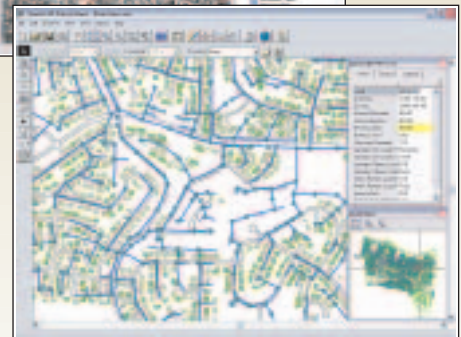
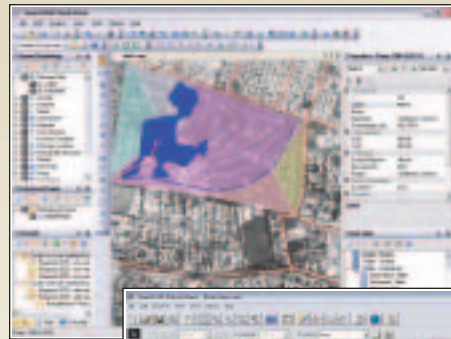


Sewer Modeling Solutions

More choices for you,
more time for engineering.

SewerGEMS®: Dynamic Sanitary
and Combined Sewer Modeling



SewerCAD®: Sanitary Sewer
Modeling and Design



**HAESTAD
METHODS®**
WATER SOLUTIONS

www.bentley.com/Haestad

The Bentley Advantage: More choices for you...

For more than two decades, Bentley's Haestad Methods sewer modeling solutions have provided utilities and wastewater professionals with advanced engineering tools to plan, design, maintain, and operate sanitary and combined sewer infrastructure.

Choose SewerGEMS...

► **For full interoperability:**

Includes four interchangeable applications (stand-alone, ArcGIS, MicroStation®, and AutoCAD). Share your work with anyone.

► **For dynamic modeling:**

Model looped networks, flow splits, overflows, and storage capacity using your choice of EPA's SWMM engine or Bentley's robust and fast implicit dynamic engine.

► **For sanitary or combined systems:**

Analyze sanitary or combined conveyance systems with built-in hydrology tools and a variety of wet-weather calibration methods.

► **For your entire infrastructure:**

Include manholes, inlets, pipe networks, channels, pumps, detention structures, control structures, and stormwater watersheds with a single solution.

www.bentley.com/SewerGEMS

Choose SewerCAD...

► **For simplicity and interface freedom:**

Work in your favorite environment for a virtually flat learning curve with two available options: stand-alone and AutoCAD.

