittee that the pesticide has not and does not threaten to pollute groundwater. For the purposes of the hearing, pollute is defined as "to introduce a pesticide product into the groundwaters of the state resulting in an active ingredient…above a level that does not cause adverse health effects, accounting for an adequate margin of safety." (Food & Agr. Code, § 13142, subd. (j).) Therefore, whether imidacloprid has polluted or threatens to pollute groundwater is determined by the detections of imidacloprid in groundwater and the human health reference level.

Food and Agricultural Code section 13150(c) requires that the Subcommittee, within 90 days after the hearing is conducted, make any of the following findings and recommendations:

> (1) That the ingredient found in the soil or groundwater has not polluted, and does not threaten to pollute, the groundwater of the state.
>
> (2) That the agricultural use of the pesticide can be modified so that there is a high probability that the pesticide would not pollute the groundwater of the state.
>
> (3) That modification of the agricultural use of the pesticide pursuant to paragraph (2) or cancellation of the pesticide will cause severe economic hardship on the state's agricultural industry, and that no alternative products or practices can be effectively used so that there is a high probability that pollution of the groundwater of the state will not occur. The subcommittee shall recommend a level of the pesticide that does not

> significantly diminish the margin of safety recognized by the subcommittee to not cause adverse health effects.
>
> When the subcommittee makes a finding pursuant to paragraph (2) or this paragraph (3), it shall determine whether the adverse health effects of the pesticide are carcinogenic, mutagenic, teratogenic, or neurotoxic.

In response to Subcommittee questions raised during Phase 1 of the Hearing, and to assist the Subcommittee with their task of making one of the findings above, the EM Branch and HHA Branch are submitting the following evidence.

DETECTIONS OF IMIDACLOPRID IN GROUNDWATER

From 2003 through 2021, EM collected and analyzed more than 700 samples for imidacloprid from over 400 wells. In 2014, when 27 wells were analyzed using the Multi-Analyte Screen during routine sampling of EM's Well Network, imidacloprid was first detected by EM in one well above the reporting limit (RL) of 0.05 parts per billion (ppb), and another well at trace concentrations between the RL and method detection limit (MDL) of 0.01 ppb (Table 1, Study 228) (Garretson, 2015).

From 2015 to 2021, EM continued to analyze wells in the Well Network with the Multi-Analyte Screen. EM used the Multi-Analyte Screen to analyze all wells from 2015 to 2019, and EM used the Multi-Analyte Screen to analyze a subset of wells in 2020 and 2021 (Garretson, 2016, 2017, 2018, 2019, 2020; Davalos, 2021, 2022). The results for all wells with imidacloprid detections are included in Table 1. Ten wells in the Well Network have had detections of imidacloprid above the reporting limit (RL), with concentrations ranging from 0.022 to 5.97 ppb (Table 1, Study 228). The RL was 0.05 ppb from 2014 to 2020, and the RL was 0.02 ppb in 2021. The MDL was 0.01 ppb from 2014 to 2020, and the MDL was 0.003 ppb in 2021. Trace detections are between the RL and the MDL. Four wells in the Well Network have had only trace detections.

In 2017 and 2019, EM sampled 69 wells in five counties as part of an imidacloprid-focused study to determine if groundwater contamination was occurring from agricultural use of imidacloprid in areas outside of the Well Network. The sampling design for this study targeted areas with moderate to high imidacloprid use and shallow depth to groundwater (Aggarwal, 2021).[1] Imidacloprid was detected

[1] In 2017, sampling locations were prioritized based on their similarity to the areas in Fresno County where imidacloprid had been detected in well samples: moderate to high reported imidacloprid use from 1995 through 2015, depth to groundwater of less than 60 feet, and previous detections of pesticides by EM. Most sections targeted for sampling in 2017 were located in Fresno and Tulare counties. Due to imidacloprid detections in 2017, the study was expanded in 2019 to prioritize sampling in sections with reported imidacloprid use from 1995 through 2015 of >2000 pounds and depths to groundwater of 130 feet or less anywhere in California.

above the RL of 0.05 ppb in five wells located in Fresno, Santa Barbara, and Tulare counties, with concentrations ranging from 0.054 to 0.124 ppb. Trace imidacloprid concentrations were detected in nine additional wells located in Fresno, Monterey, Santa Barbara, and Tulare counties. These results are included in Table 1 and identified as Study GW17.

When the pesticide detection response process for imidacloprid was initiated in September 2021, EM had detected imidacloprid above the RL of 0.05 ppb in 15 wells, with concentrations ranging from 0.051 to 5.97 ppb.[2] Fourteen additional wells had trace detections below the RL of 0.05 ppb but above the MDL of 0.01 ppb. The detections above the RL were evaluated and were determined to be the result of the legal agricultural use of imidacloprid.

In 2021, EM detected imidacloprid in ten wells using an updated Multi-Analyte Screen that included new RLs and MDLs for all analytes (Davalos, 2021). The updated RL and MDL for imidacloprid were 0.02 and 0.003 ppb, respectively. Primary and backup samples were collected and analyzed for each of the ten wells. Five wells had imidacloprid concentrations above the new RL of 0.02 ppb in both the primary and backup samples, with concentrations ranging from 0.022 to 0.126 ppb. All five of these wells had previous detections of imidacloprid (Table 1). For the five wells that had trace imidacloprid concentrations (below the RL of 0.02 ppb but above the MDL of 0.003 ppb), three had not been previously sampled by EM. One of these wells was in the same section as a well that had previous detections of imidacloprid (Table 1, Well 23B). EM determined that the recent detections of imidacloprid were consistent with the September 2021 finding of legal agricultural use of the pesticide.

Table 1. Imidacloprid concentrations (ppb) for all wells sampled by EM with detections

Study	Well	COMTRS	2014	2015	2016	2017	2018	2019	2020	2021
228	2	10M13S22E33	nd	nd	nd	nd	T	T	nd	0.022
228	4	10M13S23E32	nd	nd	nd	T	nd	nd		
228	5	10M14S21E13	nd	nd	nd	T	T	T	nd	T
228	15	10M14S22E14	nd	nd	nd	0.066	0.091	0.085	0.106	0.126
228	18	10M14S22E31	0.059	0.665	**Dry**					
228	21	10M14S23E33		0.065	nd	nd	nd	nd		
228	22	10M14S23E34		0.12	0.08	0.09	T	T		T
228	23	10M14S23E35		0.218	0.209	0.534	0.536	0.47	0.073	
228	23B	10M14S23E35								T
228	24	10M15S21E03	nd	nd	nd	T	T	T	0.112	0.088
228	26	10M15S21E09	T	0.051	0.072	0.167	0.053	nd		0.0348
228	29	10M15S22E03	nd	T	nd	5.97	0.095	T	0.053	0.045
228	47	10M15S24E14		nd	0.644	nd	nd	nd		nd
228	48	10M15S24E36		nd	T	T	**NLS**			

[2] Only sampling data collected through 2020 were included in the initiation documentation.

GW15	42-05	42S10N34W17				T				
GW17	10-01	10M14S22E02				0.054				
GW17	10-02	10M14S22E01				T				
GW17	10-04	10M14S22E01				T				
GW17	10-07	10M15S21E09				T				
GW17	10-11	10M14S22E18				T				
GW17	10-12	10M15S22E06				0.072				
GW17	10-14	10M15S23E03				T				
GW17	27-01	27M15S03E09						T		
GW17	42-01	42S10N33W20						T		
GW17	42-12	42S08N33W25						T		
GW17	42-74	42S10N34W17				0.104				
GW17	54-03	54M17S25E11				0.074				
GW17	54-11	54M18S26E24				T				
GW17	54-21	54M16S24E12				0.105				
328	10-8	10M15S22E03							0.055	
330	W127	47M44N06W27								T
Z598	10-3	10M14S21E13								T

COMTRS = county, meridian, township, range, section
blank = Well not sampled
nd = imidacloprid not detected
T = Trace
Dry = Well went dry
NLS = Well is no longer sampled
2014-2020: reporting limit (RL) was 0.05 ppb
2021: RL was 0.02 ppb

During Phase 1 of the Hearing, DPR's written evidence and presentation included information about a well in EM's Well Network (Well 29) that had a concentration of 5.97 ppb of imidacloprid in 2017. The 5.97 ppb detection is the highest concentration of imidacloprid detected in California. All other quantifiable detections of imidacloprid in California were lower and ranged from 0.022 to 0.665 ppb. When the sample with the highest concentration was collected, Well 29 was not used as an active drinking water source, some irregularities were noted about the clarity of the water, and the Legal Agricultural Use Determination indicated that the sampled water may not be representative of concentrations in active domestic wells. The Subcommittee requested that EM submit additional information about Well 29 for Phase 2.

It is important to note that the Legal Agricultural Use Determination did not solely rely on the 5.97 ppb detection. The legal agricultural use determination for detections in this one-square mile section was satisfied because imidacloprid was used for agricultural purposes in this and neighboring sections, this well had multiple detections of imidacloprid over time, and another well in the same section had a detection of imidacloprid.

Information on Well 29

Well 29 is a domestic well that has been sampled at least annually by EM since 1999 as part of the Well Network (Garretson, 1999). This well was chosen for the Well Network because it was located in an area with shallow groundwater and course soils that have been identified as vulnerable to groundwater contamination from the agricultural use of pesticides, had complete well log information, and had previous detections of simazine and diuron. The Well Completion Report indicates that when the well was drilled in 1993, the depth to the static water level was 36 feet, the well was drilled to a depth of 70 feet, and the driller was unable to drill deeper (Attachment A). The well is outside of the Corcoran Clay area and was drilled through alternating layers of sand and clay, with the last eight feet consisting of cobble stones. According to EM's Well Information Sheet, standard sampling procedure, and knowledge about the sampling practices for this well, EM scientists collected groundwater samples from the Schrader valve before the tank (Figure 1; Attachment A). There is also a faucet and hose after the tank that EM scientists used to clear the well casing by running the well for at least ten minutes before sampling according to standard sampling procedure (Figure 2). Samples were not collected from the faucet. The well has a 4x8 foot cement pad that is approximately four inches high and is in good condition. The soil surrounding the well is sandy and level with no obvious sloping toward the well. The well is adjacent to a dirt driveway and parking lot that is used for agricultural equipment and is surrounded by agricultural fields. In 1999, EM scientists noted on the Well Information Sheet that there was also an irrigation well on the property. The irrigation well has never been sampled by EM.

