

Geospatial Keynote

Nordic Civil conference 07.11.2016 | Vejle

Introduction

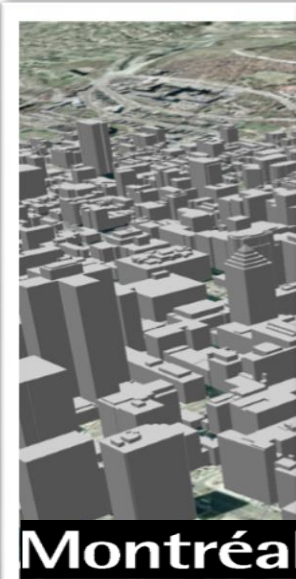
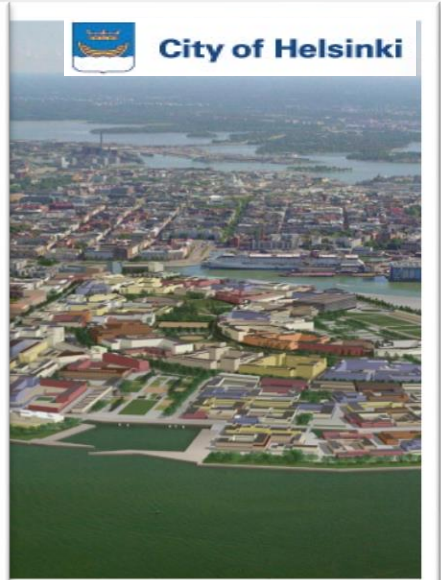
Johannes Klick




- Senior Support Manager
- Surveying Engineer and works since over 20 years in the Utility GIS Industry of which 15 years for Bentley
- Specialist in Utilities, responsible for managing and implementing Bentley Utility products like Bentley sisNET at customers.
- Manages the EMEA Application Engineer team who provide the Account and Product Advancement teams with mapping and utilities expertise; support Bentley's Asset Advancement Solutions, including BentleyOpenUtilities, Bentley Map, Mobile Apps, H&H, AssetWise Applications etc.

Mapping, 3D Modeling and Infrastructure – Trends?

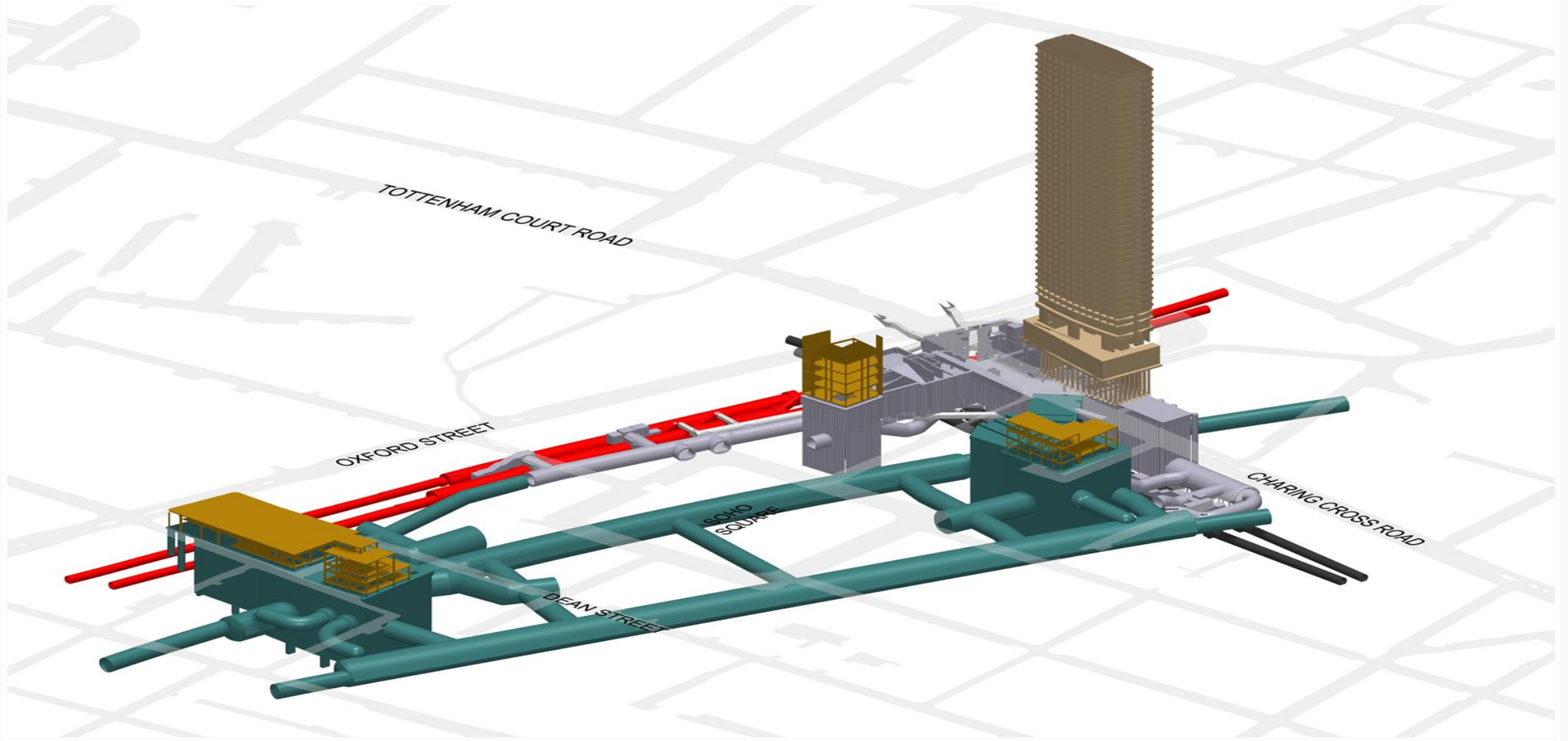




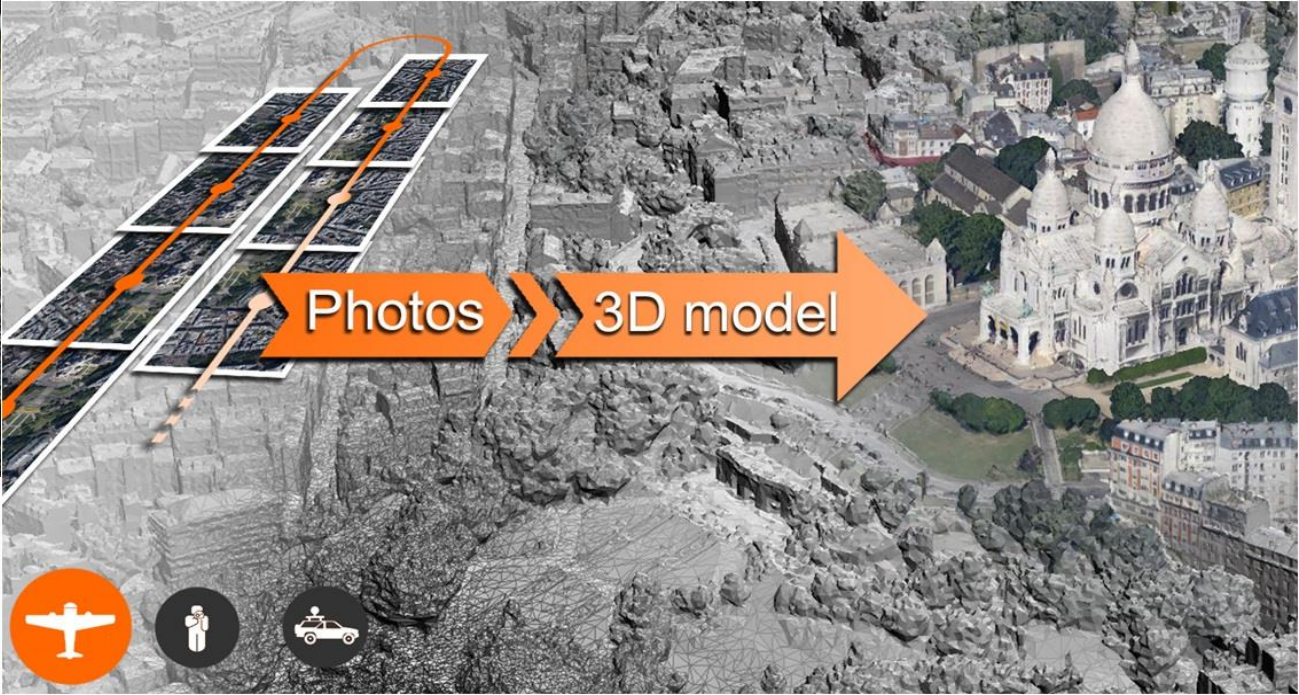
Montréal 

VILLE DE QUÉBEC 





Reality Modeling... High resolution, high accuracy

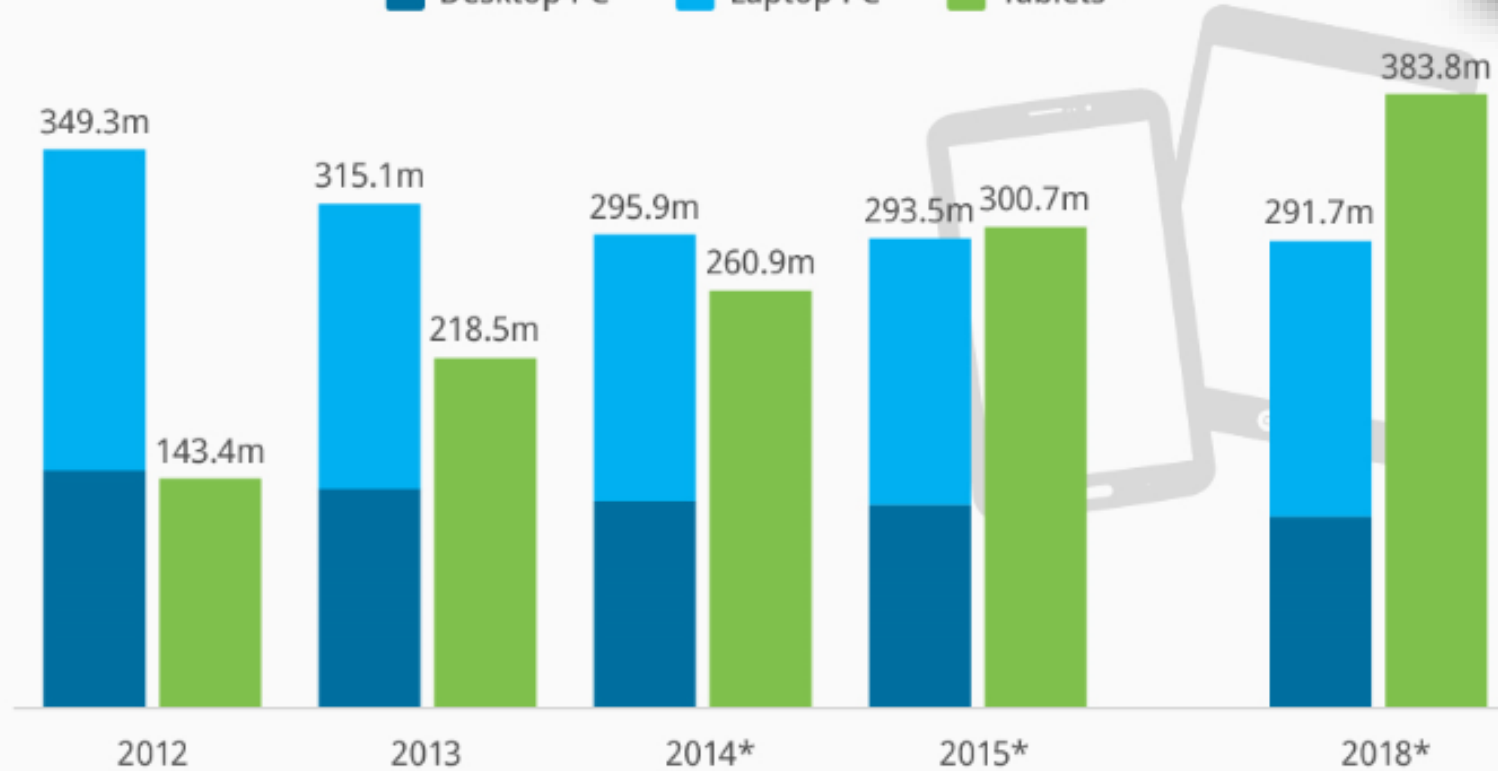


Mobility

Tablets to Outsell PCs Worldwide by 2015

Forecast of global tablet and PC shipments (in million units)

