



HyCA®

The all-in-one approach  
for analysis of large water  
quality databases



## KWR Watercycle Research Institute

The experts at KWR Watercycle Research Institute are at home in practically every aspect of the water cycle. KWR is responsible for the joint research programme of the Dutch water sector. KWR assists the water companies in effectively answering their research questions, and converts scientific answers into implementable solutions that prove their value in practice. KWR Waterware® is the product of 40 years of scientific research experience carried out in close collaboration with our clients.

## KWR Waterware®

KWR's research focuses on four important subjects: Healthy, Sustainable, Advanced and Efficient water. In the course of this research, KWR regularly develops software which, under the KWR Waterware® name, is then further developed into user-friendly versions for our clients. This brochure is dedicated to one specific software programme: HyCA®. Would you like to know what KWR's HyCA® can do for you? Then just contact one of our consultants via [www.waterware.nl](http://www.waterware.nl).

## HyCA®

**A sustainable living environment and water provision demand a thorough monitoring of the quality of groundwater and surface water. Current analytical methods produce an enormous quantity of data, which necessitate advanced software to order, interpret and present them in short time for managers who need quick answers. HyCA® (Hydro Chemical Analysis) orders all your measured data via an easily accessible database, to which you can directly apply a large number of hydrochemical and statistical checks before presenting the results in convenient 4D (space and time).**

### Fast and user-friendly insight

HyCA® is a magnificent tool for anyone working with water quality data. The display and interpretation of the data collected contribute to the evaluation of policy objectives, monitoring of the effectiveness of measures taken, and optimisation of operational processes. HyCA® covers the whole path, from data input to reporting. HyCA® provides hydrologists, ecologists and water quality experts with fast insight into the reliability of water quality data, analytical errors, norm exceedances, water types, degree of pollution, redox level and mineral saturation. HyCA® produces tables, maps and profiles which can be directly used in presentations and reports. A unique, very powerful feature of HyCA® is the integration of the database and analytical tools within a single software package. With HyCA® you have access to a number of data analysis and visualisation tools, capable of fully covering your demands.

Above | Visualisation of measured and calculated data is a powerful option of HyCA®.

### How does HyCA® work?

#### Data

HyCA® is founded on a database that can be fed with data from, among others, Excel, DINO, DAWACO and ASCII files. When data are added, the program automatically controls for double measurements, and inconsistent units are automatically converted into the standard setting that you have defined. HyCA® is programmed in Matlab, but runs independently from it (no license needed). Apart from the basic functionalities from Menyanthes, CHEMCAL and PHREEQC, the program contains a number of functions for the visualisation, control, analysis and modelling of hydrochemical data. HyCA® recognises the parameters that you have defined, and automatically identifies exceedances of previously defined norms. A powerful GIS application makes it easier for you to screen and display your data on maps and in cross sections. Using a browser, you can very quickly and easily view, sort and select all information – including both the location data (depth, geological formation, X and Y coordinates) and chemical analyses.

#### Hydrochemical diagnosis

As a standard feature, all samples are controlled through subroutine CHEMCAL to determine among others the electrical conductivity, ionic balance, equilibria in the CO<sub>2</sub>-Ca-H<sub>2</sub>O system, base exchange, redox and pollution index, and chemical water type. PHREEQC, one of the best hydrogeochemical models

available today, is fully integrated for in-depth interpretation of water quality aspects, like mineral-water equilibria and speciation of dissolved constituents. This can be done via either PHREEQC for Windows or PHREEQC Interactive. You can make use of all the functionalities of these programs via HyCA®.

#### Visualisation

HyCA® offers fast and user-friendly tools for the visualisation of water quality data. Standard options, like time series graphs, bar plots, Piper and Stiff diagrams, scatter plots, cumulative frequency distributions and box-whisker plots, require no more than a few mouse clicks. HyCA® instantly creates maps – planar view, cross-section and three-dimensional – for each parameter and location(s) selected.

### Introduction to HyCA®

Are you interested in HyCA® for your organisation? KWR can organise an introduction course at your work location, so that you can work with your own data and/or issues relevant to your organisation.



Above | Cross section of measured values shows variation in depth.

## References

HyCA® has been developed by KWR in collaboration with VU University Amsterdam. Since the start, the program has been continually improved on the basis of the experience of its users in water companies, governments, and research and academic institutions, both within and outside of the Netherlands.

The scientific background of HyCA® is described in the following doctoral thesis: *I. Mendizabal (2011), 'Public supply well fields as a valuable groundwater quality monitoring network', Ch. 3 (25 – 36) in Ph.D. thesis, VU University Amsterdam, 22 November 2011.*

### Contact

Would you like to learn more about KWR Watercycle Research Institute and KWR Waterware®? Then contact us.

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