At every sampling event, samples were analyzed using the Triazine Screen that includes simazine, bromacil, diuron, and other pesticides and degradates known to have previously contaminated groundwater and are regulated within Ground Water Protection Areas (i.e., 3CCR 6800[a] pesticides). From 2014 through 2021, samples were also analyzed using the Multi-Analyte Screen that includes imidacloprid. The concentrations of imidacloprid detections from Well 29 are shown on Figure 3 and are summarized below.

In 2015, Well 29 had a trace detection of imidacloprid (between the MDL and RL). In 2016, Well 29 did not have detectable residues of imidacloprid above the MDL. In 2017, a sample collected from Well 29 had a detection of 5.97 ppb, the highest detection of imidacloprid. At the time the sample was collected, the EM scientist recorded the following observations for Well 29 (Attachment A): "Looks like no one is living in home. Water from well was slightly brownish in color and was carrying sediment. Not drinkable. The well was being used for a hose to sprinkle down the landing area to keep dust down during harvest." In 2018, the same EM scientist made the following observations: "Well is functioning better but still is some (less) sediment in water and slight (less) brownish color to water. No one is living in home serviced by well." The sample collected from Well 29 in 2018 had an imidacloprid concentration of 0.095 ppb. No notes were made when the well was sampled in 2019 and 2020. In

2019, there was a trace detection of imidacloprid and in 2020 the concentration was 0.053 ppb. In 2021, a different EM scientist sampling the well noted that the house was still abandoned but the water was clear. The imidacloprid concentration in 2021 was 0.045 ppb.

Table 2 (Attachment B) includes the Well 29 concentration data for all detected analytes on the Triazine Screen (trace detections are not included), imidacloprid (trace detections are included), and nitrate. The concentrations of the analytes on the Triazine Screen have generally decreased over time which would be expected based on the decrease in applications of those pesticides reported in the Pesticide Use Reports (PUR) (CDPR, 2022a).

Figure 1. Well 29 sample location: A sampling tube is attached to the Schrader valve (red oval), which is between the wellhead (red arrow) and the tank

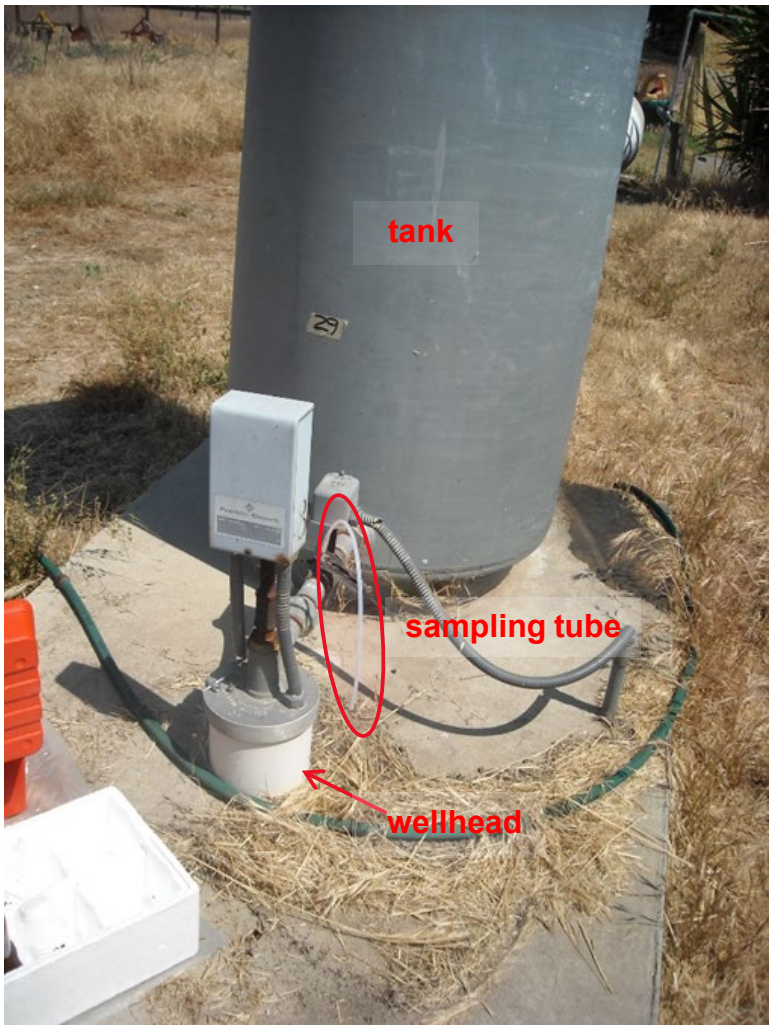
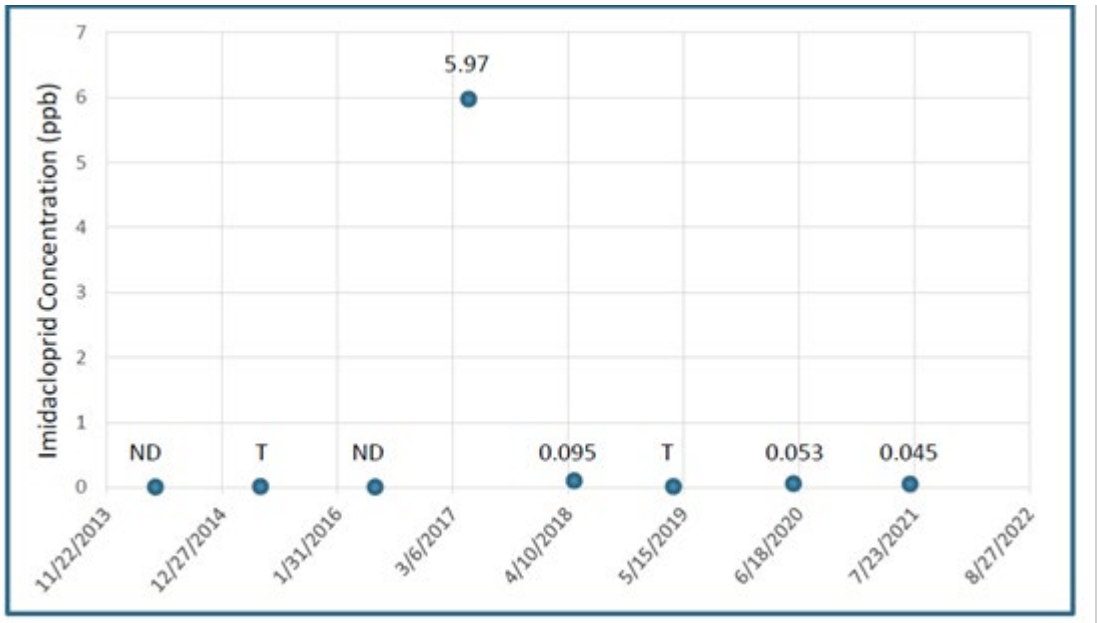


Figure 2. Overview photo of Well 29 that includes the sample location (red circle) before the tank and the faucet (red rectangle) after the tank

Figure 3. Imidacloprid results (ppb) for Well 29



ND = not detected (below method detection limit of 0.01 ppb)

T = trace detection (between reporting limit of 0.05 ppb and method detection limit of 0.01 ppb)

Quality Assurance and Quality Control Measures for All Imidacloprid Samples

A number of quality assurance and quality control (QA/QC) processes were utilized to measure and assure the quality of sampling and results. EM's Groundwater Protection Program (GWPP) relied on quality control samples to verify laboratory precision and accuracy and to test for potential field contamination. Continuing Quality Control (QC) samples were spiked with all analytes on the analytical screen and were extracted and analyzed with every set of approximately ten well samples. For all EM reports submitted for the Hearing, the recovery of imidacloprid spiked in these Continuing QC samples was recovered within the control limits in every QC sample, except for one set associated with samples collected in 2021.[3] Additionally, depending on the study objectives, EM collected and submitted field blanks from new wells if they were found to be positive for an analyte that DPR currently does not regulate under the California Code of Regulations, Title 3, section 6800(a). No field blanks submitted for imidacloprid analyses had detectable residues of any analytes. EM also submitted blind spikes for approximately 10% of samples sent to the laboratory for analysis. Blind spikes are samples fortified by a different chemist than the chemist that analyses the sample. The blind spikes are provided to EM by the laboratory, disguised by EM, and sent back to the laboratory as actual samples. As reported, all blind spikes for imidacloprid were within the control limits. All QC samples are fully defined and described in the reports and in EM's Standard Operating Procedure (SOP) for Chemistry Laboratory Quality Control (SOP QAQC001.01) (Peoples, 2019).

Quality Assurance and Quality Control Measures Applied to the 5.97 ppb Sample

Field and laboratory staff followed proper QA/QC measures when the Well 29 sample was collected and analyzed in 2017. The replicate data and laboratory instrument data indicate that the 5.97 ppb detection was accurate and was from Well 29 in the Well Network. The following are the specific factors leading to that conclusion and are discussed in more detail below:

1. Continuing QC results for imidacloprid were within control limits.
2. The field blank associated with the sampling crew and event was analyzed in the same set as the 5.97 ppb sample and contained no detectable analytes.
3. The triazines detected in the Multi-Analyte Screen for the sample match the corresponding replicate submitted for the Triazine Screen.
4. The instrument data and dilutions were appropriate for imidacloprid analysis of the 5.97 ppb sample.

[3] The recovery in that sample was 89.5%. Validation of the updated Multi-Analyte Screen in 2021 resulted in higher and narrower control limits, which are currently being reexamined.