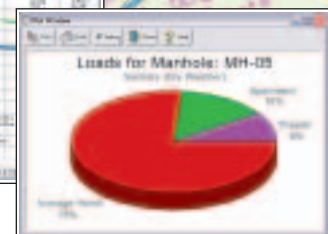
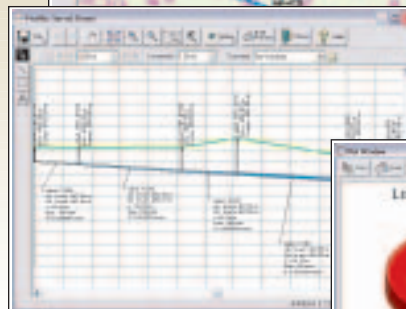
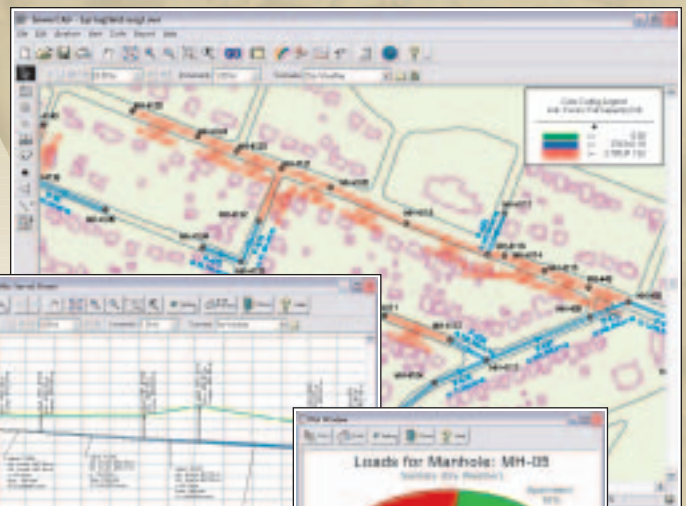
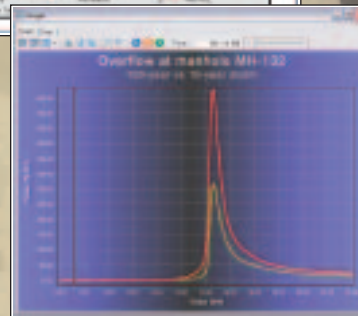
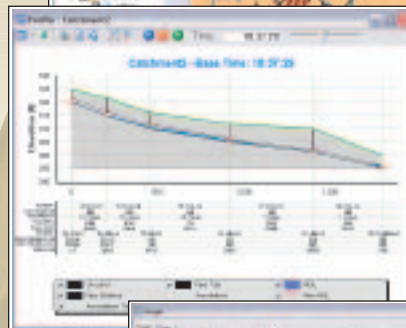
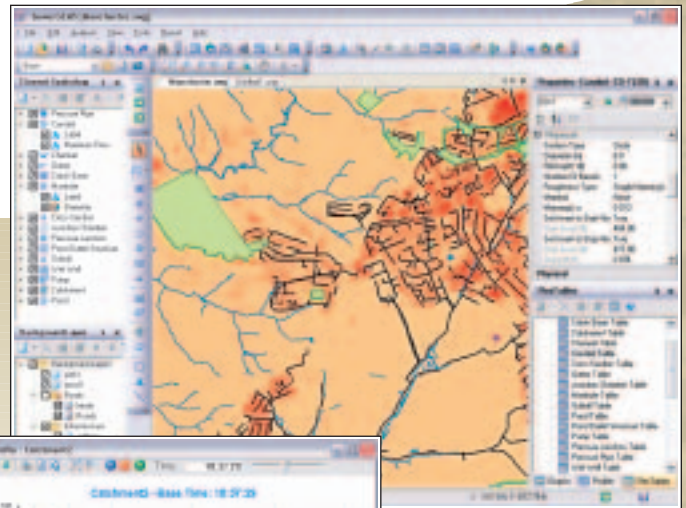
► **For steady-state modeling and convex routing:**

Analyze sanitary sewer networks under peak flow conditions with convex routing hydraulics. Ideal for system design and rehabilitation.

► **For design and rehabilitation work:**

Use constraint-based automatic design and flexible profiling features for optimized sanitary sewer designs.

www.bentley.com/SewerCAD



...More time for engineering

From urban sewer planning, to overflow remediation analysis, to detailed network design, SewerGEMS and SewerCAD are designed to give you more time for engineering. Unrivaled easy-to-use and time-saving technology, speedy and robust calculation engines, and true interoperability across platforms help you generate results faster, so you can make reliable engineering decisions supporting your sewer infrastructure.

Build

Don't re-type. Recycle! Directly use your existing CAD drawings, GIS files, spreadsheets, and legacy models, and create models using the environment you are most comfortable with.

Load

Trust results that truly reflect the real world by accurately estimating and calibrating sanitary, infiltration, and stormwater inflows.

Edit

Exercise complete control over your data and engineering parameters, managing your information wisely to avoid costly mistakes and delays.

Run

Don't limit your analysis options with a single numerical solution. Enjoy a variety of fast hydraulic and hydrologic engines for every modeling application.

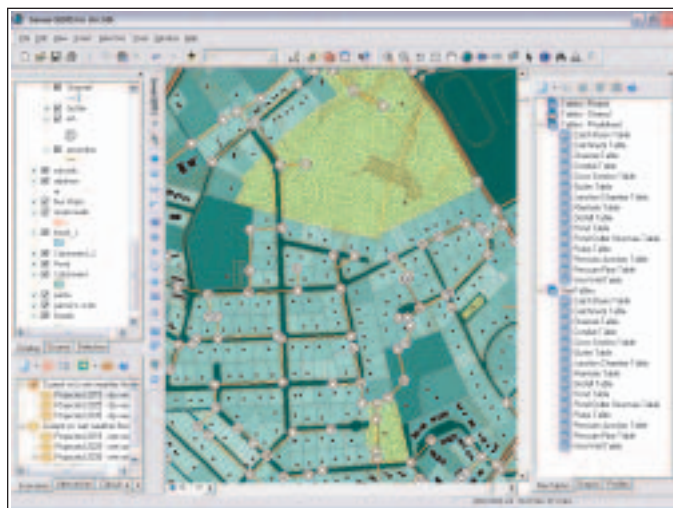
Understand

Simplify the interpretation of complex raw numerical results using flexible presentation tools that give you clear insight of how your system behaves.