Desktop PC Laptop PC Tablets**



* IDC forecast

** includes hybrid devices such as Microsoft's Surface RT

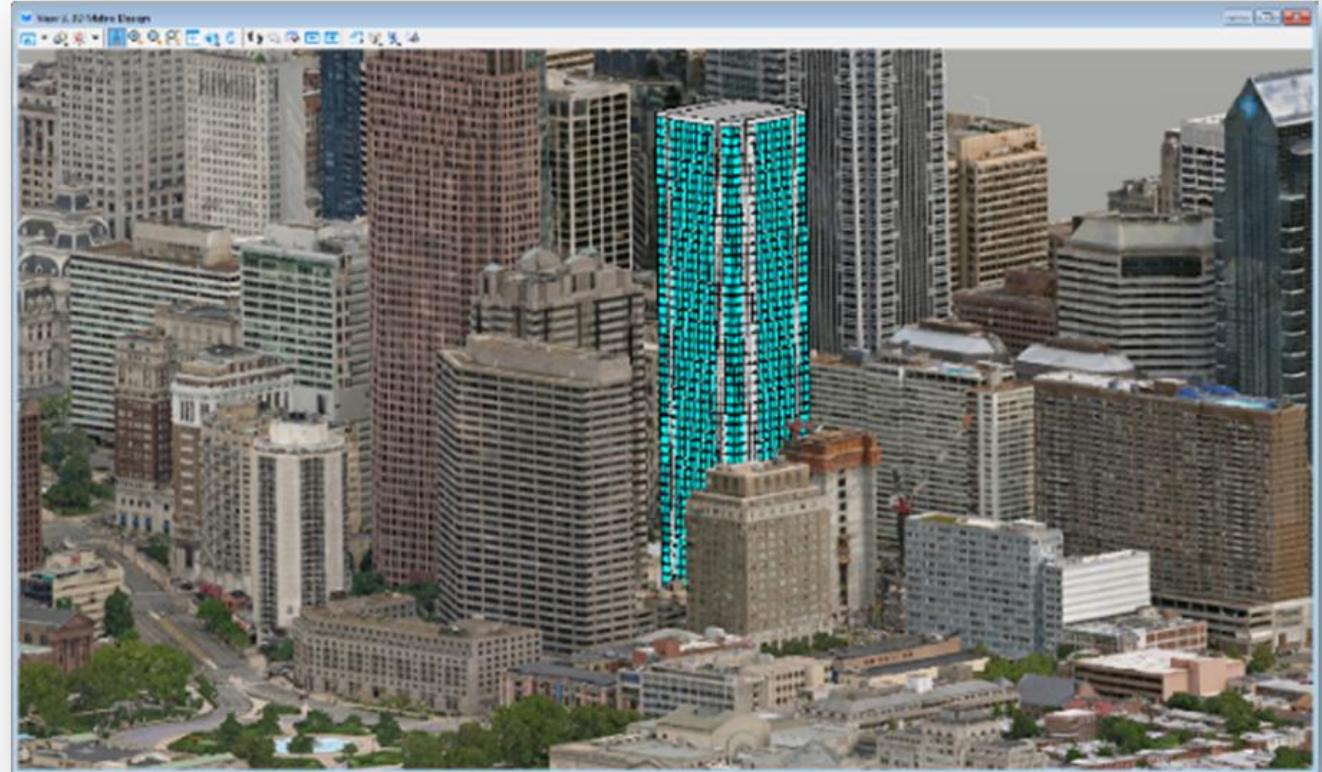
Source: IDC



Quite a challenge...

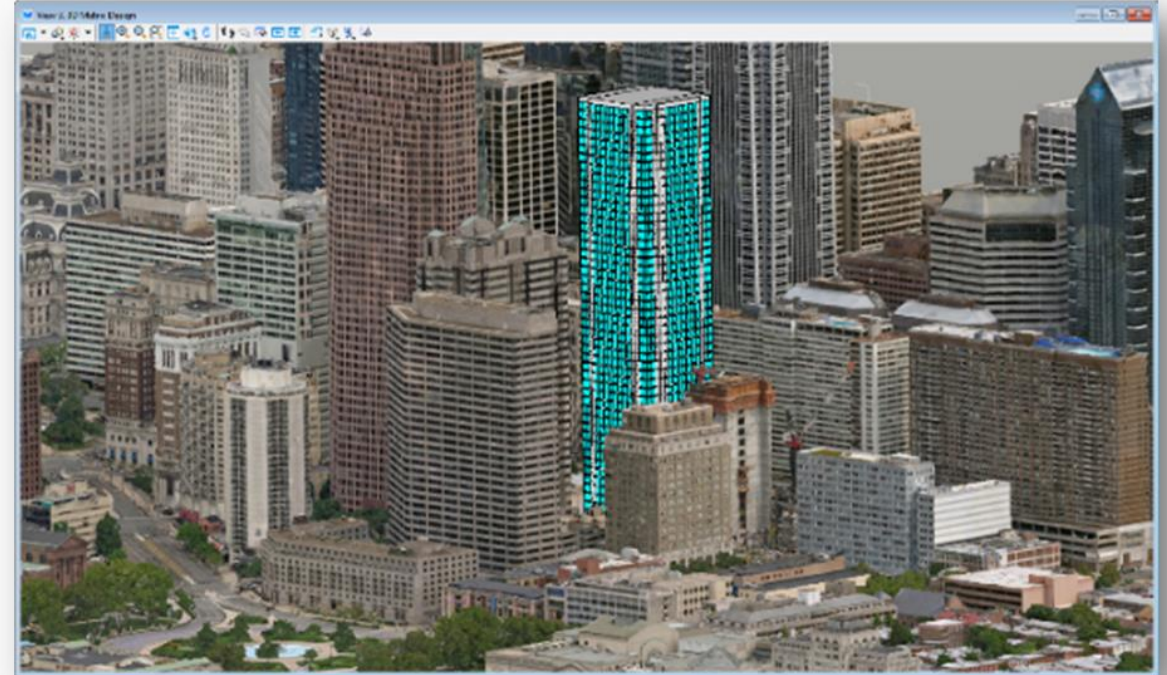
Bentley Map for Your Customer

- Add the best value in workflows that require accurate modeling of 2D and 3D assets.
 - Roads
 - Rail
 - Utilities
 - Cadastre
 - 3D city models
- Strong interoperability with GIS formats and spatial databases
 - SHP, MapInfo, GML
 - Oracle Spatial, SQL Server Spatial
- Analytical tools mean the user does not require GIS for common tasks
 - Buffers, overlays, labeling, thematic mapping
- Strong ecosystem of complimentary products
 - AssetWise
 - ContextCapture, LumenRT
 - Bentley SELECT



Bentley Map for Your Business

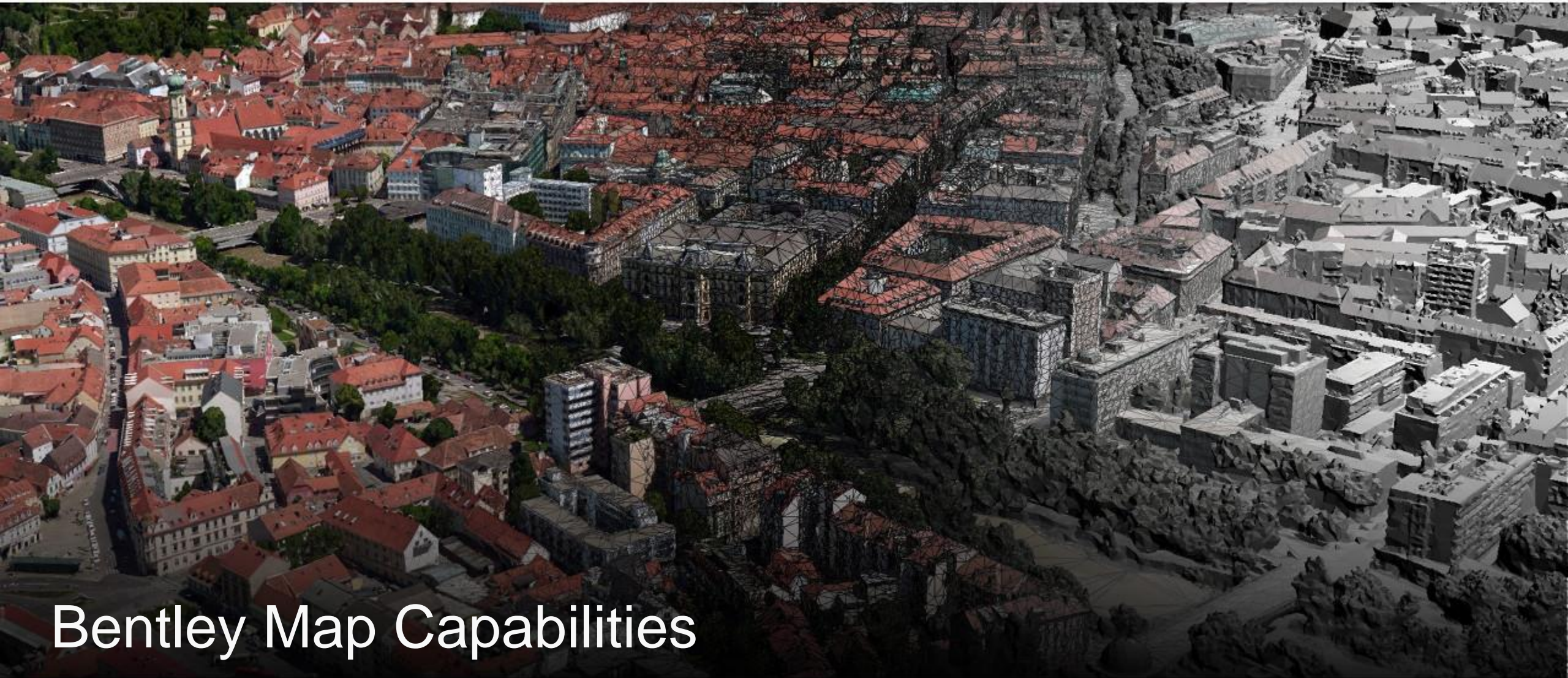
- Many opportunities for value add
 - Project customization through the geospatial administrator
 - Custom applications using the Bentley Map SDK to support local standards and language
- Cost effective application delivery
 - Bentley Map PowerView
 - No application license required



Who buys Bentley Map?

- Municipalities
 - Mapping
 - Cadastre
 - Utilities
- Electric and gas utilities
- Campuses
 - airports
 - university
 - army bases
- Surveyors
- Departments of Transportation

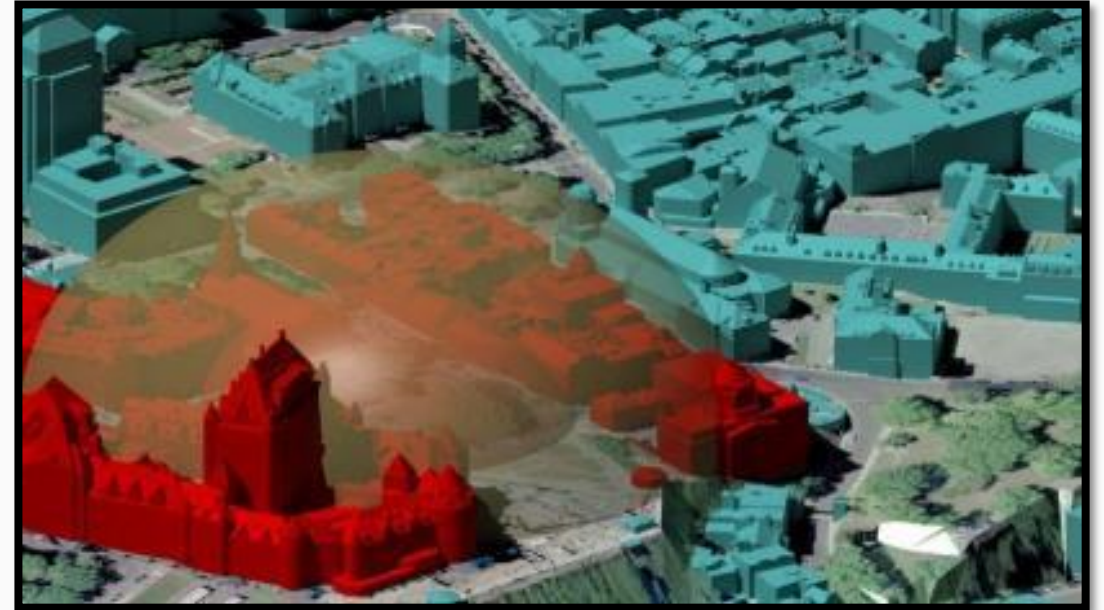




Bentley Map Capabilities

Bentley Map – GIS with the Power of MicroStation

- Engineering-grade quality
- Interoperability
- Spatial Databases
- Image, Point Clouds and Scalable Terrain Models
- Spatial Analysis
- Map Finishing and Printing Tools

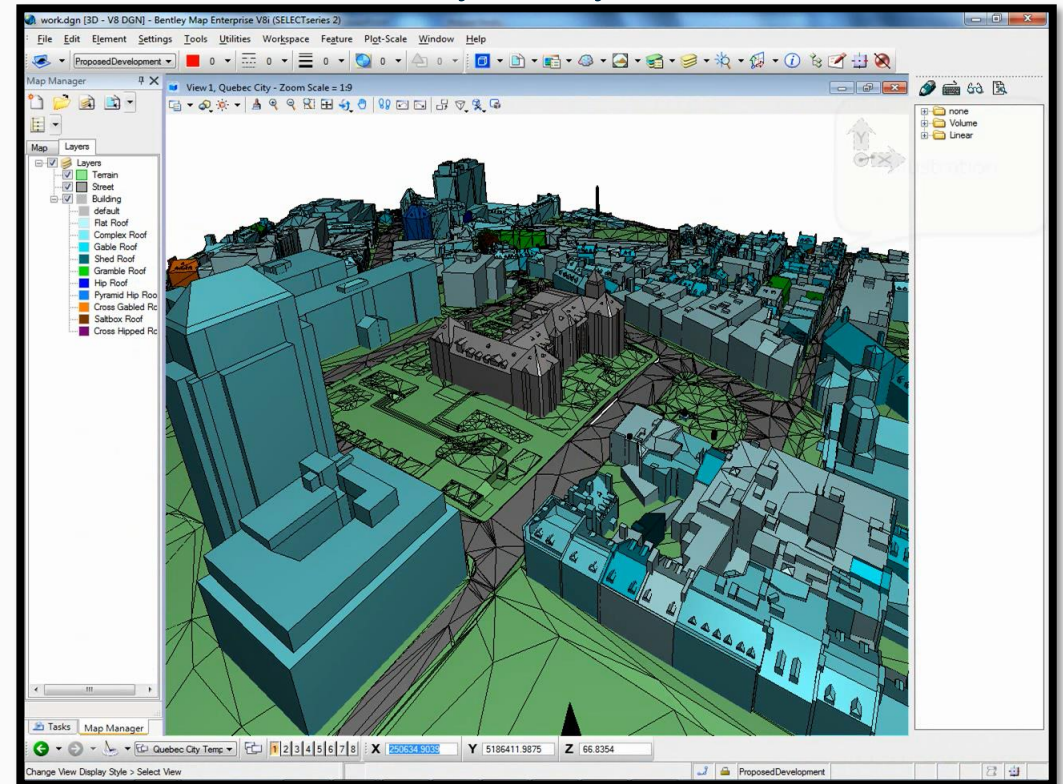


Model courtesy of City of Quebec

The Power of MicroStation

- Engineering Accuracy
 - AccuDraw
 - AccuSnap
- Excellent feature creation and editing
- Raster Management
- Geographic Coordinate System
 - Reference other geolocated designs and raster data
 - Displaying and entering latitude and longitude
 - Interfacing with a GPS device
- Full 3D Modeling
 - Animations, Visualizations, Shadow Studies