5. Imidacloprid is stable under storage conditions specified by EM SOPs.

Items 1 and 2: Laboratory and Field QA/QC

The results of the laboratory continuing QC samples—both blank and spike—that were analyzed along with the 5.97 ppb sample from Well 29 were within acceptable limits, with a few exceptions.[4] Imidacloprid recovery in the continuing QC was 88.5% (0.177 ppb detected of a 0.200 ppb spike level) and imidacloprid was not detected in the laboratory blank. As mentioned in the previous section, EM submitted field blanks to the lab when samples were collected from new well sites that had positive results. No field blank was collected at Well 29 in 2017 since EM had sampled that well for many years and it was a known positive well. For that sampling event, other wells were randomly selected as locations for the collection of field blanks to attain a minimum of 10% of the wells sampled. A field blank collected at a different well was extracted and analyzed in the same set as Well 29 and, as expected and required for quality assurance, no analytes were detected.

The EM Quality Assurance Officer submitted a blind spike to the laboratory that was analyzed and extracted in the same sample set as the 5.97 ppb sample. The blind spike did not include imidacloprid. The laboratory initially reported the spike results for the incorrect sample. This issue was found, corrected, and documented on the Chain of Custody (COC) by the project leader of EM's Well Network Study in 2017. The corrected result was reported in the Annual Well Network Study Summary (Garretson, 2018).

Items 3 and 4: Replicate Chemical Analysis and Instrument Data

To verify all data in the package, EM scientists recently reviewed the replicate data and the laboratory instrument data for the specific extraction and analysis set that contained Well 29. The 5.97 ppb sample collected from Well 29 matches replicate data for specific analytes on both the Triazine and Multi-Analyte Screens; the results for diuron, simazine, norflurazon, prometon, and non-detections on the Multi-Analyte Screen match the results for that well for the Triazine Screen from the same sampling event. These results show measurement agreement between the two screens. The instrument data indicate the laboratory properly analyzed imidacloprid in the Well 29 sample. The initial instrument signal for imidacloprid from Well 29 indicated a residue level above the upper limit of quantification (i.e., the result was outside the calibration range and noted as "no root" on the printout) (Attachment C). Subsequently, the sample was diluted and then analyzed, resulting in detectable

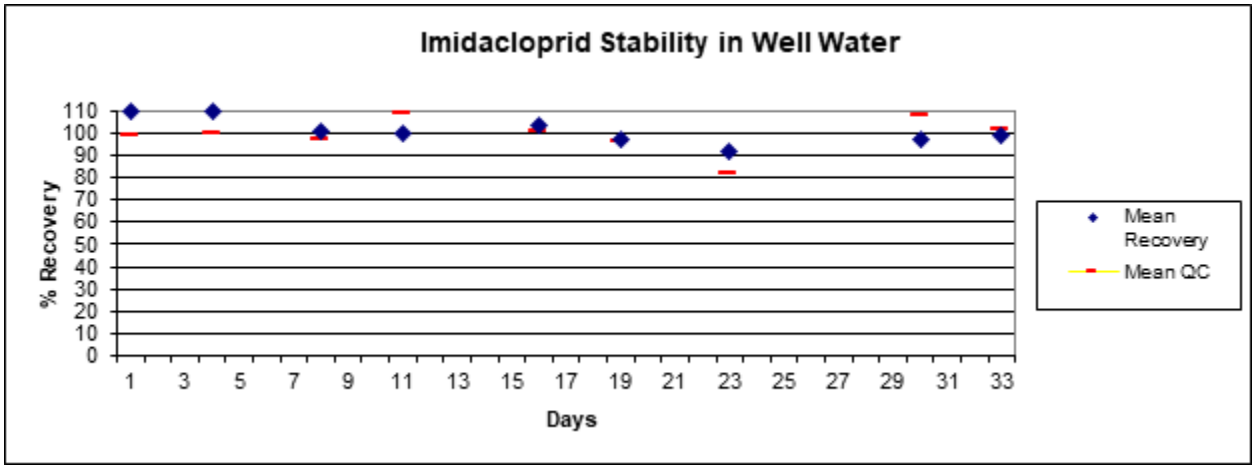
[4] Low spike recoveries for azoxystrobin, fenamiphos, and thiobencarb were not within acceptable limits. The limits are based on a bell-shaped curve and from time-to-time analytes may be recovered beyond the limits. The laboratory and EM track these results and when they are outside the limits too frequently, sample sets are reanalyzed or the method may be revalidated.

imidacloprid residue within the instrument calibration range. The raw data were processed and the imidacloprid concentration was reported from the diluted sample. To clarify, in the attached instrument data, the samples were initially run twice on the instrument, per the method, at a dilution rate of 4X the extract. After the alert that the sample was beyond the calibration, the chemist diluted the sample extract 10X more to be 40X lower than the original extract. The results of runs 3 and 4 were 5.92733 and 6.00579 µg/mL, respectively. The imidacloprid concentration recorded on the COC was reported as 5.97 ppb for the 1-Liter sample, an average of runs 3 and 4.

Item 5: Imidacloprid Storage Stability

In 2003, EM requested a storage stability study for imidacloprid and five degradates. As a parent compound, imidacloprid was found to be stable in well water in 1-Liter amber bottles stored at 4° C for 32 days (Figure 4). The results of the stored samples (blue diamonds) were similar to the quality control samples (red dashes) that were spiked on the day of extraction and analysis, meaning the samples showed no apparent difference due to storage. EM ensures that samples are delivered and extracted by the laboratory within the period indicated by the storage stability study. The current laboratory method for the Multi-Analyte Screen sets the maximum storage time at 28 days; therefore, all samples for imidacloprid were extracted within 28 days of collection.

Figure 4. Data from imidacloprid storage stability study



Information on Well within One-Mile Radius of Well 29

In 2020, as part of Study 328 (Kocis, 2020), EM sampled another well in the same section as Well 29. This well is 620 meters west of Well 29. The groundwater flow direction in this area is generally from NE to SW. This well was drilled in 1975 as an agricultural supply well; however, when EM sampled the well it was only used for drinking water. The well pad was in very good condition, and the surrounding

soil did not have cracks or any obvious sloping toward the well. The well owner did not know the drilled depth or the water level, and EM scientists were unable to take the water level because the vent cap plug was rusted closed. Since EM was unable to determine the well depth or depth to groundwater, it was not possible to determine if this well and Well 29 draw from the same part of the aquifer. However, agricultural supply wells are more likely to be drilled deeper than domestic wells and none of the analytes on the Triazine Screen that were detected in Well 29 were detected in this well. Both the Triazine and Multi-Analyte Screens were used to analyze samples from this well and imidacloprid was the only analyte detected. The concentrations of imidacloprid in the primary and backup samples were 0.055 and 0.056 ppb, respectively.

Detection Data Patterns

During Phase 1 of the Hearing, the Subcommittee asked EM if pesticide residue concentrations can drop significantly between sampling events. As stated at the Hearing, this is not an occurrence that EM's GWPP commonly observes. It is important to note that the Well Network was designed to evaluate concentrations of known contaminants whose use has been regulated to protect groundwater. Although the concentrations of pesticides in the Well Network have generally shown a pattern of declining concentrations, a review of EM data in the Well Inventory Database indicate that concentrations of bromacil and DACT (a simazine degradate) have periodically been variable in runoff-vulnerable areas when analyzed over multiple years (CDPR, 2022b). Imidacloprid is currently the only non-restricted use pesticide that has been detected in multiple wells over multiple years in the Well Network. It is not common for EM to have multiple sampling events for a newly detected pesticide in a single domestic well when initiating the pesticide detection response process. As identified in the Legal Agricultural Use Determination, all but one of the imidacloprid detections were below 0.7 ppb.

There are two other notable instances where follow-up sampling resulted in significant changes in pesticide concentrations. In January 2017, two domestic wells had detections of TPA, a chlorthal-dimethyl degradate, at concentrations of 101 and 22.7 ppb. When these wells were resampled in late May 2017, the respective concentrations were 38.2 and 12.7 ppb (Ruud, 2021).

Pesticide Use Report Data

During Phase 1 of the Hearing, the Subcommittee requested information about how imidacloprid is applied. The source for all pesticide use data is DPR's Pesticide Use Report (PUR) Database and its associated tables. Records of all agricultural and some non-agricultural pesticide applications are stored in this database. The data include information such as the location (county, township, range, and section) of the application, the pesticide product applied, the amount of product applied, the acres treated, the crop treated, and the date of the application. However, the application method reported

in the PUR is limited to aircraft or ground equipment. Ground applications can describe backpack sprayers, air blast spray rigs, chemigation, shanking in, or any number of other methods. DPR's Product/Label Database (CDPR, 2022c) lists the legal methods permitted for each pesticide product, but these often include several methods for a single product such as foliar spray, chemigation, and soil applications. If a product label allows for numerous application methods, it is not always possible to determine from the PUR data the specific application method that was used.

The actively registered imidacloprid products for use on agricultural crops allow for a variety of application methods, including chemigation, soil, and foliar applications. For some deciduous crops, the most likely application method can be determined based on the application rate and time of year. For some crops, the application rate is lower for foliar applications than for soil and chemigation applications. It is important to note that if the Subcommittee makes Finding 2 (that the agricultural use of the pesticide can be modified so that there is a high probability that the pesticide would not pollute the groundwater of the state) and the Director concurs, DPR would then proceed with identifying appropriate modifications and adopting regulations as needed outside of this hearing process.

HUMAN HEALTH REFERENCE LEVEL

Imidacloprid is a neurotoxic insecticide in the class of neonicotinoid pesticides. The toxicity of imidacloprid is largely due to interference of neurotransmission via the nicotinic cholinergic nervous system. Exposure to high levels of imidacloprid may cause loss of coordination, tremors, decreased activity, reduced body temperature, coma or even death. The primary target organs of imidacloprid toxicity are the nervous system, liver, and thyroid gland as evidenced in studies using laboratory animals. The US Environmental Protection Agency (US EPA) does not classify imidacloprid as a carcinogen, designating it as a Group E chemical showing evidence of non-carcinogenicity for humans.

