

Environmental Insite: A Software Package for Ground Water Data Visualization

reviewed by Matt Tonkin¹ and Matt Becker²

Introduction

Data visualization is fundamental to the environmental disciplines—and for good reason. Interpretations made on the basis of a two-dimensional (2D) map of data may differ significantly from those made on the basis of a three-dimensional (3D) map. Increasingly, private and public sector environmental professionals alike require flexible data visualization capabilities. The marketplace offers a variety of software packages providing a wide range of functionality. Many of these packages meet the sophisticated demands of a variety of disciplines and include an enormous range of functionality. However, they often come with a hefty price tag and a stiff learning curve for less advanced users. Ideally, the marketplace should provide lower-cost alternatives focused on a smaller range of capabilities, and accessible to users of all skill levels. A new visualization package called Environmental Insite (referred to as Insite hereafter) may be one of such alternatives suitable for ground water studies. Insite is developed by Environmental Insite LLC and available on the Web site <http://www.enviroinsite.com>.

How We Tested

We reviewed and tested Insite version 1.4.0.1 (released April 4, 2005). One reviewer used several PCs running the Windows XP operating system, while the other reviewer tested the software on a Panasonic CF-W2 Toughbook laptop with a 600-MHz central processing unit and 760-MB random-access memory under Windows XP. The software setup files for Insite were downloaded from the vendor's Web site, and the installation went smoothly and quickly without any problems. The installed software requires a little more than 20 MB hard drive space. Throughout the testing period, running Insite

had no noticeable effect on the stability of other active applications. The reviewers tested the software by (1) completing the tutorials provided with the software; (2) working with data from a variety of real-world sites; and (3) contacting existing registered users for their experiences and opinions.

What We Found

Documentation

Insite comes with a white paper that outlines the capabilities of the software; tutorial data sets and documentation; template data files for users to add their own data; and a Help file. Of these resources, the Help file within the Insite software itself is the most detailed, is logically organized, and provides the best reference for the software. For example, neither the tutorial nor the white paper provides detailed information on data formats, whereas the Help file provides sufficient information in an accessible manner, enabling users to create their own data files confidently.

Data Management and Import

The display window (Figure 1) is intuitive to those familiar with Golden Software Inc.'s Surfer or geographic information systems (GIS) software such as ArcView or ArcMap. The plot screen is presented together with a range of menu items (top), drawing and view control buttons (bottom), and a "tree control" (left) reminiscent of the Object Manager in Surfer, for managing multiple layers and plots. The tree control enables the user to select, rename, and toggle plot visibility options; change plot order; and edit other plot components.