Engineer

Spend more time engineering after efficiently building, loading, editing, running, and understanding your sewer model. Find and fix system bottlenecks, optimize control strategies, limit overflow occurrences, and more.

Build



Create models easily using your choice of the **stand-alone** Windows, **MicroStation**, **ArcGIS**, or **AutoCAD** interfaces.

Whether you need to start from scratch or have a wealth of digital data on hand, SewerGEMS and SewerCAD give you the tools to build a sewer model in no time.

With the choice of four environments, laying out a new system is as easy as you need it to be. System review tools escort you through the process so hydraulic connectivity is never an issue.

And if you already have CAD drawings or GIS data for your sewer system, you may be only a few clicks away from creating your sewer model topology.

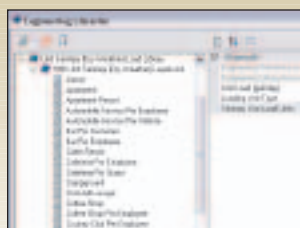
Use any common data format:

- ▶ Convert your system CAD drawings into hydraulically connected models.
- ▶ Extract data from spreadsheets and virtually any type of database.
- ▶ Leverage shapefiles, geodatabases, coverages, and SDE datasets.

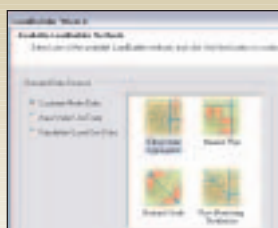
Load

An accurate estimation of the flows entering your sewer system is one of the most important steps towards trusting a model that truly reflects your real-world sewer system.

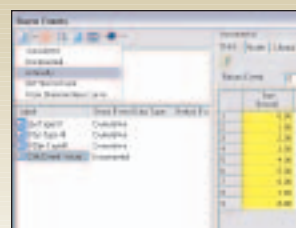
Whether you have a separate system for wastewater, or a combined system with stormwater flow, Bentley's sewer modeling solutions give you the ability to estimate and allocate sewer loadings accurately and easily.



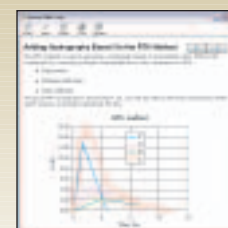
Access and customize sanitary load libraries for area-, count-, and discharge-based unit sanitary flows.



Allocate loads based on flow monitoring, water consumption records, land use polygons, and other GIS sources.



Use the SewerGEMS built-in rainfall distributions, or create your own using local gauged rainfall events.



Calibrate inflow and infiltration using several methodologies, including RTK tables and unit hydrographs.

CASE STUDY:

ANNE ARUNDEL COUNTY, MD, USA

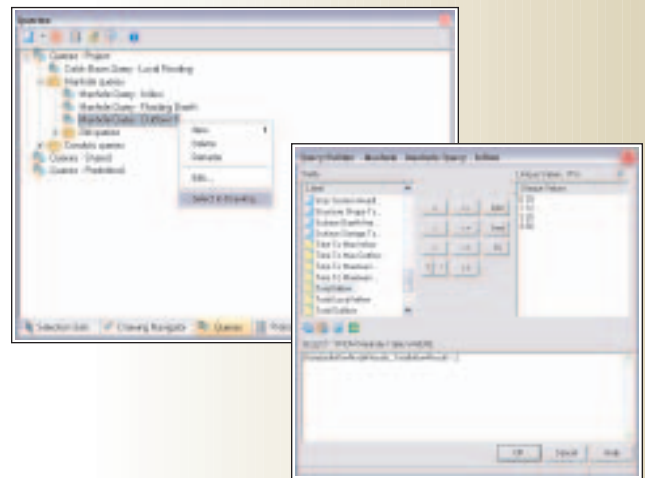
The Public Works Department of Anne Arundel County has developed an extended period simulation (EPS) model in SewerCAD for all 38,000 pipes of their wastewater collection system, which serves a major population center between Washington D.C. and Baltimore.