Pollute is defined as "to introduce a pesticide product into the groundwaters of the state resulting in an active ingredient…above a level that does not cause adverse health effects, accounting for an adequate margin of safety." (Food & Agr. Code, § 13142, subd. (j).) One factor determining whether imidacloprid has polluted or threatens to pollute groundwater is determined by the human health reference level. After DPR's EM Branch detected imidacloprid above the reporting limit in vulnerable areas with high agricultural use, EM requested assistance from the HHA Branch to determine whether imidacloprid detected in well water would affect human health. HHA evaluated the human health risk of the maximum level of imidacloprid measured in well water by acute and chronic drinking water exposure analyses using toxicological endpoints established by DPR, and consumption rates for drinking water based on the National Health and Nutrition Examination Survey (NHANES) 2005-2010 database. HHA evaluated exposures for the United States population and for sensitive subpopulations, including infants, children, and women of childbearing age.

Restatement of Conclusions

1. HHA's Human Health Reference Level of 283 ppb, the critical Point of Departure (POD) of 5.5 mg/kg/day, and the method used to calculate both values are scientifically supportable for the purpose of determining whether imidacloprid residues detected in groundwater pose a health concern under the PCPA.

2. The POD (5.5 mg/kg/day) based on developmental neurotoxicity was established in the 2006 DPR Risk Characterization Document (RCD), a comprehensive risk assessment that was vetted through external scientific review.

3. The critical POD of 5.5 mg/kg/day was evaluated and selected as part of HHA Groundwater Evaluations conducted in both 2018 and 2021. This value remains the lowest regulatory POD among all that have been established as part of a comprehensive risk assessment process, including those recently established by the European Food Safety Authority (EFSA 2013), Health Canada's Pest Management Regulatory Agency (PMRA 2016), and US EPA (2017).

4. A new imidacloprid RCD is currently in preparation. It updates the toxicology database and includes new systematic literature review, dose-response evaluation, probabilistic dietary exposure assessment, occupational and residential exposure assessment, as well as an assessment of risk from aggregate exposures. At this point of the RCD development, HHA still considers the maximum detected imidacloprid residue of 5.97 ppb in groundwater not a risk to human health.

HHA's Review of Studies Published After 2006

During Phase 1 of the Hearing, the Subcommittee requested that HHA provide more information about studies published after 2006 that showed imidacloprid effects at doses lower than 5.5 mg/kg/day. The Systematic Review conducted in support of the forthcoming RCD has identified 3,499 published studies on imidacloprid. These studies have been screened for relevance and categorized as to their applicability for evaluating the human health risk of imidacloprid. Relevant studies are being examined for data that can be used to establish or refine the acute and chronic PODs for imidacloprid. These studies are analyzed for details such as the experimental design, the test system (e.g., animal model, treatment methods and conditions), data quality, statistical methods and significance, and dose response analysis. In so doing, HHA scientists determined the relevancy and applicability of using a particular study to establish a POD. This level of scrutiny is necessary when data from laboratory animals are used as a surrogate for human exposures to a pesticide.

Prior to Phase 1 of the Hearing, the Office of Environmental Health Hazard Assessment (OEHHA) submitted "Findings on the Health Effects of Imidacloprid Relevant to its Identification as a Potential Groundwater Contaminant." HHA previously identified and reviewed all but one study noted in the OEHHA findings document prior to issuing the 2021 groundwater evaluation. Zhao *et al.* (2021) was published after the groundwater evaluation was issued. With the exception of Bagri *et al.* (2015) and Badgujar *et al.* (2013), the published studies in the OEHHA findings document and discussed during Phase 1 of the Hearing contain experimental, design, reporting, or statistical issues that would preclude their use in establishing a critical POD for imidacloprid. The issues can be broadly grouped into four categories:

1. **No information on purity of test article –** In evaluating the toxicity of a pesticide, it is critical to know the purity as it determines the dose given to experimental animals. Without this information, it is also not possible to attribute the observed effects to the pesticide when they may have been caused by a toxic contaminant. Such studies cannot be used to establish a critical POD. This was the case with the studies by Bal *et al*. (2012a), Bal *et al*. (2012b), and Kara *et al*. (2015).

2. **Introduction of solvents to test article –** The studies by Khalil *et al.* (2017) and Zhao *et al.* (2021) employed an oral dosing solution containing the organic solvent dimethyl sulfoxide (DMSO); the dosing solution used in Zhao *et al.* (2021) also included the detergent TWEEN-20. Neither is typically used in the oral dosing solutions of guideline studies because they can affect the oral bioactivity of a compound and spuriously alter or modulate a compound's toxicity. This precludes the use of such findings to establish a critical POD.

3. **Lack of dose-response or statistical significance –** PODs derived from endpoint data lacking a dose response or statistically significant differences between treated and control groups, or from studies only examining a single dose level are associated with unacceptable uncertainty. This was the case with the studies by Abdel-Rahman Mohamed *et al*. (2017), Sun *et al*. (2016), and Sun *et al*. (2017).

4. **Confounding experimental condition -** Effects were only seen in groups of animals fed a high-fat diet, not in animals receiving standard lab diet. This is a confounding condition of treatment and not relevant for studies that are used as surrogates for human health effects. This was the case with the studies by Sun *et al*. (2016) and Sun *et al*. (2017).

HHA uses established best practices for risk assessment in evaluating and recommending reference targets and health protective levels for pesticides. These values must have biological relevancy, empirical consistency, and withstand scientific scrutiny. For imidacloprid, the drinking water evaluation and the preliminary assessments included in the forthcoming RCD support the conclusion that 5.97 ppb in groundwater does not pose a risk to human health.

Below is a summary of each study, the OEHHA-identified study effects, and HHA's comments.

Table 1. Reviews of Recent Imidacloprid Toxicity Studies

Study Reference	Study Design	OEHHA Study Effects	HHA Comment
Reproductive Toxicity			
Bal et al., 2012a	**Test article:** Imidacloprid (purity not specified) **Test system:** 8–9-week-old male Albino Wistar rats **N:** 6/dose **Exposure route:** Oral gavage **Dosing schedule:** Daily for 90 days **Doses:** 0, 0.5, 2, 8 mg/kg/day **Vehicle:** Not specified	Decreased BW, absolute weight of right cauda epididymis and vesicula seminalis, and sperm concentrations at 2 mg/kg/day (LOEL); 0.5 mg/kg/day (NOEL).	Study did not report the purity of imidacloprid, and the dosing vehicle was not specified.
Bal et al., 2012b*	**Test article:** Imidacloprid (purity not specified) **Test system:** 7-day-old male Wistar rats **N:** 6/dose **Exposure route:** Oral gavage **Dosing schedule:** Daily for 90 days **Doses:** 0, 0.5, 2, 8 mg/kg/d **Vehicle:** Corn oil	Decreased BW, serum testosterone, and absolute epididymis and right cauda epididymis weights at 0.5 mg/kg/day (LOEL); 0.05 mg/kg/day (ENEL).	Study did not report the purity of imidacloprid.
Zhao et al., 2021*	**Test article:** Imidacloprid (99.8% purity) **Test system:** 7–8-week-old male Wistar mice **N:** 10/dose **Exposure route:** Oral gavage **Dosing schedule:** Daily for 90 days **Doses:** 0, 0.06, 0.6 mg/kg/d **Vehicle:** Saline with 0.1% DMSO and 0.5% TWEEN-20	Decreased sperm concentration at 0.06 mg/kg/day (LOEL); 0.02 mg/kg/day (BMDL1SD).	Study used an atypical oral dosing solution containing dimethyl sulfoxide (DMSO) and TWEEN-20, an organic solvent and detergent, respectively.

Table 1. Reviews of Recent Imidacloprid Toxicity Studies

Study Reference	Study Design	OEHHA Study Effects	HHA Comment
Bagri et al., 2015	**Test article:** Imidacloprid (>98% purity) **Test system:** Male Swiss Albino mice (21-31 g) **N:** 6/dose **Dosing schedule:** Daily for 7, 14, or 28 days **Doses:** 0, 5.5, 11, 22 mg/kg/d **Vehicle:** 3% aqueous gum acacia	Increased frequency of abnormal sperm at 28 days of treatment at 5.5 mg/kg/day (LOEL); 0.6 mg/kg/day (BMDL1SD).	DPR has included this study in the weight of evidence for hazard identification in the upcoming draft RCD.
Abdel-Rahman Mohamed et al., 2017*	**Test article:** Imidacloprid (99.9% purity) **Test system:** 4-week-old (immature) and 7-week-old (mature) male Sprague-Dawley rats **N:** 5/dose **Exposure route:** Oral gavage **Dosing schedule:** Daily for 65 days **Doses:** 0, 1 mg/kg/d **Vehicle:** Corn oil	Decreased BW, seminal vesicle and testicular indices, testosterone levels, sperm concentration, motility, and viability; increased abnormal sperm at 1 mg/kg/day (LOEL); 0.1 mg/kg/day (ENEL).	Study only included a control and a single treatment dose.
Immunotoxicity			
Badgujar et al., 2013	**Test article:** Imidacloprid (>98% purity) **Test system:** 4–6-week-old female BALB/c mice **N:** 6-8/dose **Exposure route:** Oral gavage **Dosing schedule:** Daily for 28 days **Doses:** 0, 2.5, 5, 10 mg/kg/d **Vehicle:** 0.5% carboxymethylcellulose	Decreased DTH response (48-hr post challenge) at 5 mg/kg/day (LOEL); 0.8mg/kg/day ($BMDL_{1SD}$).	DPR has included this study in the weight of evidence for hazard identification in the upcoming draft RCD.
Developmental Neurotoxicity			
Kara et al., 2015	**Test article:** Imidacloprid (purity not specified) **Test system:** Newborn or 8–9-week-old male Wistar rats **N:** 6/dose **Exposure route:** Oral gavage **Dosing schedule:** Daily for 3 months **Doses:** 0, 0.5, 2, 8 mg/kg/d **Vehicle:** Corn oil	Increased escape latencies in Morris maze on test days 3-5 for pups at 2 mg/kg/day (LOEL); 0.5 mg/kg/day (NOEL).	Study did not report the purity of imidacloprid.