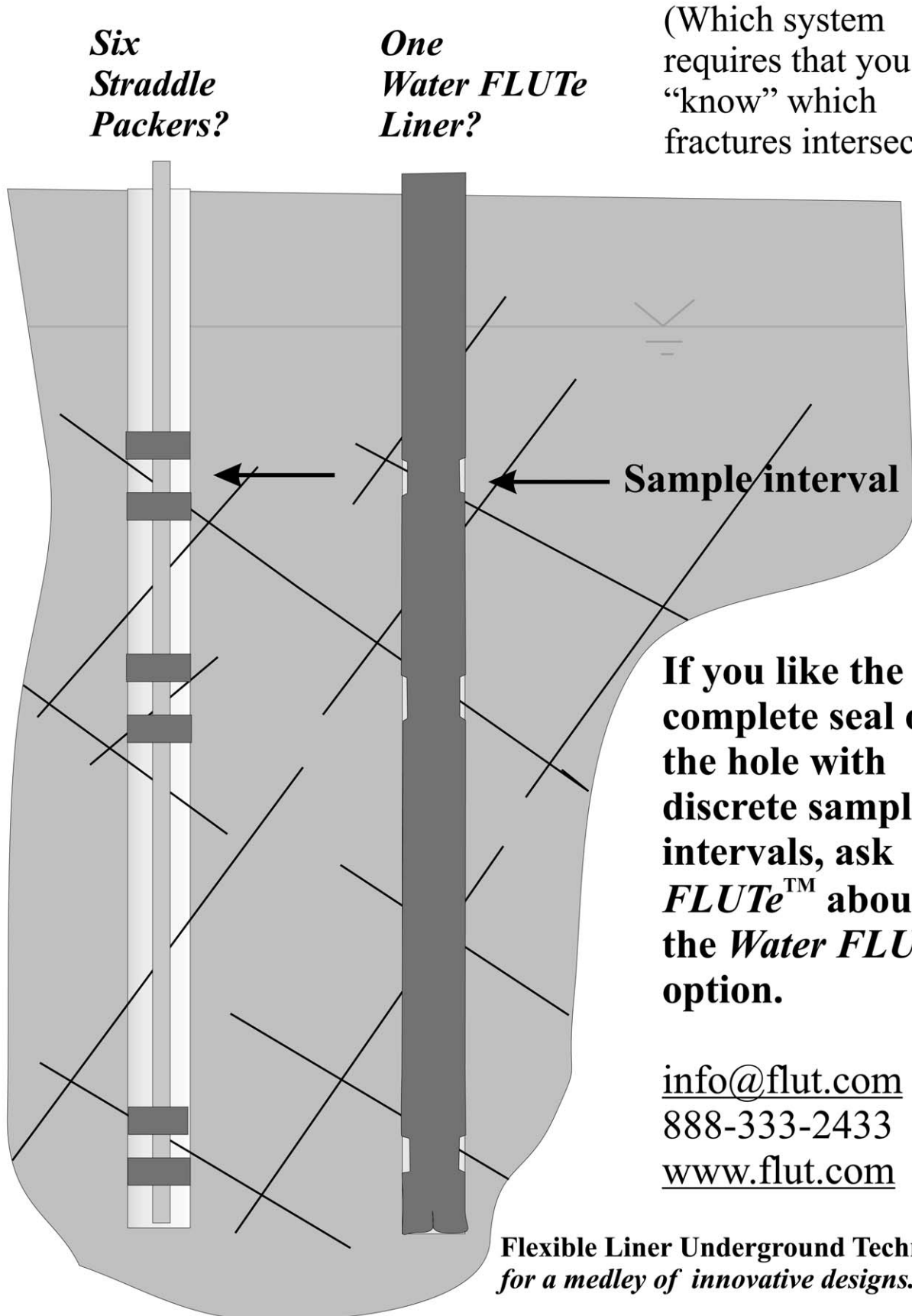
Data are imported using the menu option File→Open Database, and the contents of open data files can be reviewed using the Browse menu option. Insite employs a relational database design, with data access that employs the Microsoft ActiveX Data Objects database protocol. This supports the access, storage, and manipulation of data from Microsoft Access and Excel (Oracle and ASCII file options are also supported but not fully tested or documented). Typically, the data file(s) will contain

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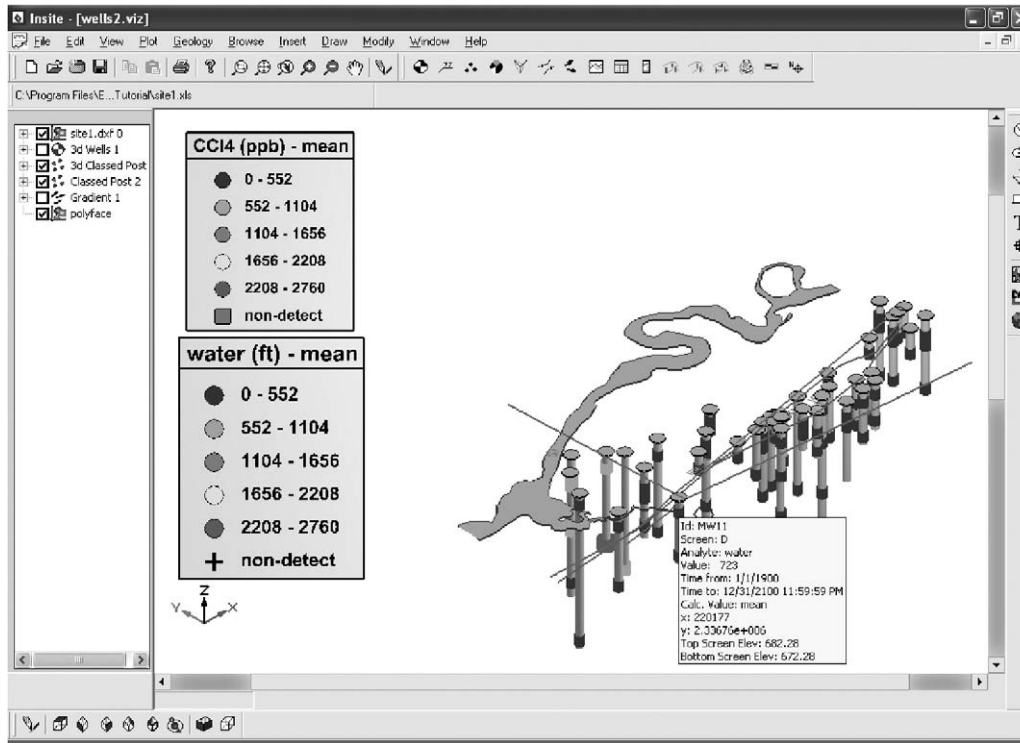