Model courtesy of City of Quebec



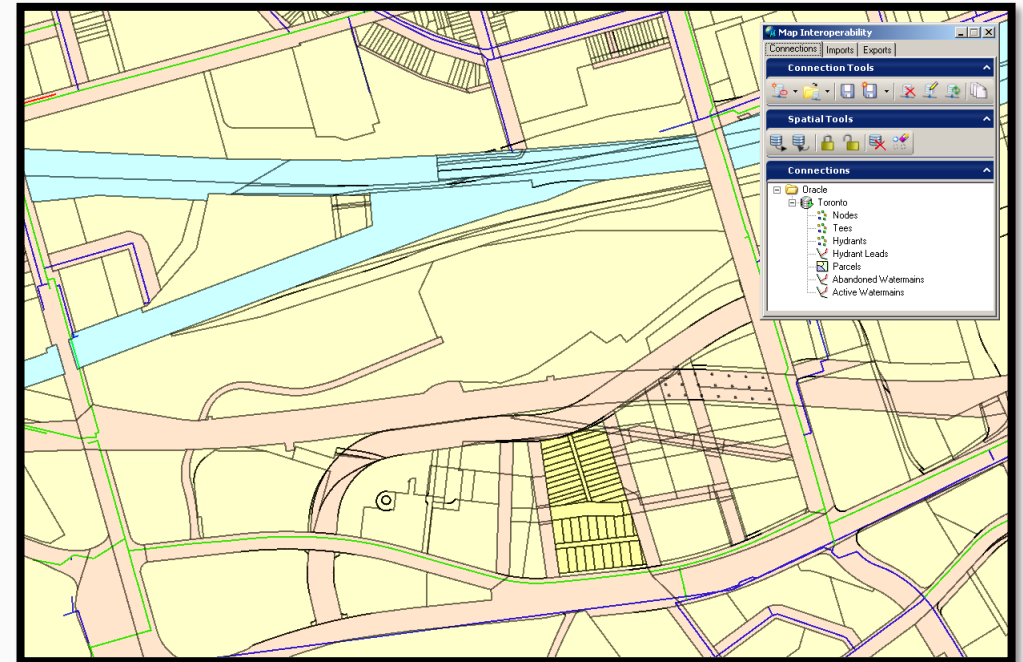
Interoperability

- Import, export and directly reference a variety of common geospatial formats
 - SHP, MapInfo, GML, CSV, ODBC, **Esri FGDB**
- WFS (Web Feature Service)
 - Query and import, Spatial Data Streaming
- Remap feature and property names and assign symbology
- Save settings for reuse and bulk operations
- Interface to FME for many more formats



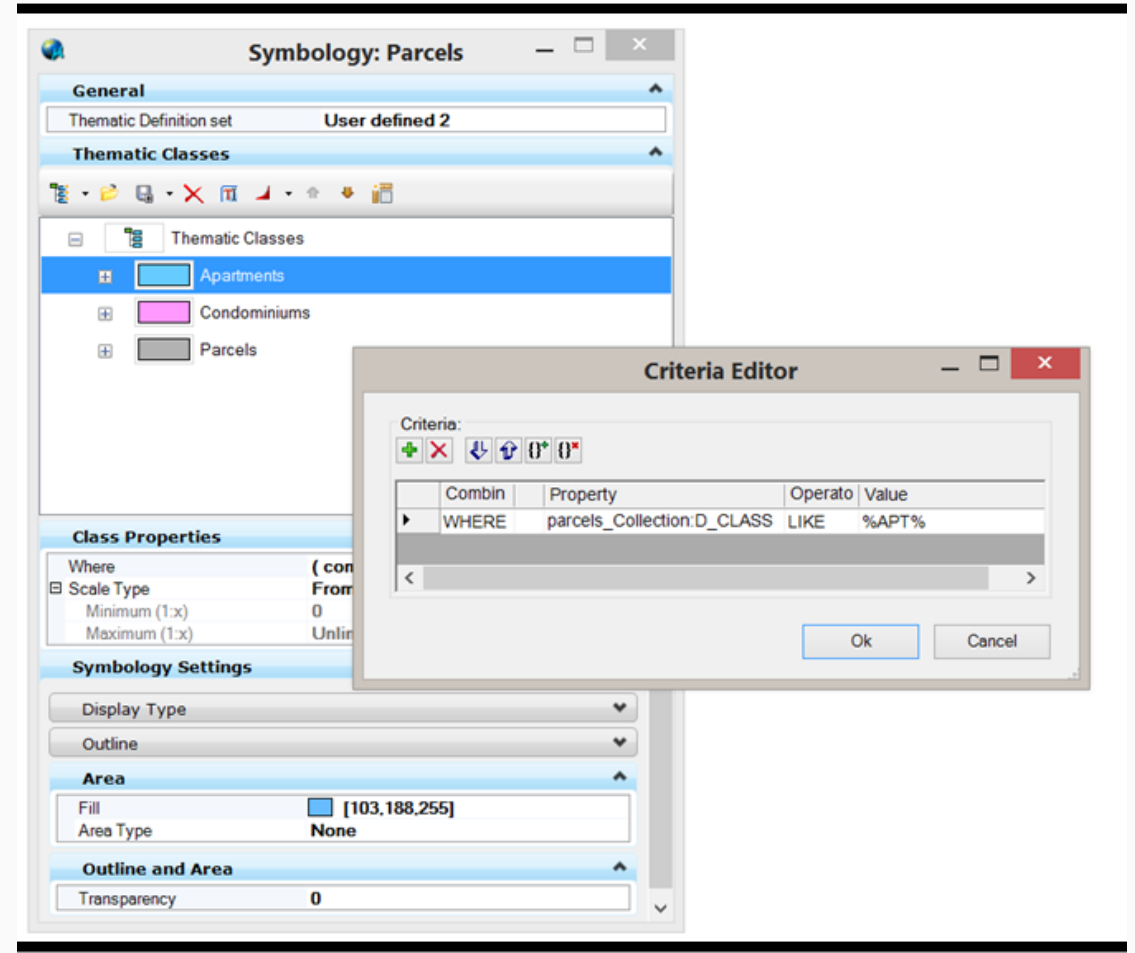
Spatial Database Support

- Oracle Spatial and SQL Server Spatial
 - Vector
 - Query, Lock, Edit, Post
 - Spatial Data Streaming and Direct Data Access
- Oracle Spatial
 - Long and short transaction
 - Textures and Raster
 - Non Top View Queries of 3D Data
 - Oracle 12c - B-Spline Curves and Non-Circular Arcs
 - Composite Primary Key, Support Views As Sub-Features



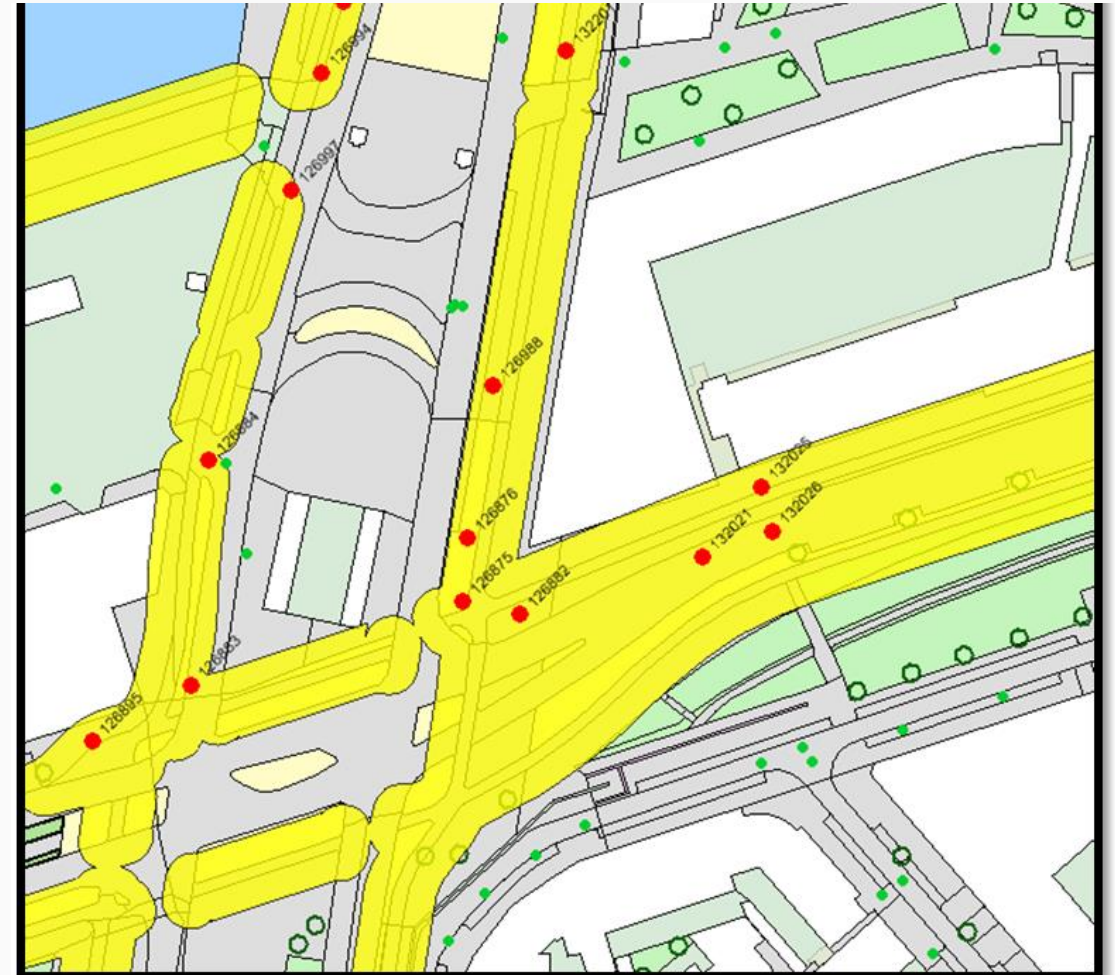
Thematic Maps

- Thematic maps
 - Communicate a topic or theme
 - Features resymbolized based on associated non-graphical attributes
 - Represents spatial distribution of data
- Scientific, statistical or informational data
- Can emphasize spatial variations and inter-relationships in the data being mapped.



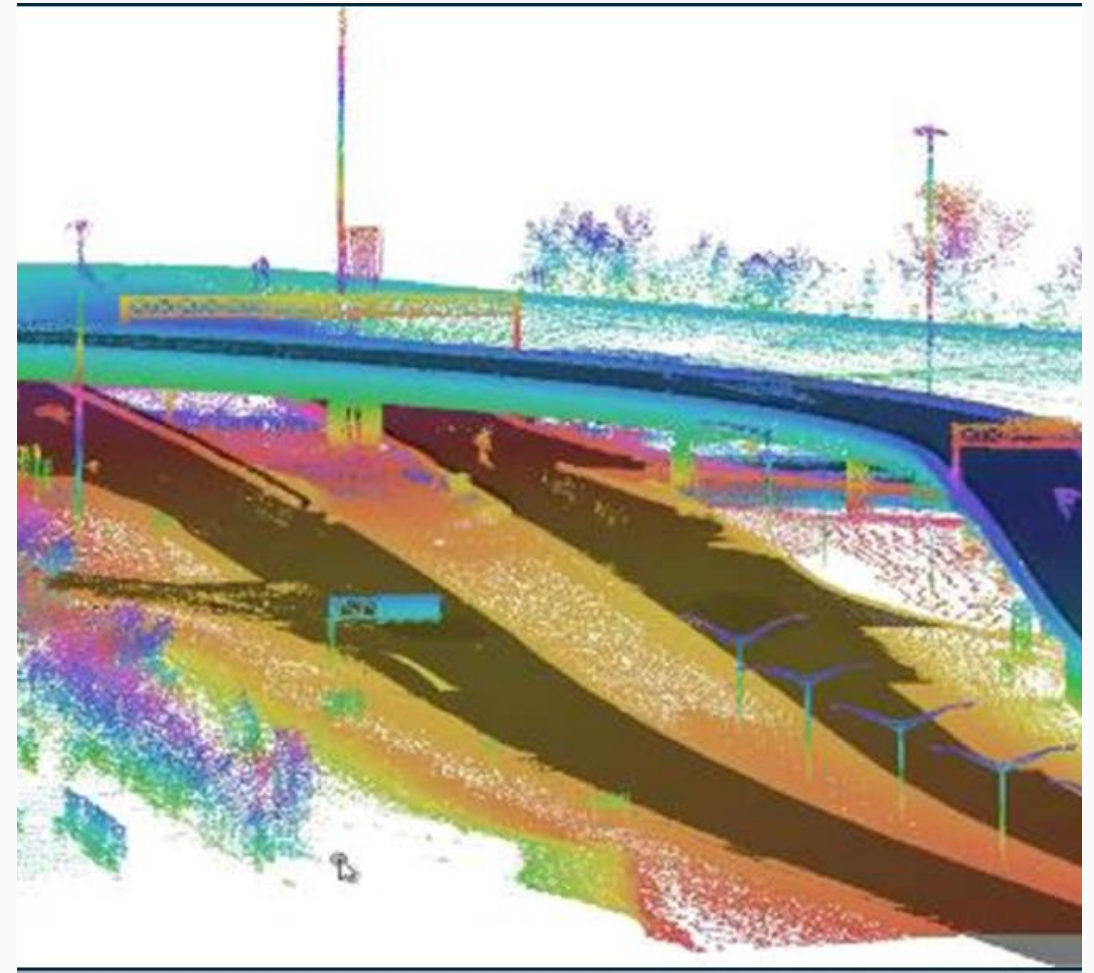
Spatial Analysis

- Buffers and Overlays
 - Performs analytical operations on Bentley Map features
 - Buffers define areas around features
 - Overlays combine two layers
- Used to provide answers to questions such as:
 - Which parcels are within 5km of a sour gas well?
 - Which properties are within 400m of a park and 500m away from a busy road?
 - Which manholes are within 5 meters of sidewalks?