Table 1. Reviews of Recent Imidacloprid Toxicity Studies

Study Reference	Study Design	OEHHA Study Effects	HHA Comment
Neurotoxicity			
Khalil et al., 2017	**Test article:** Imidacloprid (100% purity) **Test system:** 3-month-old male Sprague-Dawley rats **N:** 6/dose **Exposure route:** Oral gavage **Dosing schedule:** Daily for 60 days **Doses:** 0, 0.5, 1 mg/kg/d **Vehicle:** DMSO	Decreased swim time in forced swimming test at 0.5 mg/kg/day (LOEL); 0.05 mg/kg/day ($BMDL_{1SD}$).	Study used an oral dosing solution containing DMSO.
Glucose Homeostasis			
Khalil et al., 2017*	**Test article:** Imidacloprid (100% purity) **Test system:** 3-month-old male Sprague-Dawley rats **N:** 6/dose **Exposure route:** Oral gavage **Dosing schedule:** Daily for 60 days **Doses:** 0, 0.5, 1 mg/kg/d **Vehicle:** DMSO	Increased levels of serum glucose; decreased levels of insulin at 1 mg/kg/day (LOEL); 0.1 mg/kg/day (ENEL). Note: Same study was reported under neurotoxicity, above.	Study used an oral dosing solution contained DMSO
Sun et al., 2016*	**Test article:** Imidacloprid (>98% purity) **Test system:** 5-week-old male C57BL/6J mice **N:** 3-8/dose **Exposure route:** Oral, in diet **Dosing schedule:** Daily for 12 weeks **Doses:** 0, 0.08, 0.8, 7 mg/kg/d (high fat diet); 0, 0.07, 0.7, 7 mg/kg/d (low fat diet) **Vehicle:** High or low-fat diet	Increased BW, adipocyte size, insulin levels in conjunction with a high fat diet, increased insulin resistance, and altered glucose homeostasis at 0.08 mg/kg/day (LOEL); 0.008 mg/kg/day (ENEL) Note: The doses above and listed in Study Design were the measured doses.	Study effects were observed only in the high fat diet group; most endpoints in the standard diet group lacked a dose response and statistical significance.

Table 1. Reviews of Recent Imidacloprid Toxicity Studies

Study Reference	Study Design	OEHHA Study Effects	HHA Comment
Sun et al., 2017*	**Test article:** Imidacloprid (>98% purity) **Test system:** 5-week-old female C57BL/6J mice **N:** 4-7/dose **Exposure route:** Oral, in diet **Dosing schedule:** Daily for 12 weeks **Doses:** 0, 0.08, 0.74, 6.66 mg/kg/d (high fat diet); 0, 0.07, 0.69, 6.69 mg/kg/d (low fat diet) **Vehicle:** High or low-fat diet	Increased BW, adipose tissue weights and adipocyte size in conjunction with a high fat diet at 0.74 mg/kg/day (LOEL); 0.08 mg/kg/day (NOEL) Note: The doses above and listed in Study Design were the measured doses.	Study effects were observed only in the high fat diet group; most endpoints in the standard diet group lacked a dose response and statistical significance.

BMDL = Benchmark dose lower limit - Lower limit of a one-sided 95% confidence interval; BW = Bodyweight; DTH = Delayed-type hypersensitivity; DMSO = Dimethyl sulfoxide; ENEL = Estimated no observed effect level (LOEL ÷ LOEL-to-NOEL Uncertainty Factor ($UF_{LOEL\text{-}to\text{-}NOEL}$) of 10); LOEL = Lowest observed effect level; NOEL = No observed effect level; POD = Point of Departure; *Not used by OEHHA for potential imidacloprid Public Health Concentrations (PHC); OEHHA focused on neurotoxicity and not glucose homeostasis as the endpoint from Khalil et al. (2017) to derive a potential PHC.

Relevance of Study Used to Establish the Critical Chronic POD in 2006 Risk Characterization

HHA recommended the acute HHRL for screening imidacloprid residues in groundwater because it was applicable to both acute and chronic exposures and it was more protective. Both the acute and chronic HHRLs are based on the acute POD for developmental neurotoxicity (Sheets 2001). However, this response focuses on the critical chronic POD that was based on thyroid toxicity in rats (Eiben and Kaliner, 1991) because OEHHA findings document presented revised BMD modeling outputs of endpoint data originally reported in this study. OEHHA suggested this approach because it would result in a lower POD that could then be used to calculate a lower HHRL. HHA used the same endpoint data to establish the critical chronic no-observed-effects level in the 2006 RCD. HHA has re-modeled the Eiben and Kaliner (1991) dataset using updated BMD practices for the forthcoming RCD. These practices include the selection of a benchmark response (BMR) and all other modeling parameters on recommendations in the 2012 US EPA Benchmark Dose Technical Guidance and a comprehensive evaluation of all relevant data. Using a 10% BMR, re-modeling of the Eiben and Kaliner (1991) dataset resulted in a BMD value of 1.9 mg/kg/day. A chronic HHRL calculated with this POD would be 191 ppb (vs. 552 ppb). Even with this preliminarily revised chronic POD, HHA still considers the detected imidacloprid residue of 5.97 ppb in groundwater not a risk for human health.

Wisconsin Department of Health Services and Minnesota Department of Health Drinking Water Levels

The OEHHA findings document, and public and state agency comments made during the Phase 1 of the Hearing, noted that guidance levels for imidacloprid in drinking water proposed by the Minnesota Department of Health (MDH) and the Wisconsin Department of Health Services (WDHS) are lower than the DPR levels.

There are no California or federally established maximum contaminant levels (MCLs) or Public Health Goals (PHGs) established for imidacloprid. US EPA has established a Human Health Benchmark for Pesticides (HHBPs) value for imidacloprid, which is a non-enforceable advisory value in drinking water. However, US EPA, DPR, EFSA, and PMRA have each established regulatory targets for imidacloprid. The reference doses and PODs established by these agencies are equal to or higher than those established by DPR in its 2006 RCD (see Table 2 below). In addition, in OEHHA's most recent imidacloprid exposure assessment, it used DPR's 2006 established values.

Table 2. Comparison of Established Points of Departure and Reference Doses for Imidacloprid

Risk Assessment	Acute POD (mg/kg/day)	Total UF	Acute RfD (mg/kg/day)	Chronic POD (mg/kg/day)	UF	Chronic RfD (mg/kg/day)
DPR 2006	5.5	100	0.06	5.7	100	0.06
US EPA 2017	8	100	0.08	8	100	0.08
PMRA 2016	8	100	0.08	5.7	100	0.06
EFSA 2013	8	100	0.08	5.7	100	0.06
WHO 2019	8	100	0.08	8	100	0.08
OEHHA 2015	5.5	100	0.06	NA	NA	NA

POD = Point of Departure; UF = uncertainty factor; RfD = reference dose
US EPA, OEHHA, PMRA, and EFSA all used PODs based on data from the same studies evaluated by DPR; OEHHA's Imidacloprid Exposure Assessment for Asian Citrus Psyllid Control (2015) used a 2006 DPR POD

On February 1, 2022, the Wisconsin Department of Health Services (WDHS) proposed groundwater standards (an enforcement standard of 0.2 ppb and a preventive action limit of 0.02 ppb) based on data from Sun *et al*. (2016). As discussed above, HHA cannot rely on the studies by Sun *et al*. for setting or supporting a POD because of their study design. It is noteworthy that on February 23, 2022, the Wisconsin Natural Resources Board did not approve the proposed groundwater quality standards (https://dnr.wisconsin.gov/topic/Groundwater/NR140.html). While OEHHA referenced the WDHS

proposed groundwater standards in their findings document, they did not use the Sun *et al*. (2016) study to derive a proposed PHC.

The Minnesota Department of Health (MDH) established its Acute Non-Cancer Health Based Value (100 ppb) on an acute POD (8 mg/kg/day) used by multiple regulatory agencies (noted in Table 2, above). The MDH short-term, subchronic, and chronic health-based values (2 ppb) are based on Badgujar *et al.* (2013). These levels were derived using a different methodology than that used by DPR, OEHHA and US EPA. For example, both MDH and OEHHA established the same short-term/chronic POD from the Badgujar *et al.* (2013) (the MDH POD was 0.820 mg/kg/day and OEHHA's was 0.8 mg/kg/day) but arrived at different chronic health levels: 2 ppb (MDH) and 10 ppb (OEHHA). In conclusion, the MDH levels cannot be directly compared to levels developed by DPR or other agencies.

Methodologies for Establishing Public Health Screening Levels for Imidacloprid in Drinking Water

OEHHA provided background on the public health protective concentrations (PHC) and described their calculation. OEHHA described their methodology and stated that it differed from the one used by DPR. OEHHA then used their methodology and selected PODs to calculate alternative PHCs. However, both DPR and OEHHA derive their respective public health screening levels using the same general approach that only differ in the input values selected. In fact, DPR HHRLs, OEHHA PHCs, and US EPA HHBPs can all be calculated using the same general formula:

(POD/UF_{total} mg/kg/day) ÷ Drinking Water Consumption (DWC) (L or kg water/kg BW) x Relative Source Contribution (RSC)

DPR HHRLs are calculated following an evaluation of risk for the maximum residue level:

1) Margin of Exposure or MOE = POD (mg/kg bodyweight/day) ÷ Exposure (mg/kg bodyweight/day)
2) Acute or Chronic HHRL (ppb) = (Estimated Risk Level (MOE)/UF_{total}) x (Residue Level ppb)

Both methods give the same results.

The main differences between the reference levels calculated by different regulatory bodies result from the use of four different parameters:

1) POD
2) UF_{total}
3) DWC
4) RSC

In each case, the selection of parameters is driven by default assumptions that, while intended to be conservative and therefore health protective, can differ markedly depending on the user. Each will be discussed in turn; PODs are discussed above.

UF_{total}

OEHHA stated that they use a default total uncertainty factor (UF_{total}) of 300 unless the study is conducted in "juvenile and adult lifestages" with characterized susceptibility. This includes a factor of 10 for interspecies difference and a factor of 30 for intraspecies difference that includes an additional factor of 3 to account for sensitive subpopulations. Both DPR and US EPA consider a UFtotal or target MOE of 100 to be an appropriate default. DPR will use target MOEs (UF_{total}) that differ from the default; the decision is based on the availability of data to support it.

