

Summary Report of Pesticide Sampling  
Groundwater Monitoring Program  
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October 2019

## INTRODUCTION

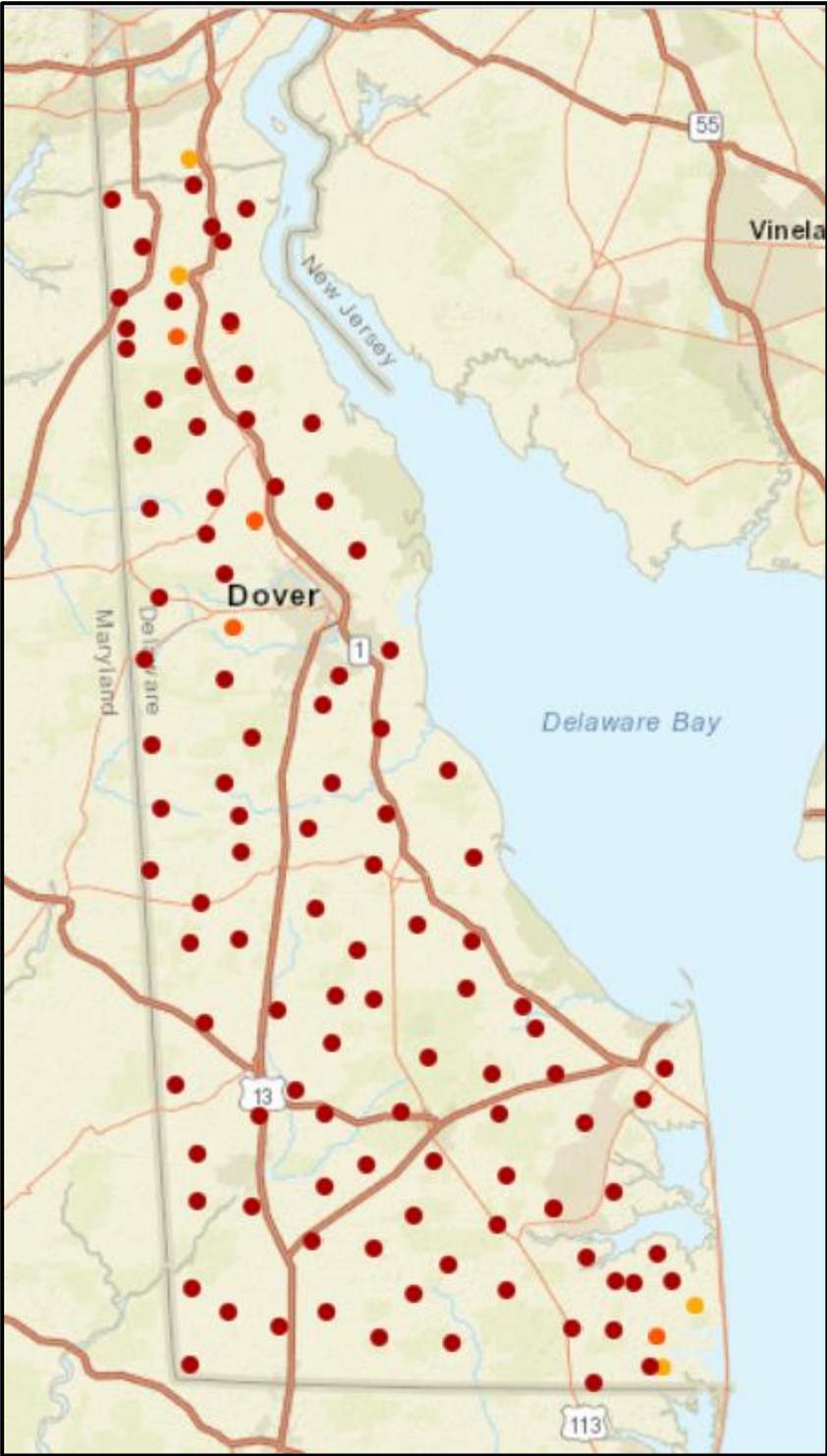
In 1995, the Delaware Department of Agriculture (DDA) designed a shallow groundwater monitoring network with the assistance of the Delaware Geological Survey (DGS). The network currently consists of 103 dedicated monitoring wells located throughout the state south of the Chesapeake and Delaware Canal (C&D Canal). The wells are used primarily to monitor the state's shallow groundwater for pesticides of interest.

DDA pesticide monitoring wells are located primarily on roadsides in state rights-of-way. Wells are screened in the Columbia aquifer. All wells are considered shallow, with the bottom of screen depths less than 40 feet below ground surface. Well depths range from 8.35 feet to 38.70 feet. Most of the wells, however, are significantly shallower than 40 feet. The average completion depth for all 103 currently active monitoring wells is 16.10 feet. The monitoring wells were screened across the water table surface at the time of drilling, as determined by geologic core analysis.