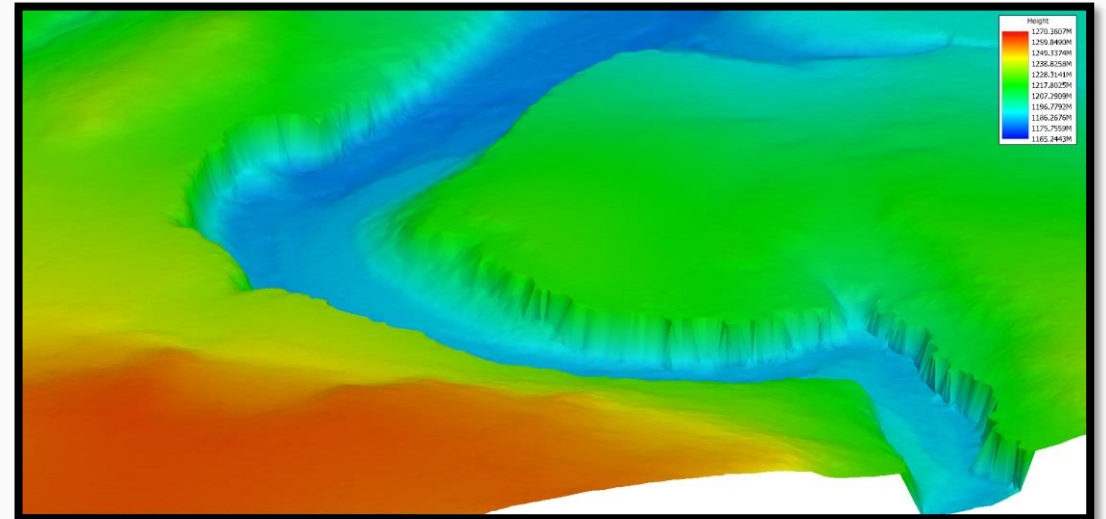
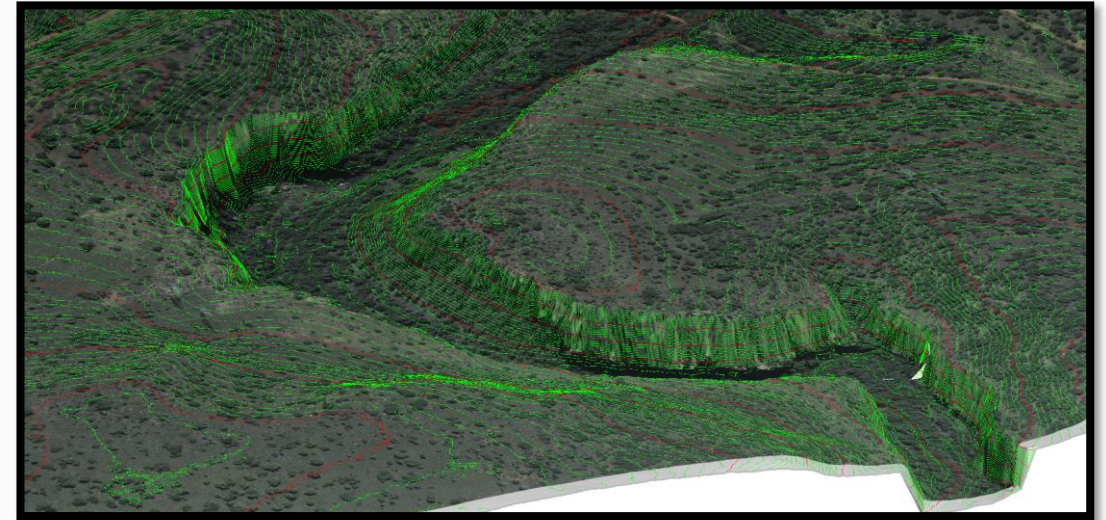
Imaging and Point Clouds

- Advanced Processing Platform for 3D Imagery
- Efficient display of point clouds
- Flexible presentation modes
- Advanced point cloud tools: Clip and Section Manager, Model by Section, and geometry extraction tools
- Advanced image editing for binary and color images
- Support for hybrid environments.



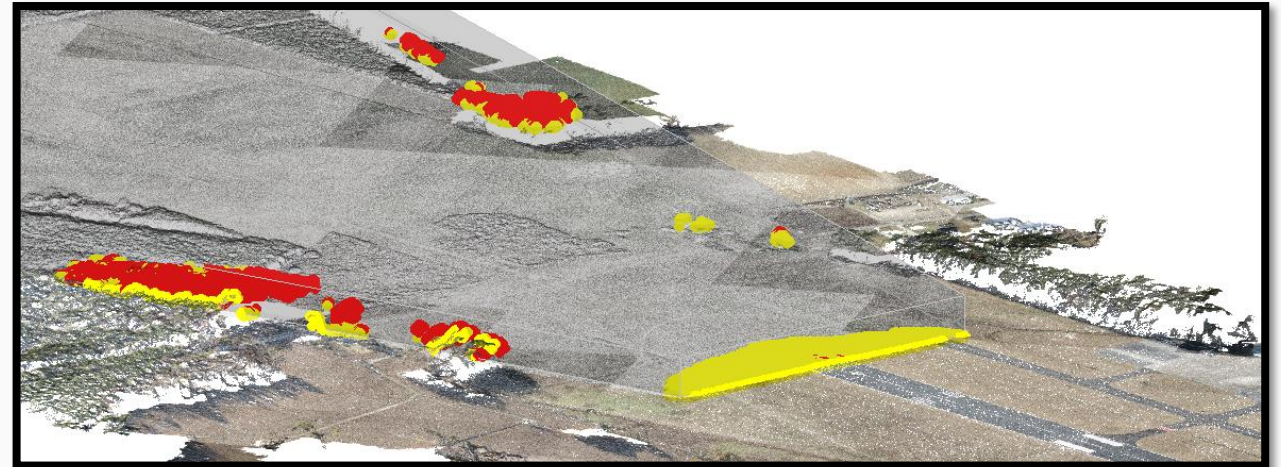
Scalable Terrain Models

- Display terrain models with billions of points
- Create models from a variety of sources: DEM, DGN, Point cloud
- Automatically detect when source file has been changed to trigger rebuild of STM
- Real-time display of contours, triangles, elevation, aspect and hill shading as well as draped imagery



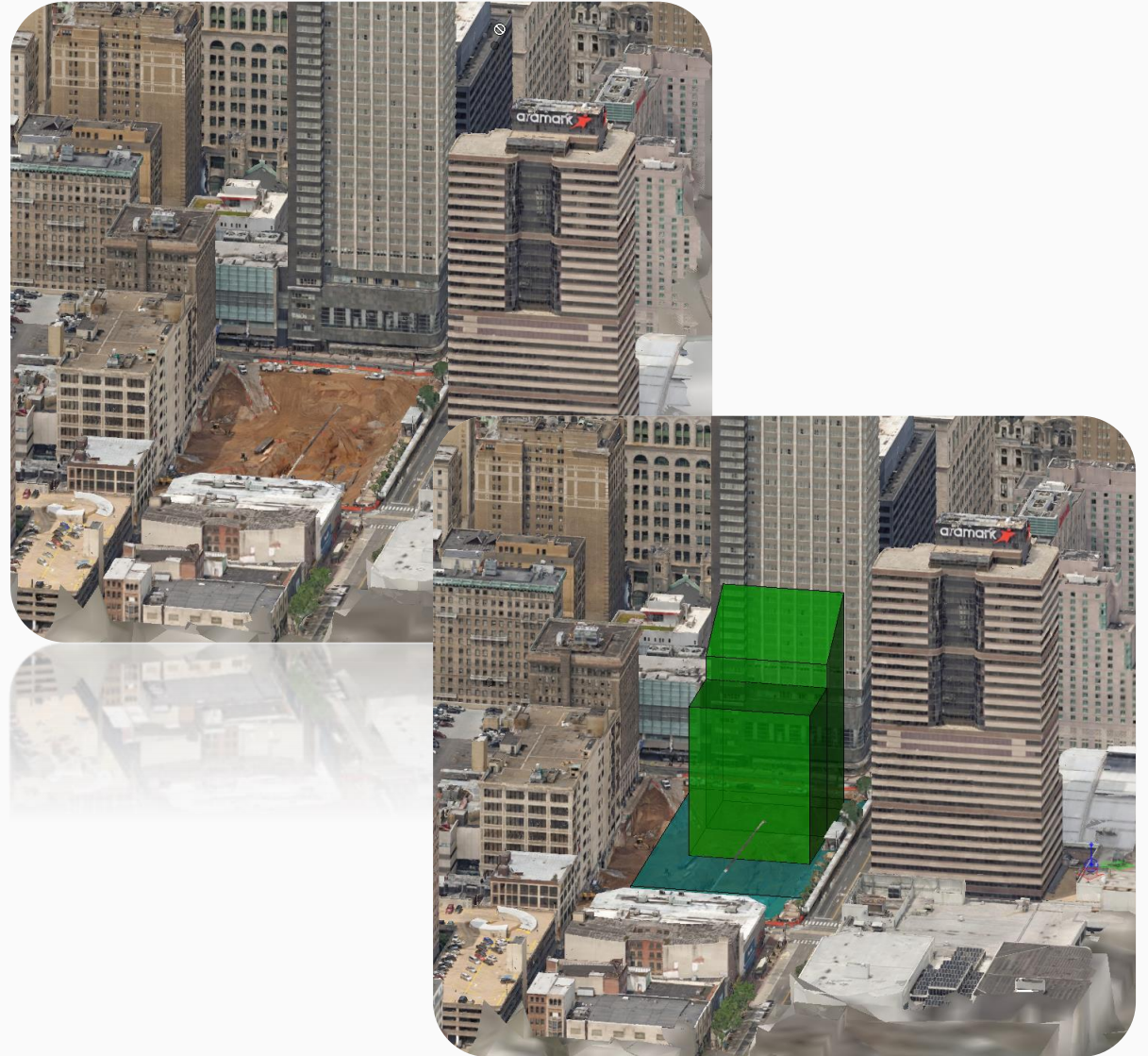
Clash Detection

- Compare solids against point clouds
 - Point clouds used in their native format
 - Eliminates the need to extract geometry
- Find hard and soft clashes
 - Anticipate future clashes
- Generate reports



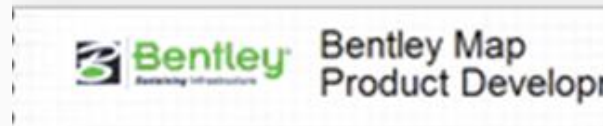
ContextCapture Integration

- Display Reality Mesh in Bentley Map
 - Local attachment
 - URL attachment
- Fast, real time display
- Clipping, masking
- Snapping for modeling and measuring



Geospatial Developers

- Geospatial Developer Extranet
- Bentley Map Development Guide
- Code samples
- Development Support
- No special license requirements



A collection of featured source code, development techniques and best practices for the Bentley Map developer.

Other Notebooks

Following is a list of other [Bentley Map - Product Development Notebooks](#) that contain collections of featured source code, development techniques and best practices for the Bentley Map developer.

[April 2016](#) [May 2016](#)

Terminology

The following terminology is being featured in this issue of the "Bentley Map - Product Development Notebook" in order to provide consistent definitions and to improve the readers understanding of the featured content, best practices, tips, workflows and sample source code. The reader can click on the hyperlinks in this section to quickly search for all occurrences of the selected terminology contained in the [Bentley Map Development and Product Customization Guide](#) document.

[Bentley Geospatial Administrator](#) - The Bentley Geospatial Administrator is an

Notes, Tips and Best Practices

The following [notes](#) and [tips](#) are being featured in this issue of the "Bentley Map - Product Development Notebook" to highlight some common best practices. The reader can click on the hyperlinks in this section to quickly navigate to the particular chapter or section contained in the [Bentley Map Development and Product Customization Guide](#) document.

[1. Introduction - 4. How To Use This Guide](#) - To familiarize yourself with the navigation capabilities of this guide, click on a specific section title on this page, then click the chapter title. Similarly, using the "Table Of Contents" - [\[2020\]](#)

[3. XFM Introduction - 6. XFM Projects](#) - Use of an XFM project is the recommended practice when the application involves building or maintaining an intelligent map or infrastructure model. The XFM project and associated metadata ensures the - [\[2020\]](#)

[3. XFM Introduction - 7. Bentley Geospatial Administrator](#) - The Bentley Geospatial Administrator application can be used to create a new geospatial schema or edit an existing one. It can also be used to import an existing MicroStation GeoGraphics legacy projx - [\[2020\]](#)

[6. XFM Schema Introduction - 7. Criteria](#) - If a property is numeric, compare the property value

Document Searches

The following [links](#) can be used to perform searches of commonly referenced content in the [Bentley Map Development and Product Customization Guide](#) document.