Figure 1. A screen capture of the Insite interface showing menus, 3D well logs, and a mouse-over data inquiry.

information on well names and locations, construction, stratigraphy encountered during drilling, and monitoring data such as water levels and contaminant concentrations. Formatting rules must be followed in order for Insite to identify wells, screens, elevations, etc., within data files. While these rules are straightforward, the documentation does not provide extensive details. Much more detailed information is found in the Help file. Insite also includes templates for Microsoft Excel and Access data tables. Once these formats are understood by the user, importing data is straightforward.

Users can also query their data through the Insite interface. For example, the user can draw a rectangle covering an area of interest at their site and query the data based on the extent of the rectangle. The full capabilities of Insite's data querying were not fully tested. The registered users one reviewer contacted have, however, created and imported databases consisting of up to 16,000 records.

Base Maps

Insite supports most popular computer-aided drawing (CAD) and GIS file formats including data exchange files (DXF), AutoCAD drawing files (DWG), and shape files (SHP), together with a variety of bitmap image file formats including BMP, TIF, JPG, and PNG. Once CAD files have been imported, Insite provides some options for customizing the color, line thickness, fill color, and fill patterns for the CAD and GIS format files. The range of options is considerably less than that in more advanced packages such as AutoCAD or Surfer, but for the simple data sets tested in this review the options were adequate. The user may consider making multiple base maps, each

containing different features of interest, in order to maintain a high level of control on the visualization.

Bitmap image files can serve as map overlays if they are correctly georeferenced. Insite provides this functionality, whereby the user can specify the coordinates of two points on the image and Insite will register the image to these coordinates. Insite will also read the world file (TFW) that accompanies some TIF files.

Mapping and Georeferenced Data

Mapping is an essential component of data visualization. Once the data file is imported and the base map is georeferenced, the user can use the plotting, posting, and contouring capabilities of Insite in 2D and 3D to view the data. Insite includes a nice "data-inquiry" capability where information on a well or other features is provided as the mouse moves over the object. Insite supports the creation of time-series (longitudinal) graphs, pie charts, radial diagrams, and data tables. Each of these can be posted/overlaid on 2D plan maps and profiles. Graphical objects and annotations can be moved around easily with the mouse, making it easy to organize a clear display of the available information. Contouring of data can be completed in plan view, profile, and 3D. Insite includes built-in options for data interpolation, which gave pleasing results in both 2D and 3D for the datasets tested. In the case of water levels, gradient arrows can be posted upon the contours to indicate flow directions.

Outputs

Insite can produce outputs in most of the same formats used for inputs—namely, DXF, DWG, PNG, JPG, TIF, and BMP, but not SHP files. In addition, the contents

of the plot screen may be copied to the buffer (Edit→Copy View) and pasted into compatible software as metafiles. This is in fact the simplest means of transferring a map window image to other compatible software, and during testing worked quite satisfactorily, producing fairly high-quality graphics. In addition, Insite exports CAD files, metafiles, and a variety of image formats. Finally, Insite can export individual frames required to build an animation (AVI) and can append frames to existing AVI files. This feature was not tested. In general, the quality of the outputs is fairly good and suitable for draft reports. Final images may often require manipulation or touching-up with production software, but this is also dependent on the sources of data and base maps provided to Insite.

What We Liked

For the reviewers, the most appealing current capabilities of Insite include (1) the rapid 3D plots of borehole log data; (2) the geospatial plotting of time-series graphs and pie charts on a base map; and (3) the cross-sectional view of the data. For these features alone, Insite justifies its very affordable registration fee.