As part of a new subdivision design submitted to the county, engineers used the automated design capabilities of SewerCAD. "We looked at the proposed pump station to determine how the additional flows would affect the downstream gravity line. Since there was a diversion in the line, we needed to verify that it could handle the extra flow," says county engineer George Albright. "Once the model was set up, we ran the simulation and used color-coding to highlight all the lines over capacity. We then ran SewerCAD in design mode to automatically resize those pipes. This process let us quickly verify the consultant's work."

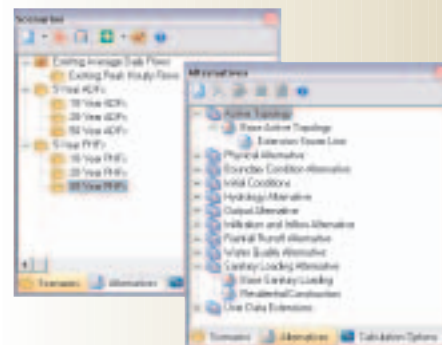
As the collection system gets closer to capacity, the Public Works Department will have to start requiring developers to replace pipes downstream of proposed sites to support the increased loads. "SewerCAD will also give us the tools to support this," says county engineer Laura Layton. "We'll be able to see what's over capacity, and give design recommendations to the developers. It will be a valuable tool to help solve disputes and provide graphical representations of what's going on so people can visualize and understand the system."

Data input and editing are typically the biggest time commitments for engineers working on sewer models.

From the convenience of Scenario Management, to the power of the new Dynamic Queries, to the simplicity of FlexUnits®, SewerGEMS and SewerCAD users save precious time with every data management task, so they can concentrate on analyzing results and making informed decisions.



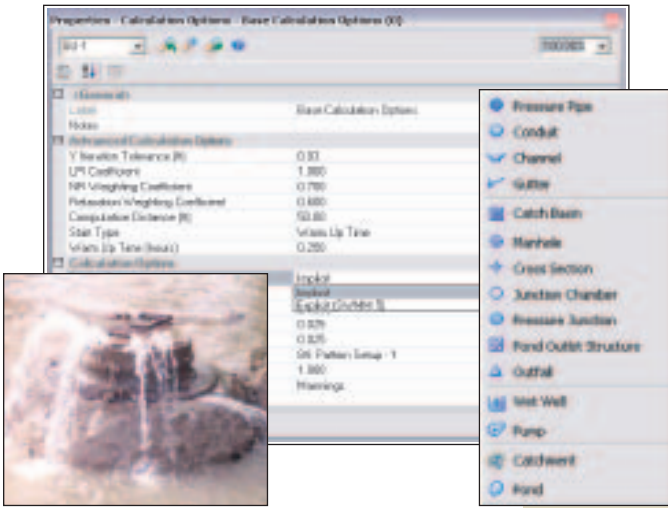
Execute advanced dynamic queries to edit, analyze and visualize element subsets in a countless number of ways. Store your queries for future use, while the elements generated by them change dynamically according to their properties.



Use a single model to evaluate an unlimited number of design, operational, sanitary loading, and network topology scenarios for better decision-making.

Run

$$\frac{\partial Q}{\partial t} + \frac{\partial (BQ^2)}{\partial x}$$



Model relief sewers, overflow diversions, inverted siphons, and looped networks with SewerGEMS' fully dynamic engine.

Calculate your model using robust, accurate, stable, and incredibly fast hydraulic and hydrologic engines designed for any sewer modeling application.

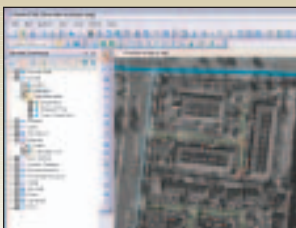
Leverage SewerCAD's steady-state analysis to design pipes and structures under peak flow conditions, or perform capacity and overflow analysis of your existing system with SewerGEMS' fully dynamic engine.

Minimize capital investment with SewerCAD's constraint-based design. Just enter your design restrictions and run the optimization engine to automatically recommend diameters and invert elevations.

Understand

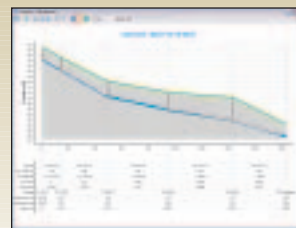
Quickly grasp the meaning of your numerical results with eloquent interpretation tools that help you create sharp presentations and make sharing results with your clients and colleagues easy.