[Archives](#) - A listing of archives contained within this document.

[Chapters](#) - A listing of this guide with all document content including a "Table Of Contents" section that includes only Chapter entries.

[Chapters and Sections](#) - A listing of this guide with all document content including a "Table Of Contents" section that includes both Chapter and Section entries.

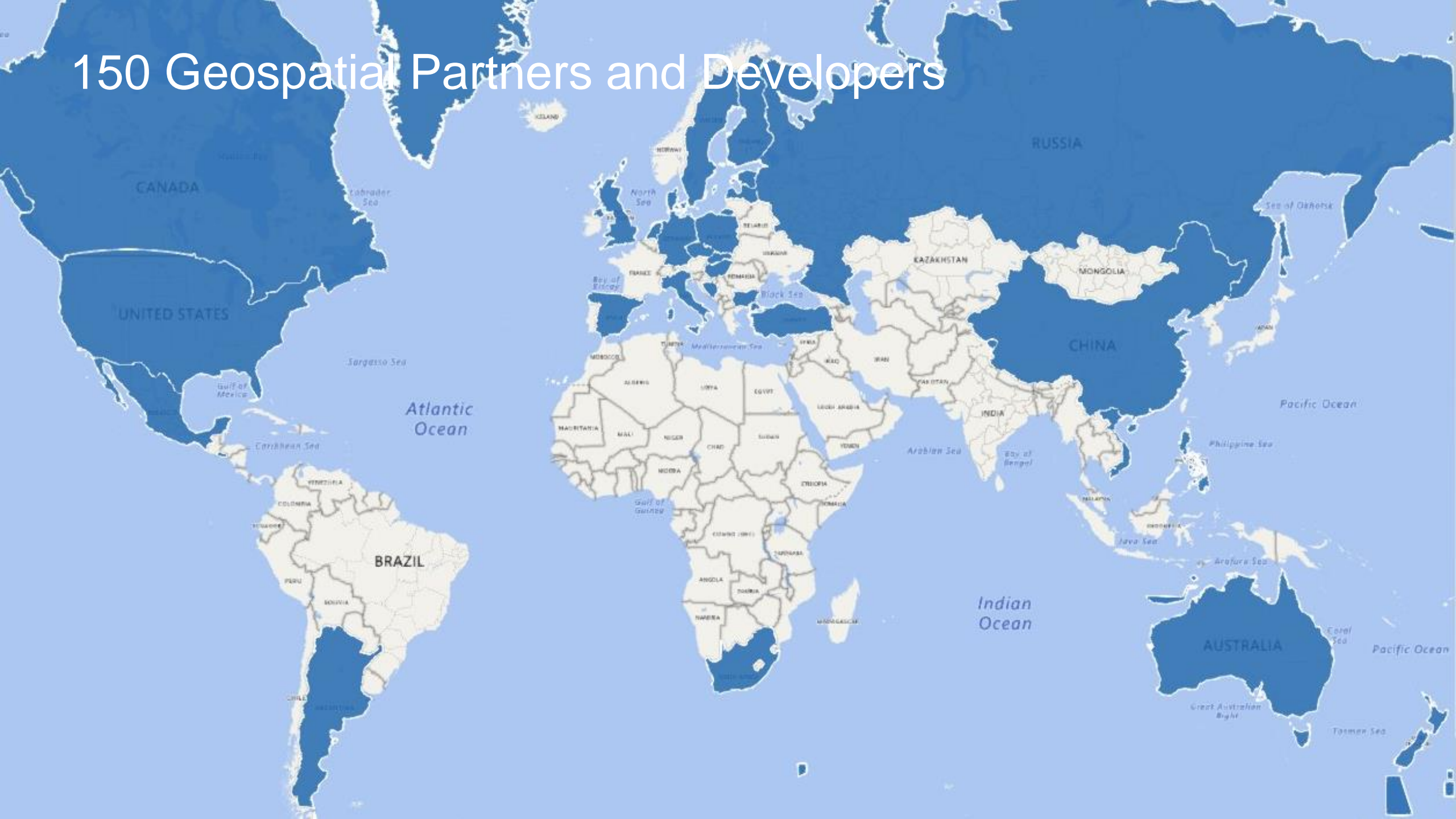
[Code](#) - A listing of sample code snippets contained within this document.

[Code_MCL](#) - A listing of sample "MCL" code snippets contained within this document.

[Code_VBA](#) - A listing of sample "VBA" code snippets contained within this document.

[FeatureGenerator](#) - Example XFM VBA code making use of the FeatureGenerator class.

150 Geospatial Partners and Developers

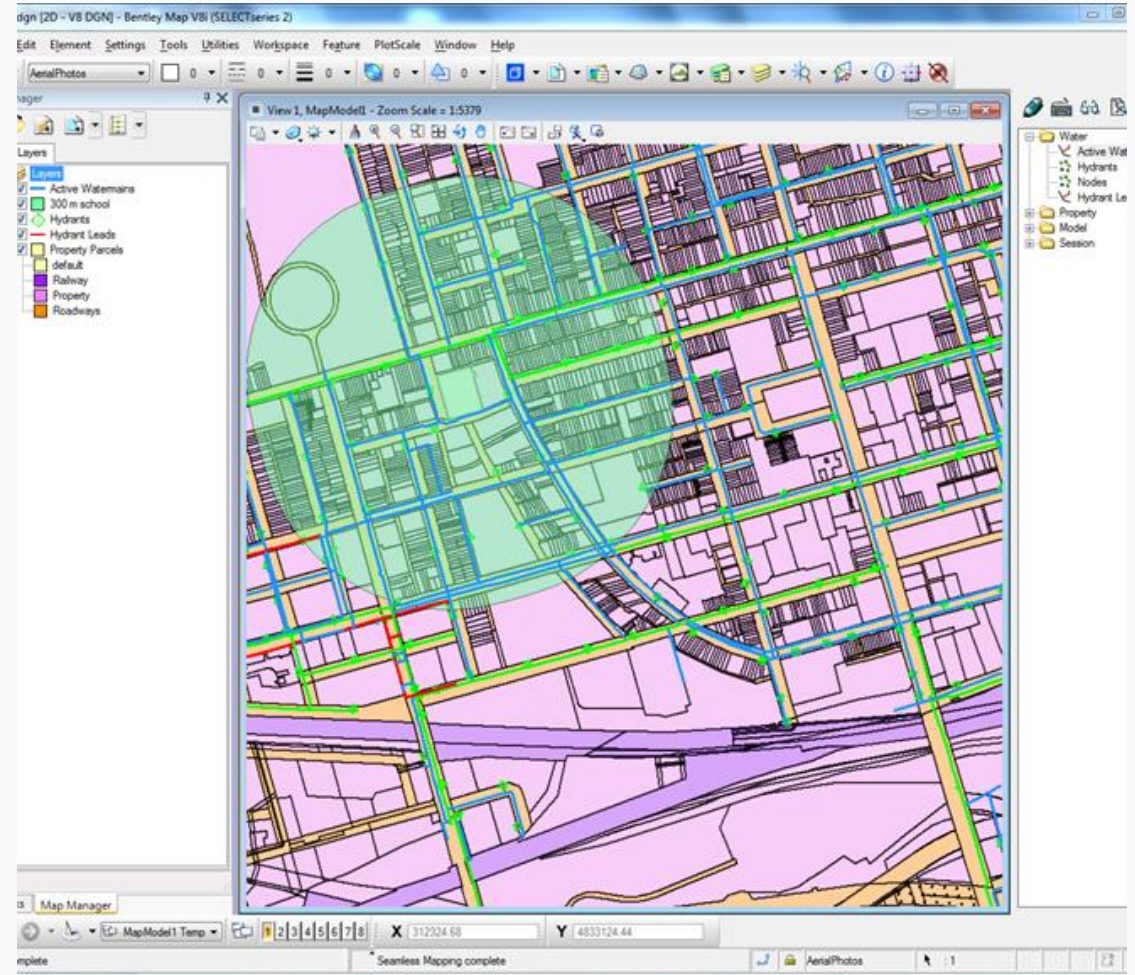


Sample Geospatial Developers

Company	Country	Applications
Geodezy	Poland	Surveying
Verizon	United States	Telecommunications
LE34	Denmark	Surveying
Crotec	Netherlands	Cadastral
HSI	Czech Republic	Telecommunications
Terrasolid	Finland	3D modeling

Bentley Map API – Key Benefits

- high-level geospatial functionality to increase application performance and reduce development time.
- an object-oriented interface which encapsulates feature geometries and business properties.
- leverage the same core geospatial functionalities and data modeling capabilities used by other Bentley applications.
- The Bentley Map API contains ~3,200 additional functions.

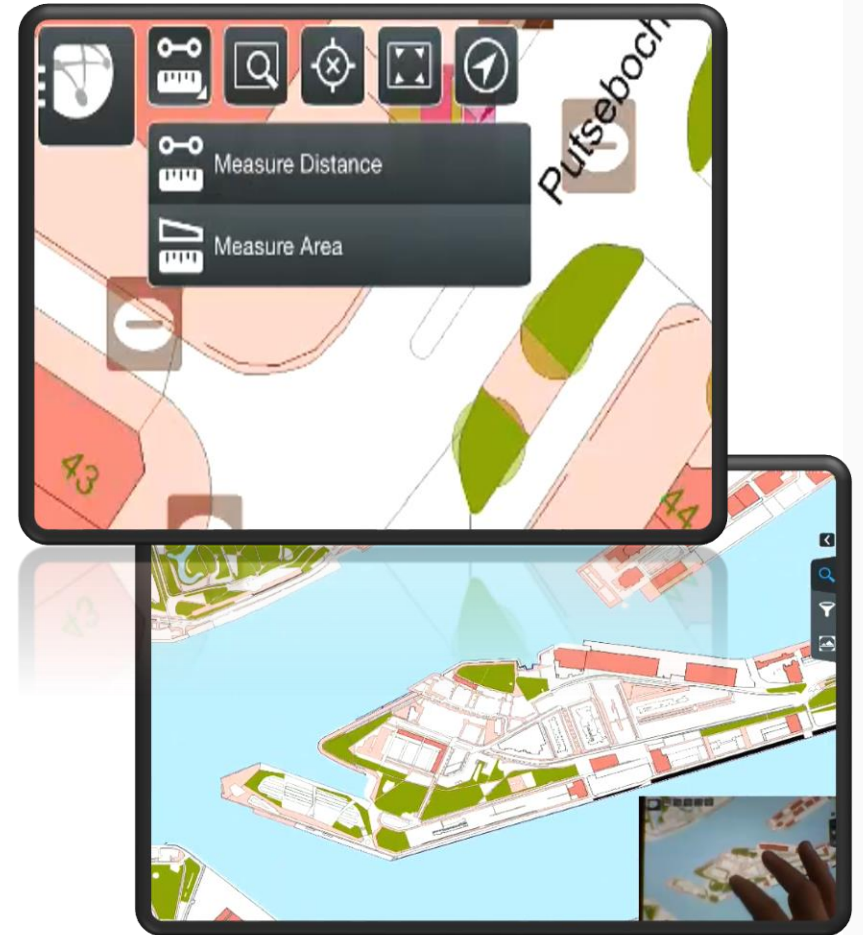




Other Geospatial Products

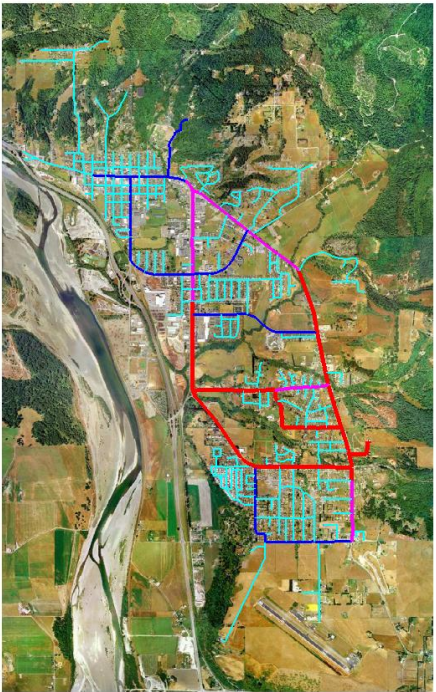
Bentley Map Mobile – take your geospatial data to the field

- Easy to Use
 - Pinch to zoom, touch to select
 - AccuSnap capabilities
- Advanced tools
 - Query tool
 - Detailed measuring tools
 - Coordinate read-outs
 - GPS integration (Google Maps or Apple Maps)
 - Redlines and Markups
 - Delta change updates
- Disconnected operation



Hydraulic modeling applications

- Hydraulic modeling as decision support:

Water Distribution	Wastewater Collection	Stormwater Conveyance	Site Design
			

Utility Lifecycle Needs

- Planning and Design
- Evaluate long-term master planning considerations
 - Study the impact of population shifts, conservation efforts, etc.
- Prioritize capital planning to balance service needs
 - Meet regulatory requirements
 - Improve public safety
 - Increase system reliability and reduce failure risks
- Operations and Maintenance
- Perform maintenance with minimal service disruptions
- Predict performance to improve operational planning
 - Increase pumping efficiency and reduce energy costs
 - Evaluate different operational strategies
- Respond quickly and effectively to emergencies

Improve the Performance of Urban Water Infrastructure

Comprehensive water solution to:

- Address the entire water lifecycle
- Map, analyze, design, operate, and manage water infrastructure