Since the network was initially designed to monitor groundwater for agricultural herbicides, all of the monitoring wells are located below the C&D Canal, where most of the state's agricultural land is located. The wells were originally located such that a well is within 3 miles of all areas in the state below the C&D Canal where significant quantities of agricultural pesticides were applied. This requirement generally excludes land above the C&D Canal, areas within incorporated towns and cities, and areas along the coast where land is largely marsh and wetlands.

Land use throughout the study area has changed significantly in the years since the network's initial inception. Many wells in previously agricultural areas are now in suburban or light industrial land uses. With that shift in land use comes a shift in pesticide usage patterns. The Hydrologist has addressed this by working with the Pesticide Administrator and the EPA Region III Project Leader to select the most appropriate analyte list for sampling, within budgetary constraints. For example, the Hydrologist petitioned for EPA Special Project Funding in 2011 to analyze samples from the entire network using the S150 method, which detects a range of commonly used turfgrass pesticides.

Delaware Department of Agriculture Pesticide Section  
Groundwater Monitoring Network Well Locations (2019)



## GOAL OF PROGRAM

The DDA Hydrologist conducts annual groundwater sampling activities utilizing the statewide network of shallow monitoring wells. These wells are located throughout the region of the state (the portion of the state located south of the Chesapeake and Delaware Canal) that utilizes groundwater as the sole drinking water source.

The purpose of the DDA's monitoring network is to monitor the state's shallow groundwater for pesticides of interest that are registered for use in the state. The Hydrologist works with the Pesticide Administrator and the EPA Region III Project Leader to determine the optimal strategy for sampling each year. This strategy includes assessing which compounds can be included in laboratory analysis within the limits of budget and other resources. Currently, the analyte list is determined largely by the list of Pesticides of Interest (POIs), delineated in the EPA's Pesticides of Interest National Tracking System (POINTS). In addition to analyzing for POIs, additional compounds can be added to the analyte list after deliberation with the aforementioned parties.

Since 2007, the EPA has been operating a web-based Pesticides of Interest National Tracking System (POINTS). States, tribes, and territories are obliged to evaluate each of the 57 Pesticides of Interest (POI) active ingredients based on the respective level of concern for each POI.

This list of 57 compounds was originally compiled from results from a nationwide survey of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) state lead agencies (SLAs). The DDA Pesticide Section is the SLA for Delaware. These 57 compounds were found to be of greatest concern for FIFRA SLAs across the nation. The EPA then tasked each state's FIFRA SLA to evaluate the entire POINTS compound list based each state's respective concerns about the compounds in that state. The DDA Pesticide Section must therefore use a variety of evaluation tools to determine its respective levels of concern about each POI active ingredient. One of these evaluation tools is groundwater monitoring. Because a majority of the state's population (65%) depends on groundwater for drinking water, Delaware emphasizes the value of groundwater monitoring for evaluating the risks of individual pesticides.

The Hydrologist and Pesticide Administrator have determined that alachlor, atrazine, metolachlor, and simazine are Pesticides of Concern (POCs) in Delaware, mainly due to their widespread use in the state and their potential for contamination of the shallow groundwater. As part of POINTS, POCs must be "actively managed," and a large part of this active management conducted by the DDA involves yearly monitoring of these four compounds across the monitoring well network.

## SAMPLE METHODOLOGY

During the 2018-2019 sampling season, the Hydrologist obtained groundwater samples for analysis using the EPA 525.2 method. Groundwater sampling activities were conducted in accordance with the Section's Quality Assurance documents, including the Quality Management Plan (2013), Groundwater Standard Operating Procedure (SOP) document (Mensch, 2019), and Groundwater Quality Assurance Project Plan (QAPP) (Mensch, 2019).

Wells are purged using an electric submersible pump run on a Geotech® rechargeable 12 V field battery. Purge water is run through a flow cell where chemical parameters such as pH, electrical conductivity, and temperature are monitored at 5 minute intervals. Once the chemical parameters have stabilized a sample is collected using the laboratory's sample bottle. For most analytical methods previously used, this bottle consists of a 1 liter amber glass bottle with preservatives (added by laboratory personnel prior to acquisition by the Hydrologist). Sample bottles are labeled with the date, location, time of collection, and analytical method to be used. Samples are kept in a dedicated low residue groundwater sample cooler on ice until transfer to a locked low residue refrigerator. The Hydrologist coordinates with the laboratory to ensure that samples are delivered well within the analytical method's holding period.