DWC

DPR, US EPA, and OEHHA all use high-end estimates of consumption for risk assessment. OEHHA uses estimates from their Technical Support Document for Exposure Assessment and Stochastic Analysis (2012) while DPR and US EPA use estimates based on the National Health and Nutrition Examination Survey (NHANES)/ "What We Eat in America" (WWEIA) survey (2005-2010). This is the same consumption dataset used for comprehensive dietary risk assessment. Acute drinking water consumption values used by DPR, US EPA, and OEHHA are summarized below (Table 3). It should be noted that the acute consumption values are all similar.

Table 3. DWC values used by DPR, US EPA, and OEHHA

User	Duration	DWC (L or kg water /kg BW/day)
DPR	acute	0.20
US EPA	acute	0.15
OEHHA	acute	0.23

RSC

The Relative Source Contribution factor is used to account for the possibility that exposure to a residue may come from other sources of food in addition to that from drinking water. An RSC of 0.2 assumes that the exposure from drinking water will be 20% of the total exposure from other sources that make up the remainder (80%). An RSC is intended to be used with mean intake estimates and is not applicable to acute exposure screening using a maximum concentration. For this reason, DPR and US

EPA do not use an RSC for calculating acute reference levels. However, OEHHA uses an RSC of 0.2 for acute exposures.

Using FIFRA Guideline, GLP Studies, and Open Literature to Derive a Point of Departure

DPR Risk Characterization Documents evaluate the entire database for information relevant to defining the potential impact of a pesticide on human health. HHA uses FIFRA guideline studies (Title 40, Code of Federal Regulations, Part 158) and other studies that conform to Good Laboratory Practices (GLP). These studies are submitted to DPR by the pesticide registrant for registration purposes and are largely designed to provide data that can be used for risk assessment in a regulatory environment. HHA also reviews published literature and any other documents that are pertinent to human health risk assessment. HHA has derived critical PODs from both registrant submitted and published studies. Regardless of the type of study, HHA evaluates the quality of data against established criteria, such as if the effect showed a dose-response and was treatment related, if statistical significance was defined, and if the study used the appropriate test model. HHA considers these criteria when establishing a critical POD using best practices for risk assessment as described by the National Research Council (1983, 1994 and 2015, https://nap.nationalacademies.org/read/21664/chapter/1).

Even if a study is not used as the basis of a critical POD, it can add to the weight of evidence for pesticidal effects. The weight of evidence informs the Risk Characterization phase of the risk assessment process. In this final step in risk assessment, the hazards, dose-response, and exposure assessment are combined to qualify and quantify the overall risk to human health from pesticides. The Risk Characterization contains explanations of the assumptions and uncertainty factors, as well as the strength of the overall database. The weight of evidence can describe findings that were compelling and supportive of the final conclusions, regardless of study type.

Together, the FIFRA Guideline (GLP) studies and open literature create the entirety of the database for information relevant to defining the potential impact of a pesticide on human health. From this database, DPR can confidently calculate risk that reflects the most current and appropriate data on which to base human health protective levels.

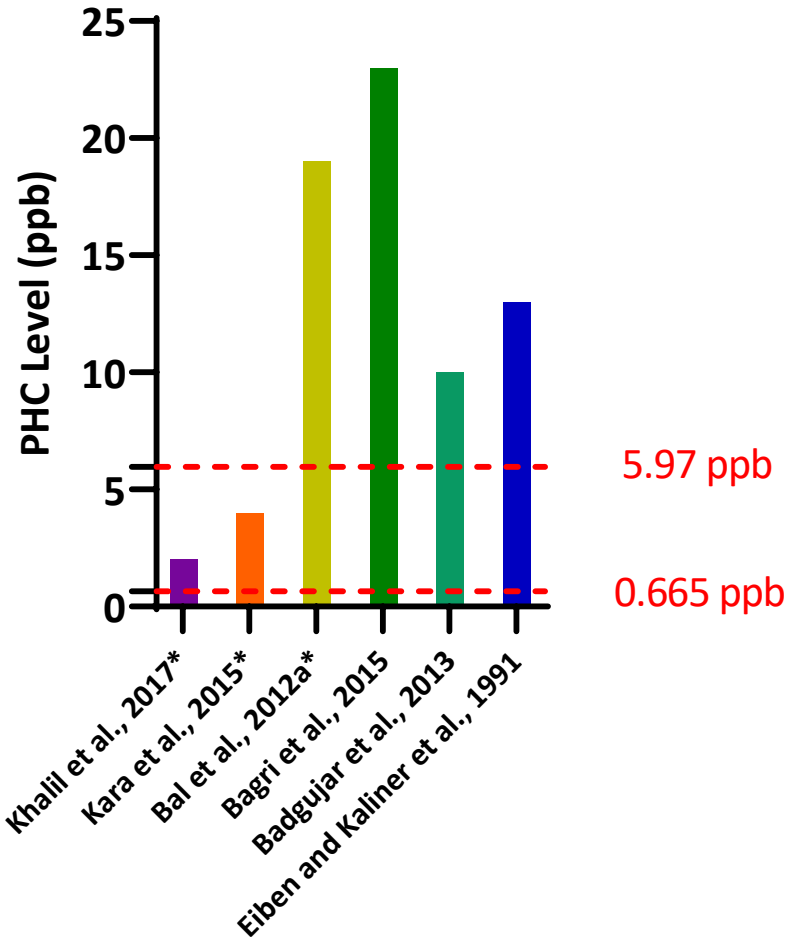
CONCLUSION

When the pesticide detection response process for imidacloprid was initiated in September 2021, EM detected imidacloprid above the RL of 0.05 ppb in 15 wells, with concentrations ranging from 0.051 ppb to 5.97 ppb. Fourteen additional wells had trace detections below the RL of 0.05 ppb but above the MDL of 0.01 ppb. The 5.97 ppb detection is the highest concentration of imidacloprid detected.

From 2015 through 2021, all other quantifiable detections of imidacloprid ranged from 0.022 to 0.665 ppb.

DPR's Human Health Reference Level of 283 ppb and the critical POD of 5.5 mg/kg/day were calculated with scientifically supportable methods. The highest imidacloprid detection of 5.97 ppb is lower than DPR's Human Health Reference Level of 283 ppb. While DPR is confident that its Human Health Reference Level is scientifically supportable, even if the studies that OEHHA offered are considered, the 5.97 ppb imidacloprid detection is below all but two of the potential PHCs suggested by OEHHA and the next highest detection (0.665 ppb) is below all of them (Figure 5). The three proposed PHCs flagged with an asterisk are based on studies with experimental design and reporting issues that preclude their use for establishing reference levels for imidacloprid.

Figure 5. Plot of OEHHA PHC levels and two highest detections of imidacloprid in groundwater (*denotes studies not applicable for HHA POD derivation)



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Attachment A

#29

2017 sampling:

Looks like noone is living in home.
Water from well was
slightly brownish in color
and was carrying sediment.
Not drinkable.
The well was being
used for a hose
to sprinkle down the
loading area to keep
dust down during harvest.

2018 sampling:

Well is functioning better,
but still is some (less)
sediment in water & slight (less)
brownish color to water.
No one is living in home
serviced by well.

2021

ABANDONED HOUSE STILL.
WATER WAS CLEAR

#29

STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

WELL DATA

State No. 15S/22E/03
Rechecked 4.17.13
BRANCH

Owner [redacted]
Address
Tenant
Address
State No.
Other No. [redacted]
Type of Well: Hydrograph ☐ Key ☐ Index ☐ Semiannual ☐
Location: County Fresno Basin No.
U.S.G.S. Quad. Quad. No.
¼ ¼ Section 03 Twp. 15 Rge. 22E MD SB H Base & Meridian
Description

Reference Point description [redacted]

which is ft. above below land surface. Ground Elevation ft.
Reference Point Elev. ft. Determined from
Well: Use Domestic Condition Depth ft.
Casing, size Co in., perforations

Measurements By: DWR ☐ USGS ☐ USBR ☐ County ☐ Irr. Dist. ☐ Water Dist. ☐ Cons. Dist. ☐
Chief Aquifer: Name Depth to Top Aq. Depth to Bot. Aq.
Type of Material Perm. Rating Thickness
Gravel Packed? Yes ☐ No ☐ Depth to Top Gr. Depth to Bot. Gr.
Supp. Aquifer Depth to Top Aq. Depth to Bot. Aq.
Driller
Date drilled Log, filed open (1) confidential (2)
Equipment: Pump, type submersible make
Serial No. Size of discharge pipe in.
Power, Kind Make
H. P. Motor Serial No.
Elec. Meter No. Transformer No.
Yield G.P.M. Pumping level ft.

Water Analysis: Min. (1) San. (2) H.M. (3)
Water Levels available: Yes (1) No
Period of Record: Begin End
Collecting Agency:
Prod. Rec. (1) Pump Test (2) Yield (3)

[redacted]

REMARKS

Study # 182 Well Location # 29
Sample Date: 9.1.99
Samplers' Initials: PF
Chemicals Analyzed For:
Atrazine Simazine Diuron
Prometon Bromacil Prometryn
Hexazinone Cyanizine Metribuzin
Norflurazon DEA ACET DACT
Sample Port:
After Pump ☑ or After Tank ☐

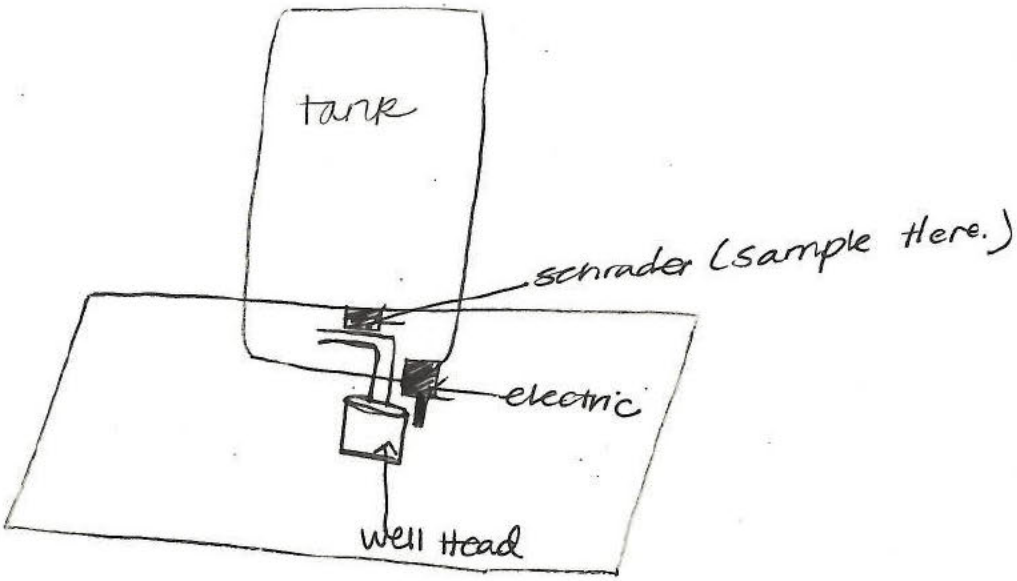
Recorded by: MS
Date 9.1.99

VR 429

#29

SKETCH (INCLUDE WELL HEAD, SAMPLE PORT, TANK, SLOPE, WELL CONDITION, ANYTHING UNUSUAL SUCH AS CRACKS, HOLES, ETC.)