Find bottlenecks by simply looking at a color-coded map, and visualize how additional storage can attenuate overflows by using profiles that animate through time.



Create thematic maps with property-based symbology and annotation, and apply the mapping features of MicroStation or ArcMap.

View tabular data in an organized way, with full control over units, sorting, filtering, and advanced querying features.



Build and recycle detailed profiles with complete control over drawing levels, colors, placement, and annotation.



MicroStation users:

Compose PDF reports with interactive graphs, maps, tabular reports, and everything you need to share results with anyone.

SEWERGEMS: TWO ENGINE CHOICES

Out of the box, SewerGEMS is the only sewer model on the market that not only gives the users four interface options, but also two different types of dynamic engines to choose from.

An engine that solves the complete Saint Venant dynamic flow routing equations is essential for overflow, system capacity, flow control and detention modeling work, but there are different approaches to solving these equations based on finite difference solutions.

EPA's SWMM is an industry-standard solver that employs a universally accepted solution and also features water quality analysis modules. Despite known numerical stability problems with certain models, SWMM is accepted by the U.S. Federal Emergency Management Agency (FEMA) for use in the National Flood Insurance Program (NFIP).

On the other hand, implicit solutions have advanced the standard as they can deliver lightning-fast, hydraulically coherent, and numerically stable results for any model size, without users having to trick the model with unrealistic physical properties and calculation intervals.

So, whether you are comfortable with the SWMM engine, prefer a faster and more stable solution, or simply need to use the engine that local or federal regulations impose, SewerGEMS gives you all the choices, not just one.

Bentley's sewer modeling solutions are designed so you can spend more time engineering. Start making cost-effective and reliable decisions for your sewer infrastructure today.



- ▶ Demonstrate compliance with overflow regulations, develop remediation programs to limit overflow events, and minimize customer complaints.



- ▶ Minimize capital investment on your sewer infrastructure with optimized network designs and comprehensive master plans of your entire system.



- ▶ Optimize lift station and flow control operations by implementing real-time control strategies with variable-speed pumps, and rule-based controls.



- ▶ Regulate flow to treatment facilities, locate storage opportunities within the conveyance system, and design detention structures.

Protect your software investment subscribing to SELECT®

More than a software support contract, SELECT® is a comprehensive technology and service subscription program that includes exclusive licensing privileges, continuous product upgrades, comprehensive technical support, discounts on training and software, and much more.



- ▶ Network licensing
- ▶ Software upgrades

- ▶ Home-use licensing
- ▶ 24/7 support

- ▶ Subscription licensing
- ▶ Special discounts

www.bentley.com/SELECT



Wastewater Collection System Modeling and Design

Developed for designers, managers, regulators, and students, this Bentley Press book focuses on linking engineering theory to practical modeling applications.

www.bentley.com/library



Sewer Model Training

Increase your productivity with the perfect combination of theory, hands-on experience, and best-practice sessions from the Bentley Institute.

www.bentley.com/training/haestad

Contact us:

Bentley Systems, Incorporated
Haestad Methods Solution Center
 27 Siemon Co. Drive. Suite 200W
 Watertown, CT 06795
 1-800-727-6555 (US & Canada)
 +1-203-755-1666 (worldwide)
 email: sales.haestad@bentley.com

Corporate Headquarters
 685 Stockton Drive
 Exton, PA 19341, USA
 1-800-BENTLEY (US & Canada)
 +1-610-458-5000 (worldwide)

International Headquarters
 Wegalaan 2
 2132 JC Hoofddorp
 The Netherlands
 +31 23 5560560

Bentley Australia
 68 Dorcas Street
 Southbank VIC 3006
 Melbourne, Australia
 +613 9699 8699

Bentley Latin America
 Periférico Sur No. 4194, Piso 1
 Col. Jardines del Pedregal
 C.P. 01900
 Mexico, Mexico, D.F.
 +52 55 5652 9299

Bentley China
 Unit 406, NCI Tower, No. 12 A
 Jianguomenwai Ave.,
 Chaoyang District, Beijing 100022
 +86 20 38812857
 +86 20 38814460

Bentley India
 203 Okhla Industrial Estate
 Phase III
 New Delhi, India
 + 91 11 5161 4122