Mitigates risks of poorly coordinated project information



Improve the Performance of Urban Water Infrastructure

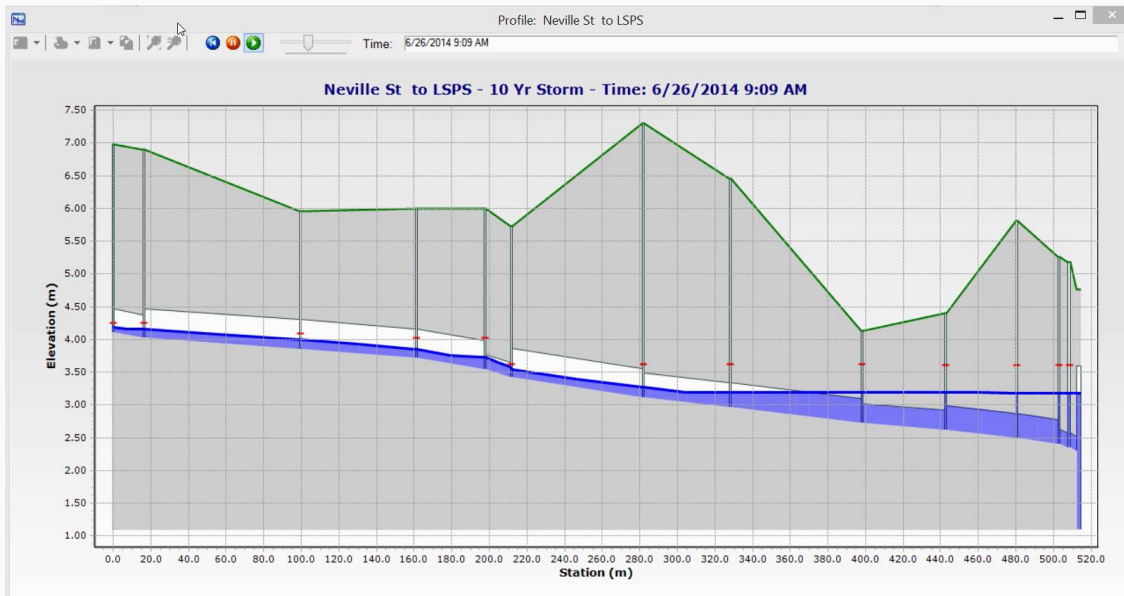
Master plan preparation tools, to:

- Enable intelligent planning
- Deliver clean water safely with the least possible disruption

Ensures system
reliability



Rehabilitation



Existing Infrastructure

Evaluation of capacity

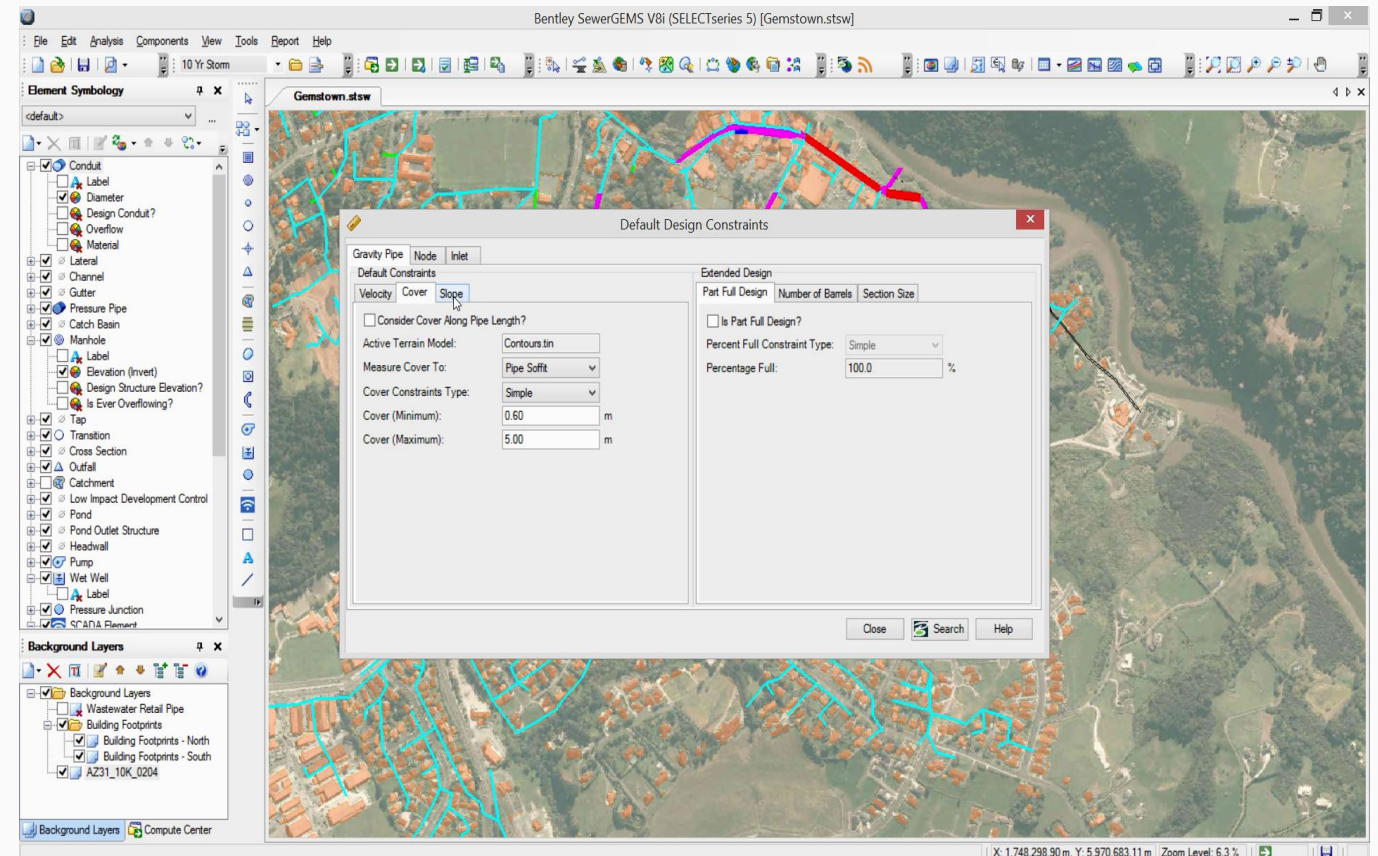
Find/fix bottlenecks
Improve overall system
Lower capital investments

Design

New Infrastructure

Automated constraint-based design

Minimize design costs and capital investments
Maximize performance



Operations

Engineering support of operations

Pump modeling
Criticality and flushing analysis

Plan operations
Reduce energy use
Track water quality
Plan shutdowns

Reduce energy costs
Reduce customer complaints

Bentley WaterGEMS V8i (SELECTseries 5) [Watertown 2013 4-2-13.wtg]

Scenario Energy Cost

Scenario: Energy Cost

Daily Cost: 491.3 \$
Usage Cost: 491.3 \$
Overall Energy Used: 881.9394 kWh/MG
Overall Unit Energy Cost: 73.0058 \$/MG
Total Carbon Emission: 0.00 lb/day

Time (hours)	Time Change (hours)	Flow (Total) (gpm)	Volume Pumped (Incremental) (MG)	Volume Pumped (Cumulative) (MG)	Water Power (kW)	Efficiency Pump Station (%)	Wire to Water Efficiency (%)	Wire Power (kW)	Energy Used (Incremental) (kWh)	Energy Used (Cumulative) (kWh)	Energy Price (\$/kWh)	Energy Cost (Incremental) (\$)	Energy Cost (Cumulative) (\$)	Cost per Unit Volume (\$/MG)
0.00	0.000	2,680	0.00	0.00	93.0	67.0	60.3	154.3	0.0	0.0	0.05	0.0	0.0	0.0000
1.00	1.000	2,678	0.16	0.16	93.0	67.0	60.3	154.2	154.3	154.3	0.05	7.7	7.7	6.4114
2.00	1.000	2,655	0.16	0.32	92.9	67.2	60.5	153.5	154.2	308.5	0.05	7.7	15.4	6.4143
3.00	1.000	2,623	0.16	0.48	92.6	67.5	60.7	152.5	153.5	462.0	0.05	7.7	23.1	6.4396
4.00	1.000	2,596	0.16	0.64	92.4	67.7	60.9	151.7	152.5	614.5	0.05	7.6	30.7	6.4760
5.00	1.000	2,596	0.16	0.79	92.4	67.7	60.9	151.7	151.7	766.1	0.05	7.6	38.3	6.5076
6.00	1.000	2,592	0.16	0.95	92.4	67.7	61.0	151.5	151.7	917.8	0.05	7.6	45.9	6.5076
7.00	1.000	2,597	0.16	1.11	92.4	67.7	60.9	151.7	151.5	1,069.3	0.07	10.6	56.5	9.1177
8.00	1.000	2,643	0.16	1.26	92.8	67.3	60.6	153.1	151.7	1,221.0	0.07	10.6	67.1	9.1088
9.00	1.000	2,692	0.16	1.42	93.1	66.9	60.2	154.6	153.1	1,374.1	0.09	13.8	80.9	11.6157
10.00	1.000	2,778	0.16	1.58	93.5	66.1	59.5	157.2	154.6	1,528.8	0.09	13.9	94.8	11.5164
11.00	1.000	2,841	0.17	1.75	93.7	65.4	58.9	159.1	157.2	1,686.0	0.12	18.9	113.7	15.1304
12.00	1.000	2,844	0.17	1.92	93.7	65.4	58.9	159.2	159.1	1,845.1	0.12	19.1	132.8	14.9714
13.00	1.000	2,844	0.17	2.09	93.7	65.4	58.8	159.2	159.2	2,004.3	0.12	19.1	151.9	14.9641
14.00	1.000	2,827	0.17	2.26	93.7	65.6	59.0	158.7	159.2	2,163.5	0.12	19.1	171.0	14.9633
15.00	1.000	2,801	0.17	2.43	93.6	65.9	59.3	157.9	158.7	2,322.2	0.09	14.3	185.3	11.2541
16.00	1.000	2,790	0.17	2.60	93.6	66.0	59.4	157.6	157.9	2,480.1	0.09	14.2	199.5	11.3051



Operations

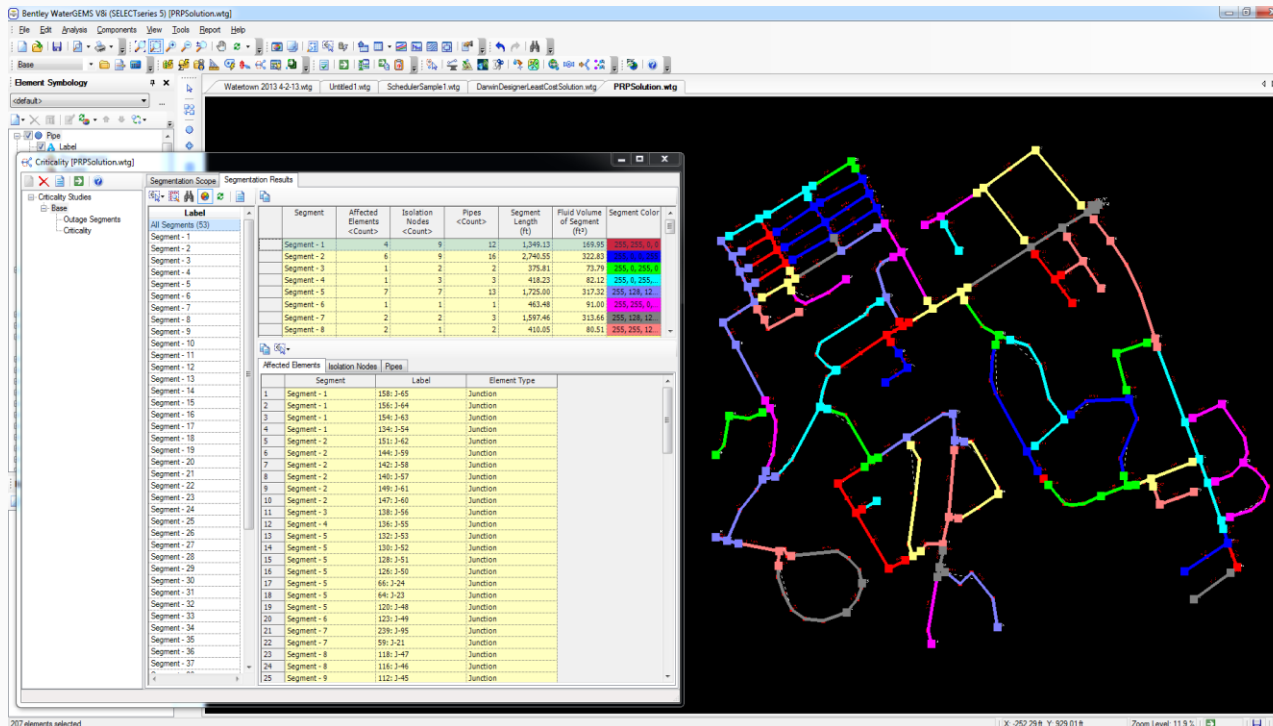


Emergency response

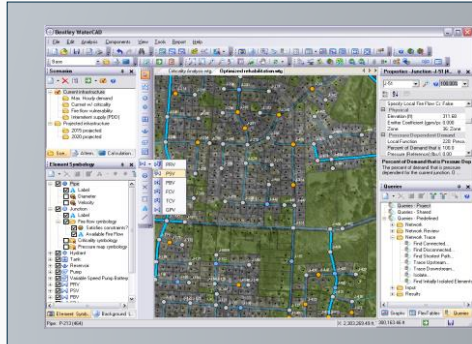
Fire flow, transient, water quality, flushing and criticality analyses