Draw the sample port clearly so that it's position in relation to the well head and the tank is evident.



ATTACH POLAROIDS

SITE DESCRIPTION

Crops adjacent to well site
- North - grapes
- South - " "
- East - " "
- West - " "

Comments:

* power switch in tank house behind main House. (Blue switch on bottom, in multi-breaker Box.)
* pump turned on @ 18.

[redacted]

Include on Photo:
Date, Study #, Owner Name
T/R-Section

#29

CALIFORNIA STATE DEPARTMENT OF PESTICIDE REGULATION

WELL INFORMATION

STUDY NUMBER 182 WELL OWNER [redacted]

TWNSHP/RNG-SEC 15S/22E/03 SAMPLING ADDRESS [redacted]

LOCATION CODE _____ [redacted]

CHEMICALS ANALYZED: Atrazine, Simazine, Diuron, Prometon, Bromacil, Prometryn, Hexazinone, Cyanazine, Metribuzin, Norflurazon, DEA, ACET, DACT

WELLCONDITION

CASING

- ✓ PVC
- O STEEL
- O OTHER
- O CRACKS
- O RUST
- O HOLES
- 6" DIAMETER "

CAP

- O CRACKS
- O RUST
- O HOLES
- O OTHER

CEMENT PAD

- O CRACKS
- 4x8 AREA FT²
- 4" HEIGHT "

WELL LOCATION

- O CRACKS IN SOIL
- O DEPRESSED
- O BERMED
- level SLOPE
- sand SOIL TYPE
- ✓ HERBICIDE USE (around grapes)

SHED

- O WOOD
- O ALUMINUM
- O GARAGE
- O OTHER

SHED CONDITION

- O GOOD
- O POOR

SHED CONDITION (CONT.)

- O PESTICIDE STORAGE
- LIST _____

WELL USE

- ✓ DOMESTIC
- O IRRIGATION

PUMP TYPE

- ✓ SUBMERSIBLE
- O TURBINE
- O JET

SAMPLE PORT

- O FAUCET
- ✓ SCHRADER
- O PRESSURE RELEASE VALVE
- O OTHER

SAMPLE PORT LOCATION

- ✓ AFTER PUMP
- O AFTER TANK

OTHER WELLS ON PROPERTY

- O DOMESTIC
- ✓ IRRIGATION
- O ABANDONED
- O TEMP. SHUT DOWN
- O MONITORING
- O OTHER
- _____ DISTANCE FROM SAMPLE WELL '

DATE 9·1·99

SAMPLE NUMBERS: 337-340

TRIAZINE SCREEN _____

pH 7.4

#29

Well 29
DWR 15/22-3

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

I No. [redacted] No. [redacted]
gan [redacted]-93, Ended [redacted]-93
Local Permit Agency Fresno County Dept. Environmental Health Serv.
Permit No. [redacted] Permit Date [redacted]

GEOLOGIC LOG

ORIENTATION (✓) XX VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DEPTH TO FIRST WATER ___ (Ft) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0'	3'	Top Sandy Soil
3'	17'	Sand
17'	23'	Clay
23'	28'	Sand
28'	45'	Clay
45'	62'	Sand
62'	70'	Cobble Stones, unable to drill deeper

OUTSIDE CORC. CLAY AREA

TOTAL DEPTH OF BORING 70' (Feet)
TOTAL DEPTH OF COMPLETED WELL 70' (Feet)

WELL OWNER

[redacted] ZIP

or Township 15S Range 22E Section 3
or Latitude ___ DEG. ___ MIN. ___ SEC. NORTH Longitude ___ DEG. ___ MIN. ___ SEC. WEST

LOCATION SKETCH

NORTH
Same as Permit
WEST EAST
SOUTH
Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

XX NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (*Describe Procedures and Materials Under "GEOLOGIC LOG"*)

PLANNED USE(S) (✓)
___ MONITORING

WATER SUPPLY
XX Domestic
___ Public
___ Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD Rotery FLUID Water

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 36' (Ft.) & DATE MEASURED [redacted]-93
ESTIMATED YIELD* 75 (GPM) & TEST TYPE Air
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CORRUGATED	FILL PIPE	MATERIAL/ GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0'	52'	12"	X				PVC	6"	Class	
52'	70'	12"		X			PVC	6"	160	0.045

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0'	20'	XX			Portland
20'	52'			XX	Cuttings
52'	70'			XX	Gravel

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME [redacted]
ADDRESS
Signed

DWR 188 REV. 7-90 IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Attachment B

Table 2. Well 29 detection data from the Triazine Screen, imidacloprid analysis from the Multi-Analyte Screen, and nitrate analysis. Pesticide results are in parts per billion (ppb) and nitrate results are in parts per million (ppm).

Chem	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
ACET	0.547	0.650	0.542	0.452	0.377	0.236	0.251	0.278	0.211	0.145	0.201	0.208	0.143	0.142	0.058	0.074		0.062					
DACT	0.580	0.540	0.616	0.524	0.418	0.358	0.483	0.426	0.393	0.303	0.164	0.387	0.230	0.161	0.094	0.166	0.090	0.157	0.113	0.113	0.092	0.095	0.083
Diur													0.059	0.071									
DSMN						0.813	0.939	0.915	0.814	0.636	0.413	0.992	0.820	0.666	0.250	0.175	0.213	0.163	0.229	0.160	0.218	0.202	0.176
Norf	0.262	0.180	0.099	0.101	0.199	0.065	0.064	0.106	0.103	0.077		0.145	0.211	0.164									0.020
Sim	0.142	0.150	0.162	0.145	0.123	0.062	0.059	0.086	0.067				0.053										
Imid																	T		5.97	0.095	T	0.053	0.045
Nitr			44.7	58.0	72.2	66.4	76.2	81.9	90.3	98.8	68.6	63	69	72	86	63	122	71	103	123	100	96	163

Blank spaces indicate there was no chemical detected. Trace detections are only included for imidacloprid
The pesticide reporting limit is 0.050 parts per billion from 1999-2020 and varied by analyte in 2021.
ACET: deisopropyl atrazine; degradate of atrazine and simazine.
DACT: diaminochlortriazine; degradate of simazine.
Diur: diuron
DSMN: desmethyl norflurazon; degradate of norflurazon.
Norf: norflurazon
Sim: simazine
Imid: imidacloprid
Nitr: nitrate
Reported pesticide use in section and adjacent sections (CDPR, 2022:

Diuron was last reported used in section in 2004; and in adjacent sections in 2013
Norflurazon was last reported used in section in 2007; and in adjacent sections in 2008
Simazine was last reported used in section in 2014; and in adjacent sections in 2019

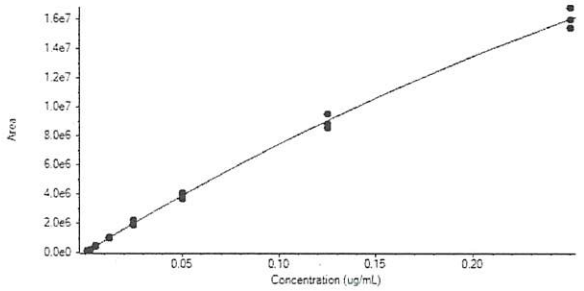
Attachment C

Sample Inj # and Name	Std Conc	RT / Exp. RT	Area	Dilution Factor	Calc. Conc. (ug/mL)	Accuracy	Ion Ratio - Calculated / Expected	Ratio Flag	Used
#72 CC 0.025_H	0.02500	5.86 5.85	1285977	1	0.02637	105.47	0.276 0.269		
#73 2016-3033 Dil 1:10	N/A	N/A 5.85	N/A	40	N/A	N/A	0.000 0.269	Ratio Fail	
#74 2016-3033 Dil 1:10	N/A	N/A 5.85	N/A	40	N/A	N/A	0.000 0.269	Ratio Fail	
#75 1:1 MeOH:H2O	N/A	N/A 5.85	N/A	1	N/A	N/A	0.000 0.269	Ratio Fail	
#76 CC 0.025_H	0.02500	5.85 5.85	1241573	1	0.02544	101.74	0.274 0.269		

Analyte Name: Imidacloprid 1

Correlation : 0.9989

Regression : y = -6.61606e7 x^2 + 8.07145e7 x + 7827.14647 (r = 0.99890) (weighting: 1 / x)