Posting time-series graphs on base maps is an extremely useful capability for reviewing time-series measured data such as concentrations or water levels and for comparing simulated (modeled) changes in a variable—such as water levels—with time-series measured data. The posted pie charts and radial diagrams are particularly useful where maps of multiple chemical constituents are of interest, such as in monitored natural attenuation analyses. For example, the user can plot the degradation chain from TCE to PCE to VC on a radial diagram.

Once the user is satisfied with an image in the plot view window, Insite enables hand annotation of the plot view window. For example, a borehole log profile (cross section) can be annotated with the geologist's interpretation of the stratigraphy and intervening geology. This is particularly useful since Insite does not automatically interpolate intervening geology, and many packages that do often produce unsatisfactory (to a geologist) results. In addition, Insite enables the user to draw primitive 3D shapes (boxes, pyramids, etc.), which are georeferenced or tied to a coordinate in the map space. The reviewers found this feature useful when drawing buildings in the tutorial exercises.

Once all the data are loaded, the user has the choice of investigating data in map view, cross-sectional view, or 3D. The transition among these views is simple and is supported by multiwindow functionality. The cross-sectional view is one of the best features of the software. It allows the user to draw a line in map view and produce a cross section. An ingenious "capture" setting allows the user to grab wells within a specified distance of the cross section, thereby collapsing the entire data set onto the cross section or including only a specified set of nearby wells. The same plotting features available in map view are also available in cross-sectional view. Three-dimensional renderings were easy to generate in the tutorial but a bit difficult to work with in the absence of guidance. Never-

theless, the ease with which the monitoring wells could be viewed in 3D is a much appreciated feature.

What We Did Not Like

The reviewers would have liked to see more sophisticated importing tools allowing import of CAD and ESRI SHP files and georeferenced images. One reviewer was able to import these types of graphics with the tutorial data but had trouble importing his own SHP files and Geotiffs. For example, the reviewer could import polygon SHP files but not points (well locations). A large-line SHP file (a county road map) loaded correctly but rendered very slowly. The capability to import attribute information from SHP files might be a worthwhile addition to the software. An additional file format that might be worth supporting is the popular Surfer blanking line file.

Insite does not include many data interpolation options, for example, as offered by a suite such as GSLIB, nor does it enable automatic contouring of the logarithm of data values. The ability to read grid files created by external programs would be a welcome addition to Insite as it would enable those who use their own custom interpolation routines and programs to visualize results rapidly in Insite, and would allow the user to view the interior of a 3D interpolated field, as in TecPlot and EVS.

Users may also be disappointed if they are expecting Insite to produce report-quality figures exactly matching their preferences. While these niggles could no doubt be improved upon in future releases, this would probably lead to increased cost, bringing Insite in competition with more established packages and undermining the reviewers' interpretation of the purpose of the Insite package. The challenge for the developers will be to maintain an affordable product while meeting the demands of a growing user base.

Overall

Overall, both reviewers were very favorably impressed by this software. The well-designed software clearly was created by someone who understands the needs of the environmental ground water community. The software performs smoothly and reliably with respect to the advertised capabilities. It is very easy to use, and within a fairly short time frame (a matter of days) the user should master the full range of functionality. If the user is reasonably adept with Microsoft Excel and/or Access, and has access to suitable base maps, Insite can be used to produce useful figures efficiently from a database for both data analysis and draft reporting purposes. The output may not always be suitable for report-quality figures but will certainly enable the user to determine the content and format that final figures would entail. Given the reasonable price and the 30-day trial period, most researchers and practitioners dealing with environmental and ground water data would want to give this software a try.

Rankings

The reviewers ranked the software's capability, reliability, ease of use, and technical support on a scale of 1 (worst) to 5 (best). The following rankings are the average of three sets of scores from both reviewers and the editor:

- Capability—4.3
- Reliability—4.0
- Ease of use—4.5
- Technical support—5.0

How to Obtain the Software

The software can be downloaded from the vendor's Web site at <http://www.enviroinsite.com>. Interested parties can obtain a 30-day, fully functional, evaluation copy from the same pages. The single-seat user license is \$399. Two to 10 licenses are sold for \$195 per license, and purchases of 11 or more licenses can be obtained for \$99 per license. The vendor offers free licenses to academic, non-profit, and government users.

Our Mission

The goal of Software Spotlight is to help readers identify well-written, intuitive, and useful software. Independent reviewers from government, industry, and academia try out full working versions of software packages and provide readers with a concise summary of their experiences and opinions regarding the capability, stability, and ease of use of these packages.

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