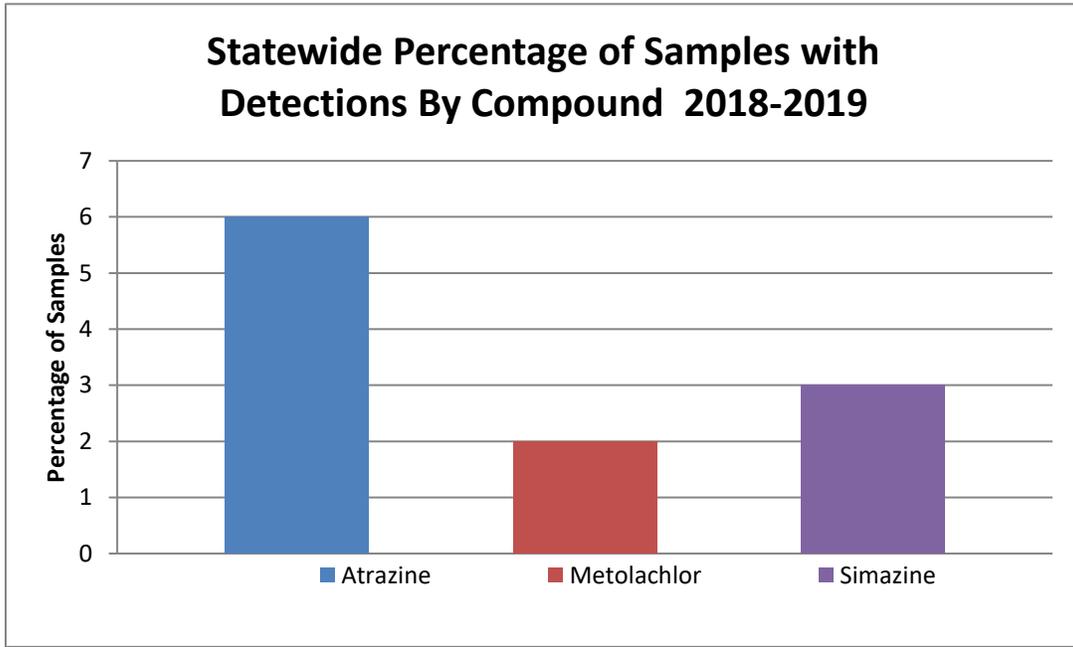
## LABORATORY ANALYSIS

Groundwater samples were analyzed using the EPA Drinking Water 525.2 method. This method is used primarily to detect the presence of semivolatile compounds (SOCs) in drinking water, including alachlor, atrazine, metolachlor, and simazine. The Hydrologist submitted groundwater samples for laboratory analysis to QC Laboratories in Southampton, PA. A full analyte list, including respective Minimum Reporting Limits (MRLs), is located for reference in the appendix.

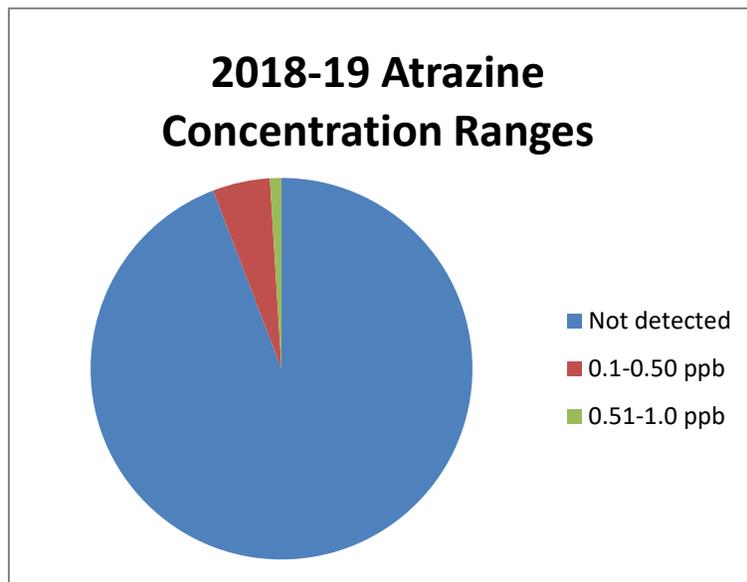
## RESULTS

### Statewide Results:

- Alachlor was not detected in any of the samples.
- Atrazine was detected in 6% of the wells, metolachlor in 2% and simazine in 3%.



- Atrazine levels across monitoring well network broken down by concentration range (ppb):



Reporting Limit (RL) = 0.10 ppb    Non-detects = Below RL of 0.10 ppb    ppb = Parts per Billion