



Indicators to identify the source of pesticide contamination to groundwater

Thorling, Lærke; Brüsche, Walter; Tuxen, Nina; Roost, Sandra; Aisopou, Angeliki; Binning, Philip John; Bjerg, Poul Løgstrup; Smith, Katrine; Svendsen, Tove; Olesen, Ida H.

Publication date:
2015

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Thorling, L., Brüsche, W., Tuxen, N., Roost, S., Aisopou, A., Binning, P. J., Bjerg, P. L., Smith, K., Svendsen, T., & Olesen, I. H. (2015). *Indicators to identify the source of pesticide contamination to groundwater*. Abstract from 2nd International Interdisciplinary Conference on LAND USE AND WATER QUALITY, Vienna, Austria.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Indicators to identify the source of pesticide contamination to groundwater

Lærke Thorling¹, Walter Brusch¹, Nina Tuxen², Sandra Roost^{2*}, Angelina Aisopou³, Philip J. Binning³, Poul L. Bjerg³, Katrine Smith⁴, Tove Svendsen⁵, Ida H. Olesen⁵

¹GEUS, Lyseng Alle 1, 8270 Højbjerg, Denmark ²Orbicon A/S, Ringstedvej 20, 4000 Roskilde, Denmark, ³Technical University of Denmark, Dept of Environmental Engineering, Building 113, Miljoevej, 2800 Kgs. Lyngby, Denmark, ⁴Danish Ministry of the Environment, Strandgade 29, 1401 Copenhagen K, Denmark, ⁵Region of Southern Denmark, Damhaven 12, 7100 Vejle, Denmark,

In Denmark groundwater is synonym with drinking water. The mainstream Danish political approach favors prevention and action at source over advanced treatments of polluted groundwater. The main pollutants are nitrate and pesticides. Pesticides in groundwater can originate from either diffuse or point sources. Point sources are characterized by high pesticide concentrations leaching from small areas, while diffuse sources are characterized by low concentrations over large areas. Some source types can either be termed diffuse or point sources, e.g. line sources (uses at railways) or more intensive diffuse sources (clean keeping of farm yards). It is important to determine the source type in order to make correct management decisions.

This project aimed to identify and develop a set of indicators that can be used to determine whether pesticides detected in a groundwater sample (e.g. in a monitoring or abstraction well) originate from a diffuse or a point source.

Conclusion

Historical data on pesticide sales in Denmark are a good indicator of the quantity and types pesticides that have been used over time.

A statistical assessment showed that the distribution of sum concentrations and max concentrations clearly show that findings from point sources have higher concentrations than findings from diffuse sources. Here, "high" concentrations are considered to be $> 1.0 \mu\text{g/l}$, and "low" concentrations $< 0.05 \mu\text{g/l}$. The number of compounds detected in samples from point sources and diffuse sources also differ. Therefore, a useful indicator for point sources was defined: if a groundwater sample has findings of ≥ 4 compounds, and/or at ≥ 2 compounds above $0.1 \mu\text{g/l}$.

Model results show that the breakthrough curves from point and diffuse sources differ, with diffuse sources resulting in flat breakthrough curves, while point sources results in steeper breakthrough curve. Model results also show that the spatial variability of pesticide concentration data is different for diffuse and point sources. Large variations of the same compound can indicate a point source.

The outcome of the project is a set of indicators the origin of pesticides: from a diffuse source or a point source -and these are shown in the figure below. The indicators can only be used one-way; a "YES" implies the given result, but a "NO" answer does not imply any conclusion on the question posed.

The indicators have been used around Aarhus to identify whether pesticide findings originate from diffuse sources or point sources. This will have implications for future groundwater protection initiatives.