Results Summary

Sample Inj # and Name	Std Conc	RT / Exp. RT	Area	Dilution Factor	Calc. Conc. (ug/mL)	Accuracy	Ion Ratio - Calculated / Expected	Ratio Flag	Used
#1 1:1 MeOH:H2O	N/A	N/A 3.50	N/A	1	N/A	N/A	0.000 0.869	Ratio Fail	
#2 CC 0.00125_H	0.00125	3.51 3.50	104896	1	0.00120	96.31	0.838 0.869		
#3 CC 0.0025_H	0.00250	3.51 3.50	206461	1	0.00247	98.64	0.869 0.869		
#4 CC 0.005_H	0.00500	3.51 3.50	391600	1	0.00477	95.47	0.859 0.869		
#5 CC 0.0125_H	0.01250	3.51 3.50	985650	1	0.01224	97.90	0.856 0.869		
#6 CC 0.025_H	0.02500	3.50 3.50	1871395	1	0.02354	94.17	0.877 0.869		
#7 CC 0.05_H	0.05000	3.51 3.50	3637688	1	0.04676	93.53	0.912 0.869		
#8 CC 0.125_H	0.12500	3.51 3.50	8533087	1	0.11681	93.44	0.875 0.869		
#9 CC 0.25_H	0.25000	3.51 3.50	15462210	1	0.23784	95.13	0.888 0.869		

Sample Inj # and Name	Std Conc	RT / Exp. RT	Area	Dilution Factor	Calc. Conc. (ug/mL)	Accuracy	Ion Ratio - Calculated / Expected	Ratio Flag	Used
#10 1:1 MeOH:H2O	N/A	N/A 3.50	N/A	1	N/A	N/A	0.000 0.869	Ratio Fail	
#11 1:1 MeOH:H2O	N/A	N/A 3.50	N/A	1	N/A	N/A	0.000 0.869	Ratio Fail	
#12 Blk 2016-3085	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#13 Spk 2016-3086	0.20000	3.51 3.50	3370016	4	0.17274	86.37	0.870 0.869		
#14 1:1 MeOH:H2O	N/A	N/A 3.50	N/A	1	N/A	N/A	0.000 0.869	Ratio Fail	
#15 1:1 MeOH:H2O	N/A	N/A 3.50	N/A	1	N/A	N/A	0.000 0.869	Ratio Fail	
#16 2016-3029	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#17 2016-3030	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#18 2016-3031	N/A	3.51 3.50	30737	4	0.00114	N/A	0.984 0.869		
#19 2016-3032	N/A	3.51 3.50	91483	4	0.00415	N/A	0.918 0.869		
(b) #20 2016-3033	N/A	3.51 3.50	52647506	4	no root	N/A	0.881 0.869		False
#21 2016-3034	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#22 2016-3035	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#23 2016-3036	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#24 2016-3037	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#25 2016-3038	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#26 2016-3039	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#27 2016-3040	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#28 2016-3041	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#29 2016-3042	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#30 2016-3043	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#31 1:1 MeOH:H2O	N/A	N/A 3.50	N/A	1	N/A	N/A	0.000 0.869	Ratio Fail	
#32 CC 0.00125_H	0.00125	3.51 3.50	101420	1	0.00116	92.85	0.887 0.869		
#33 CC 0.0025_H	0.00250	3.51 3.50	207673	1	0.00248	99.24	0.834 0.869		
#34 CC 0.005_H	0.00500	3.51 3.50	404490	1	0.00493	98.69	0.884 0.869		
#35 CC 0.0125_H	0.01250	3.51 3.50	1038284	1	0.01290	103.23	0.841 0.869		
#36 CC 0.025_H	0.02500	3.51 3.50	1949344	1	0.02455	98.19	0.911 0.869		
#37 CC 0.05_H	0.05000	3.52 3.50	3963662	1	0.05116	102.31	0.882 0.869		
#38 CC 0.125_H	0.12500	3.51 3.50	8823007	1	0.12127	97.02	0.859 0.869		
#39 CC 0.25_H	0.25000	3.51 3.50	15986216	1	0.24863	99.45	0.841 0.869		
#40 1:1 MeOH:H2O	N/A	N/A 3.50	N/A	1	N/A	N/A	0.000 0.869	Ratio Fail	

(b) SAMPLE ABOVE CALIBRATION RANGE, ORIGINAL SAMPLE WAS DILUTED & RE-ANALYZED. // SM 5/31/17

AB SCIEX Analyte Summary Report

Created with Analyst Reporter
Date: 05/23/17 11:08:45 AM

Sample Inj # and Name	Std Conc	RT / Exp. RT	Area	Dilution Factor	Calc. Conc. (ug/mL)	Accuracy	Ion Ratio - Calculated / Expected	Ratio Flag	Used
#41 1:1 MeOH:H2O	N/A	N/A 3.50	N/A	1	N/A	N/A	0.000 0.869	Ratio Fail	
#42 Blk 2016-3085	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#43 Spk 2016-3086	0.20000	3.51 3.50	3515146	4	0.18049	90.24	0.871 0.869		
#44 1:1 MeOH:H2O	N/A	N/A 3.50	N/A	1	N/A	N/A	0.000 0.869	Ratio Fail	
#45 1:1 MeOH:H2O	N/A	N/A 3.50	N/A	1	N/A	N/A	0.000 0.869	Ratio Fail	
#46 2016-3029	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#47 2016-3030	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#48 2016-3031	N/A	3.51 3.50	35321	4	0.00136	N/A	0.871 0.869		
#49 2016-3032	N/A	3.51 3.50	97440	4	0.00445	N/A	0.912 0.869		
(6) #50 2016-3033	N/A	3.51 3.50	56507736	4	no root	N/A	0.853 0.869		False
#51 2016-3034	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#52 2016-3035	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#53 2016-3036	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#54 2016-3037	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#55 2016-3038	N/A	3.51 3.50	24947	4	0.00085	N/A	0.000 0.869	Ratio Fail	
#56 2016-3039	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#57 2016-3040	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#58 2016-3041	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#59 2016-3042	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#60 2016-3043	N/A	N/A 3.50	N/A	4	N/A	N/A	0.000 0.869	Ratio Fail	
#61 1:1 MeOH:H2O	N/A	N/A 3.50	N/A	1	N/A	N/A	0.000 0.869	Ratio Fail	
#62 CC 0.00125_H	0.00125	3.52 3.50	107266	1	0.00123	98.66	0.854 0.869		
#63 CC 0.0025_H	0.00250	3.51 3.50	212679	1	0.00254	101.73	0.888 0.869		
#64 CC 0.005_H	0.00500	3.51 3.50	453596	1	0.00555	110.96	0.823 0.869		
#65 CC 0.0125_H	0.01250	3.51 3.50	1055427	1	0.01312	104.96	0.895 0.869		
#66 CC 0.025_H	0.02500	3.52 3.50	2181292	1	0.02755	110.20	0.844 0.869		
#67 CC 0.05_H	0.05000	3.51 3.50	4095868	1	0.05295	105.89	0.893 0.869		
#68 CC 0.125_H	0.12500	3.52 3.50	9517070	1	0.13212	105.70	0.861 0.869		
#69 CC 0.25_H	0.25000	3.52 3.50	16843470	1	0.26703	106.81	0.887 0.869		
#70 1:1 MeOH:H2O	N/A	N/A 3.50	N/A	1	N/A	N/A	0.000 0.869	Ratio Fail	
#71 1:1 MeOH:H2O	N/A	N/A 3.50	N/A	1	N/A	N/A	0.000 0.869	Ratio Fail	

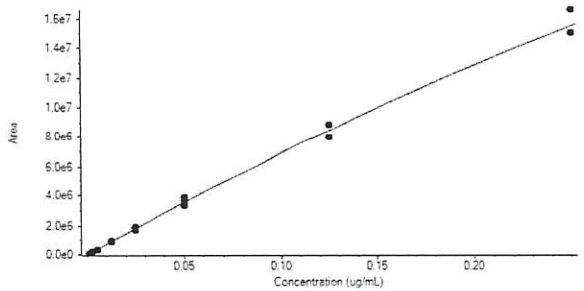
(b) See comment on page 44. SM 5/31/17

Sample Inj # and Name	Std Conc	RT / Exp. RT	Area	Dilution Factor	Calc. Conc. (ug/mL)	Accuracy	Ion Ratio - Calculated / Expected	Ratio Flag	Used
#72 CC 0.025_H	0.02500	3.51 3.50	2119468	1	0.02675	106.99	0.872 0.869		
#73 2016-3033 Dil 1:10	N/A	3.51 3.50	10515593	40	5.92733	N/A	0.862 0.869		
#74 2016-3033 Dil 1:10	N/A	3.52 3.50	10635189	40	6.00579	N/A	0.880 0.869		
#75 1:1 MeOH:H2O	N/A	N/A 3.50	N/A	1	N/A	N/A	0.000 0.869	Ratio Fail	
#76 CC 0.025_H	0.02500	3.51 3.50	1932663	1	0.02433	97.33	0.888 0.869		

Analyte Name: Linuron 1

Correlation : 0.99843

Regression : y = -4.46430e7 x^2 + 7.30653e7 x + 3375.71611 (r = 0.99843) (weighting: 1 / x)



Results Summary

Sample Inj # and Name	Std Conc	RT / Exp. RT	Area	Dilution Factor	Calc. Conc. (ug/mL)	Accuracy	Ion Ratio - Calculated / Expected	Ratio Flag	Used
#1 1:1 MeOH:H2O	N/A	N/A 5.70	N/A	1	N/A	N/A	0.000 1.007	Ratio Fail	
#2 CC 0.00125_H	0.00125	5.62 5.70	94908	1	0.00125	100.30	1.003 1.007		
#3 CC 0.0025_H	0.00250	5.63 5.70	183729	1	0.00247	98.88	1.053 1.007		
#4 CC 0.005_H	0.00500	5.62 5.70	343173	1	0.00466	93.28	1.066 1.007		
#5 CC 0.0125_H	0.01250	5.62 5.70	897916	1	0.01234	98.69	1.007 1.007		
#6 CC 0.025_H	0.02500	5.61 5.70	1669640	1	0.02313	92.53	1.055 1.007		
#7 CC 0.05_H	0.05000	5.61 5.70	3323961	1	0.04678	93.57	1.063 1.007		
#8 CC 0.125_H	0.12500	5.62 5.70	7961472	1	0.11733	93.86	0.997 1.007		
#9 CC 0.25_H	0.25000	5.62 5.70	15025472	1	0.24112	96.45	0.977 1.007		