Increase knowledge and understanding of system operations

Reduce emergency response time
Improve decision making

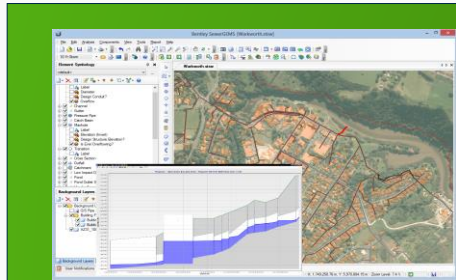


Hydraulics and Hydrology Product Line



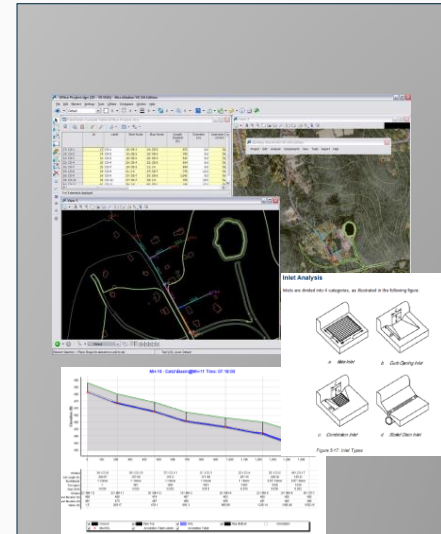
Potable Water Distribution and Transmission

- WaterGEMS
- WaterCAD
- HAMMER



Wastewater Collection

- SewerGEMS
- SewerCAD



Stormwater Systems

- CivilStorm
- StormCAD
- PondPack
- CulvertMaster
- FlowMaster

Efficient Operations



Objectives

Limiting water losses, including leakage

Optimizing pump scheduling



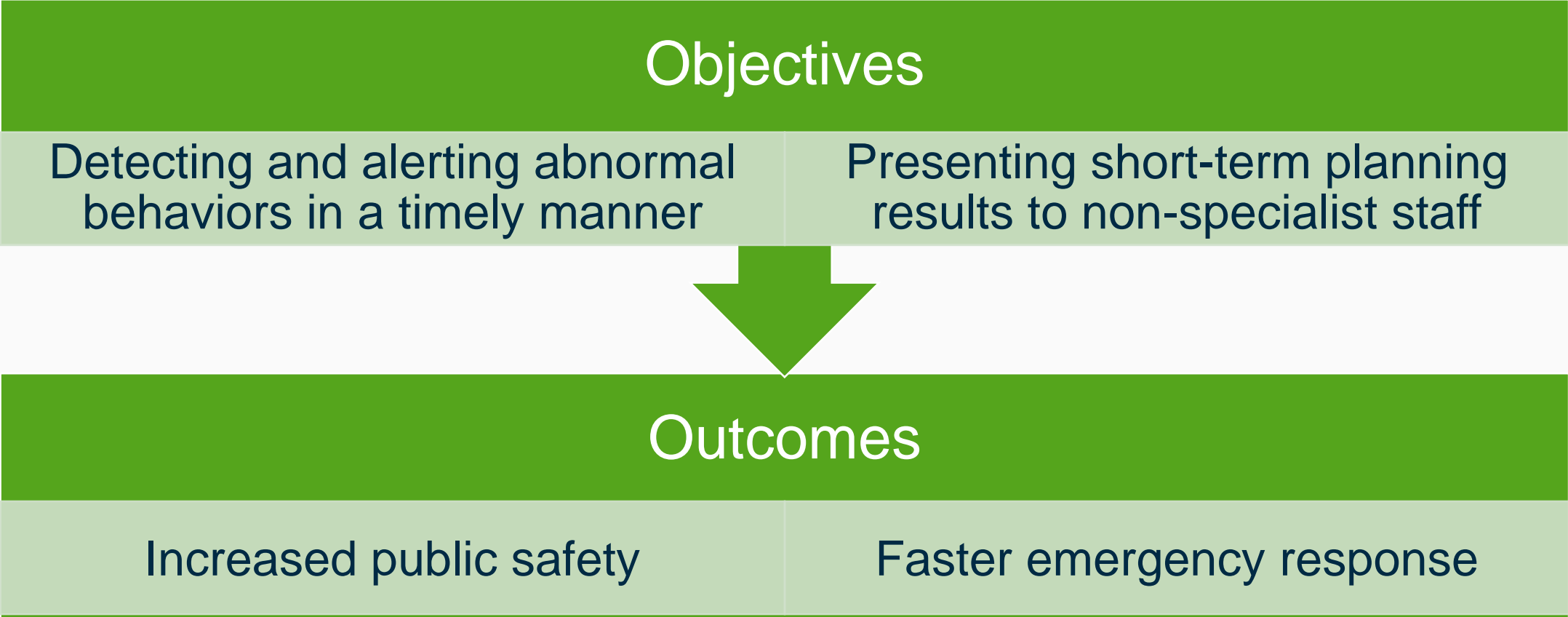
Outcomes

System efficiency

Reduced operating costs

Reduced carbon footprint

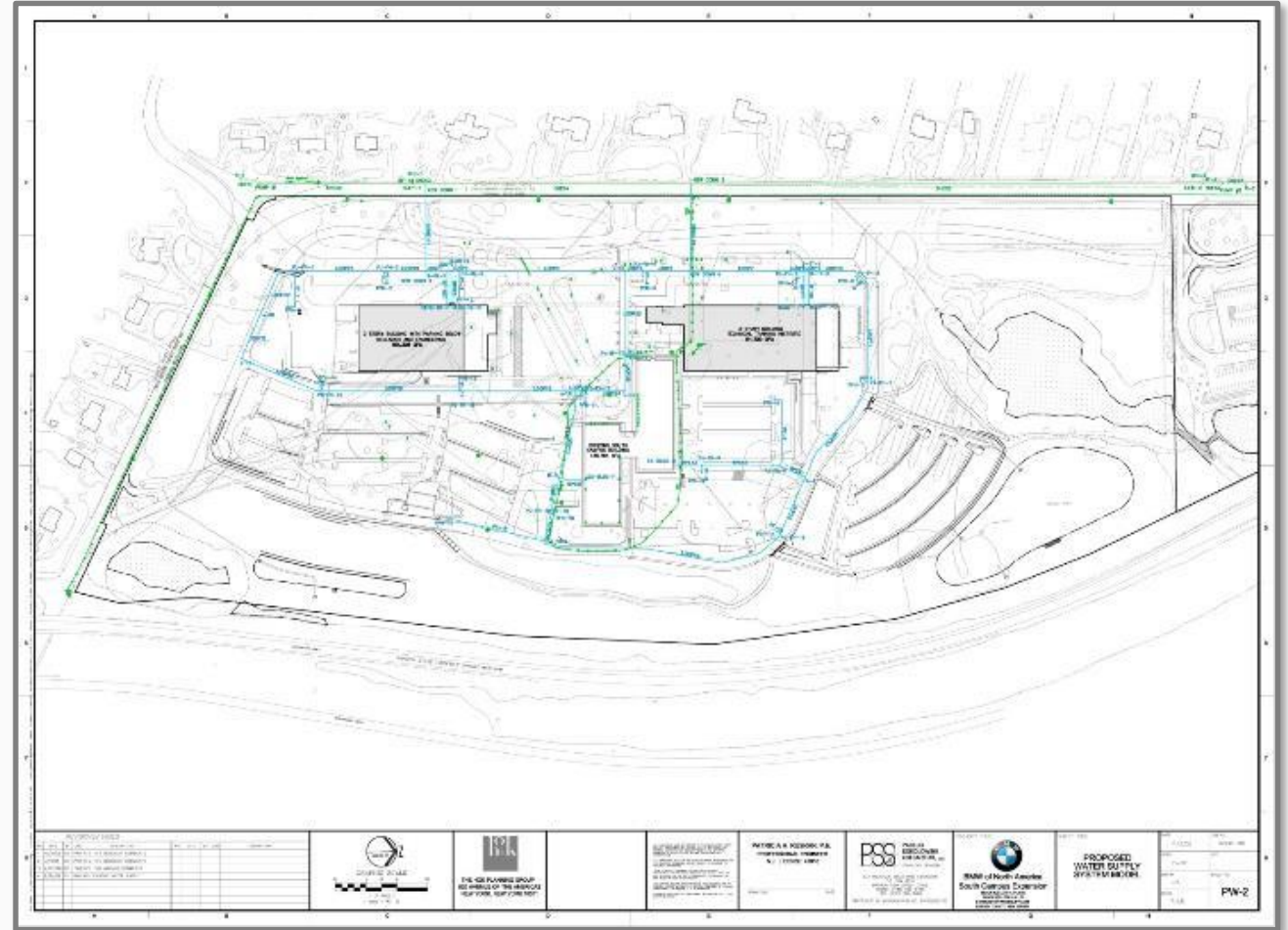
Improved Emergency Response



Site Engineering Needs

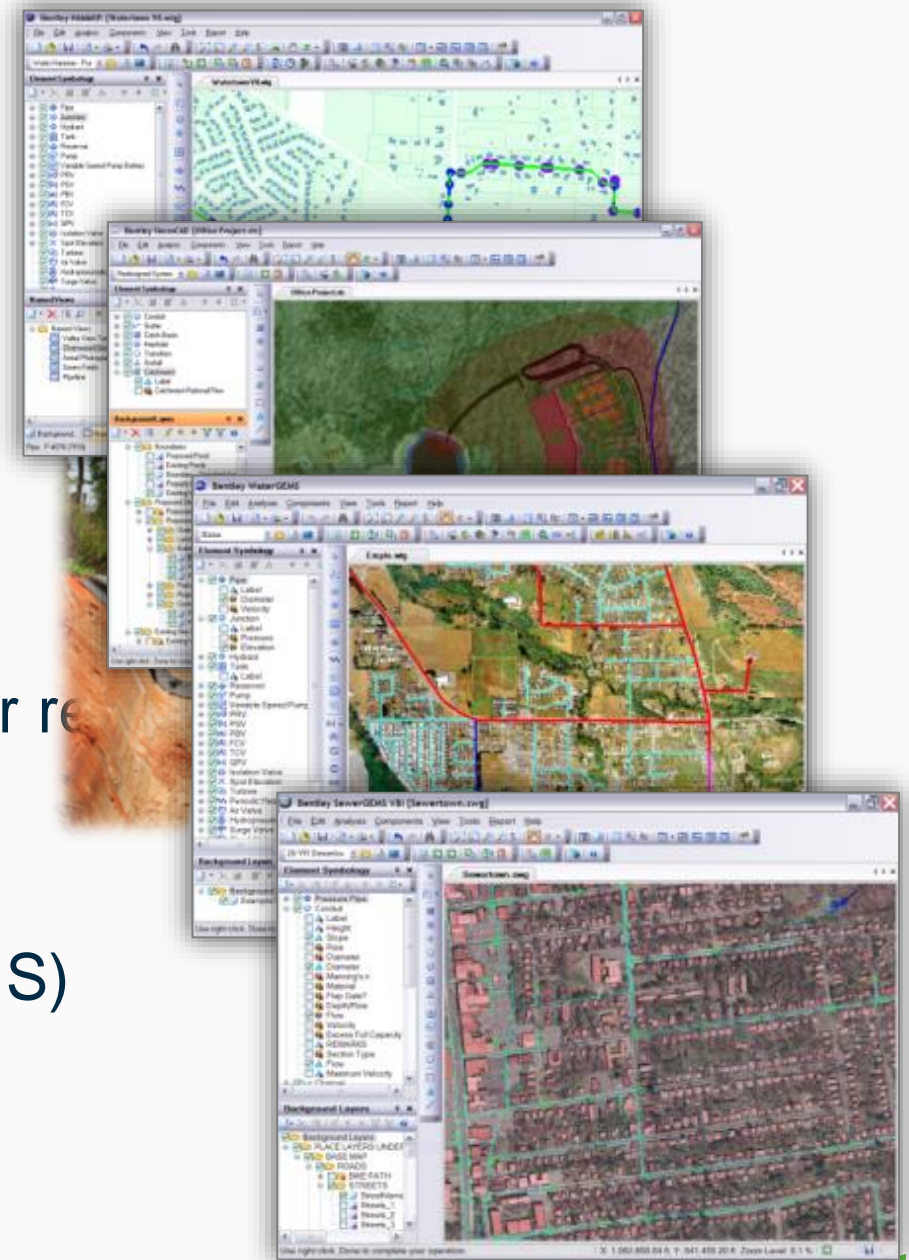
Design and analysis for:

- Stormwater management
- Wastewater collection
- Water distribution



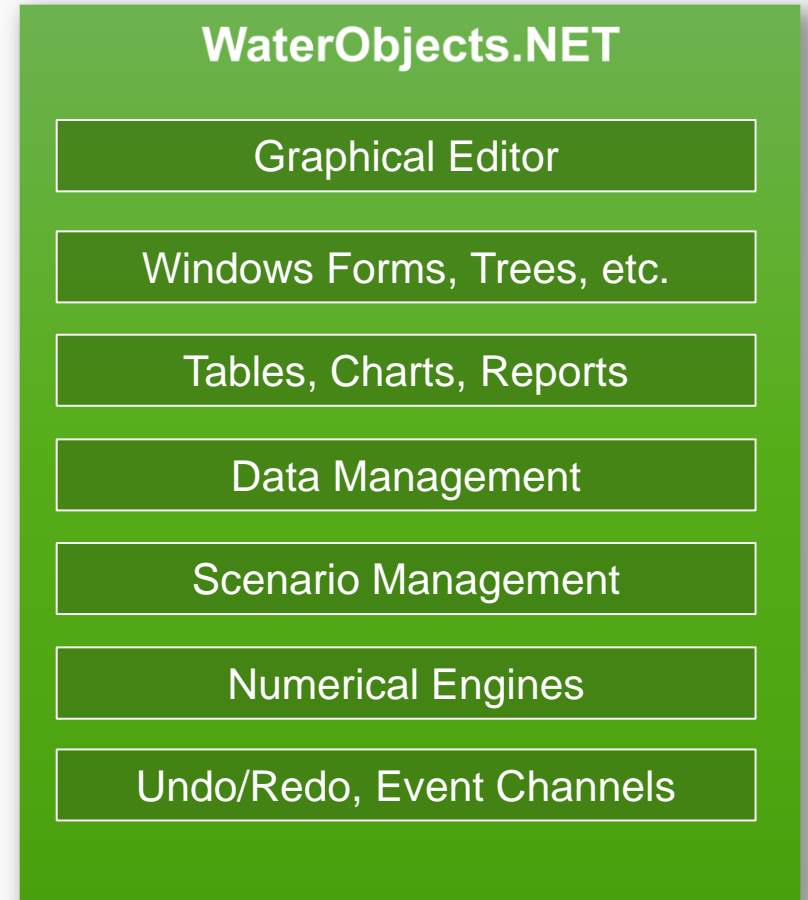
Site Engineering Capabilities

- Balance performance and cost
 - Accurate analysis and automated design
 - Easily compare alternative designs
- Streamline regulatory approval process
 - Design to local guidelines and constraints
 - Customize report templates to meet reviewer requirements
- Work more efficiently
 - Choose any interface to work within (Stand-Alone, MicroStation, AutoCAD, ArcGIS)



WaterObjects.NET

- Programming API
- Means of extending the capabilities of the model to do:
 - Pre-processing
 - Calculations
 - Post-processing



Utilities Networks Challenges and Opportunities

- Infrastructure sustainment
 - Aging assets at or past lifetime
 - Integration new technology
- Aging workforce
 - Experienced workers retiring
 - Difficulty attracting and training new workers
- Regulatory compliance
 - Reporting and change management requirements
 - Time consuming audits and costly fines
- Financial pressure
 - Reduce cost without sacrificing reliability or safety
 - Offset increases in cost of labor, construction, compliance



Who buys Bentley OpenUtilities Solutions?

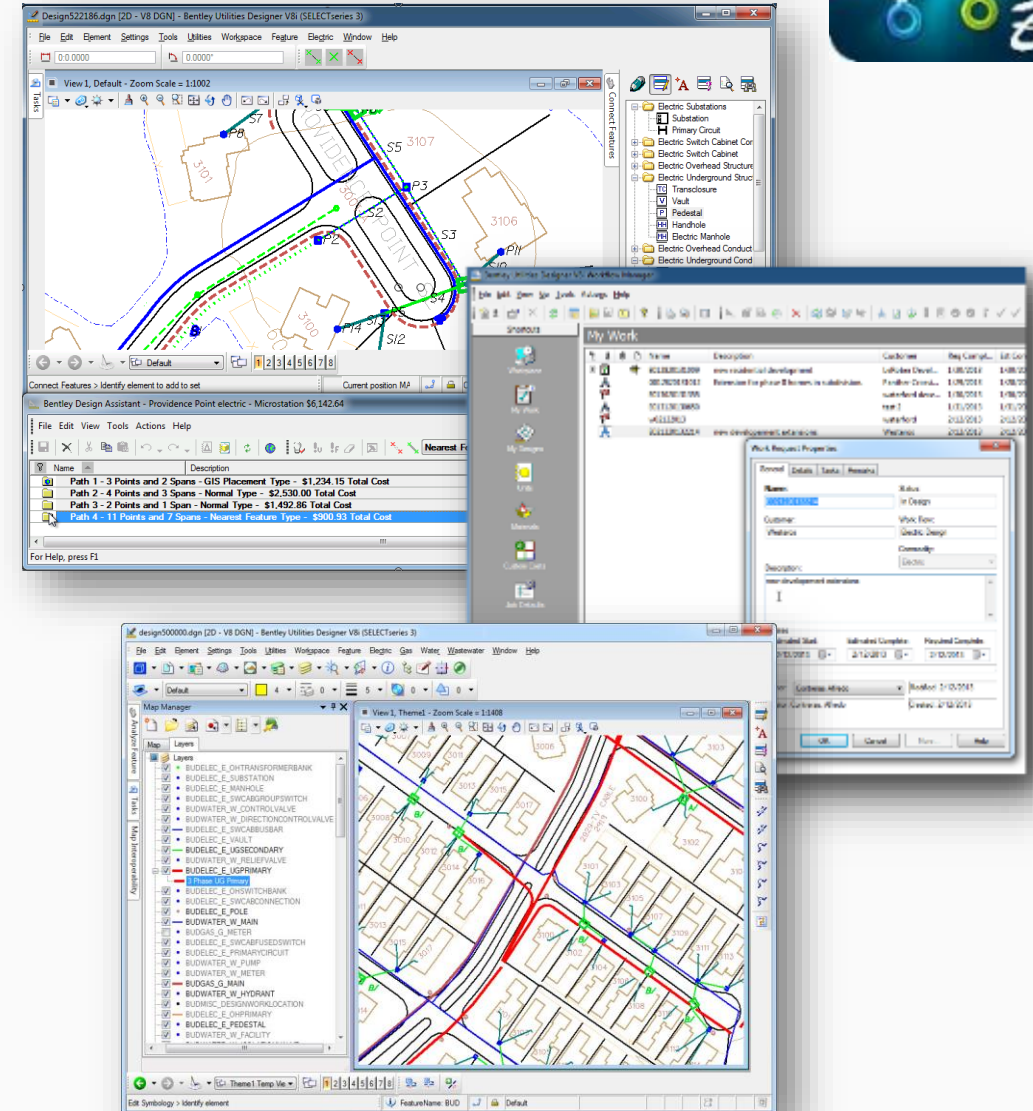
- Municipal water and waste water departments
- Electric and gas utilities
- Campuses
 - airports
 - university
 - army bases
- District Heating



OpenUtilities

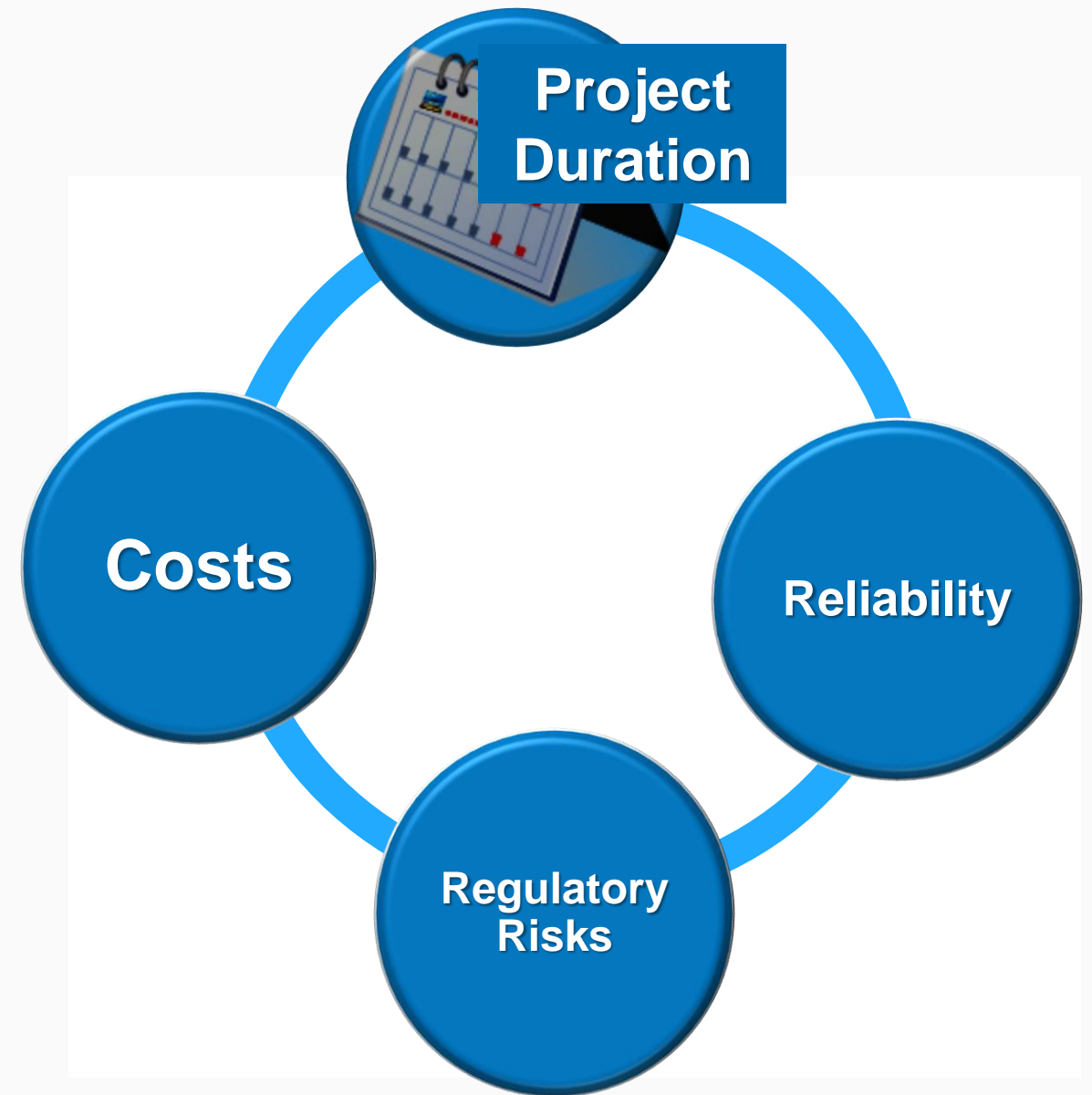


- A utility network design tool
 - Standard data models for electric, gas, water, wastewater and district heating
 - On-the-fly cost estimation with breakdowns of labor, materials and equipment
 - Configurable workflow engine
 - Integration with Bentley's network modeling and analysis products
- Increases productivity, accelerates projects, and reduces software costs



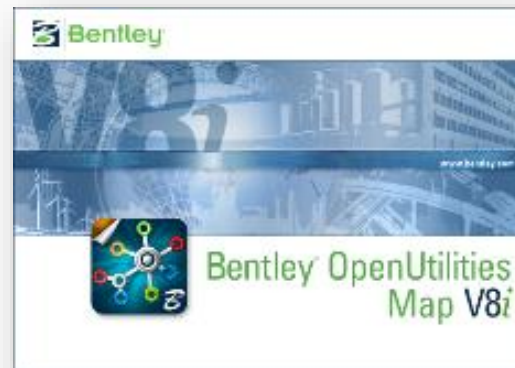
OpenUtilities Benefits

- Data will be precise as well as reliable and robust
- Engineering will have no duplication or data loss
- Quick implementation
- No additional license costs for adding network types
- Affordable Capex and Opex
- Can be offered as Cloud Service



Bentley OpenUtilities Versions

- Bentley OpenUtilities Designer
 - Enterprise GIS for design and management of utility networks
- Bentley OpenUtilities Map
 - Utilities-specific GIS for network mapping and decision support
- Bentley OpenUtilities PowerView
 - Streamlined, cost-effective application to review, explore, and markup utility network designs and maps



Communications Business Challenges and Opportunities

Recruit and Retain Customers

- Timely offerings
- Superior customer service
- Competitive pricing

Increase Capacity and Reliability

- Rapid fulfillment of service orders
- Expand service areas
- Network monitoring and predictive maintenance

Optimize Budget and Delivery

- Reducing costs while improving service
- Apply investment funds effectively
- Deliver projects on time, on budget



...While Change Continues to Accelerate



COMPETITION

- Define new and better service offerings
- Shorten time-to-market
- Cloud, Internet of Things, Industrial, Energy

TIME-TO-SERVICE

- Automation of service fulfillment processes
- Timely network builds and upgrades
- Speedy outage restoration



BUDGET

- Too much to do – not enough money
- Network technology quickly becomes obsolete
- Replacement of legacy plant in the field



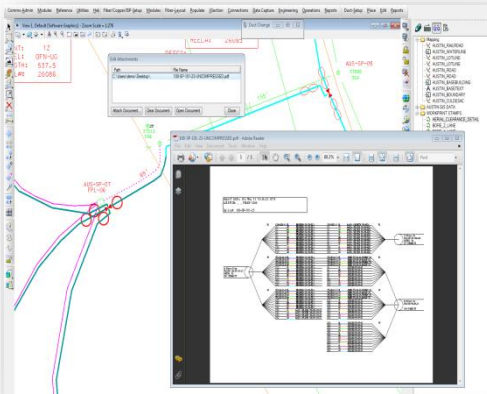
Who buys Bentley Communications Solutions?

- Cable and Telecom Providers
- Communications Contractors
- Departments of Transportation
- Mining
- Railroad
- Utilities
- Anyone who runs a communication network

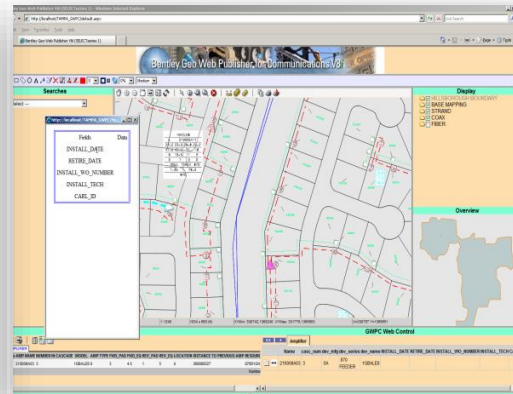


Bentley Communications Solution

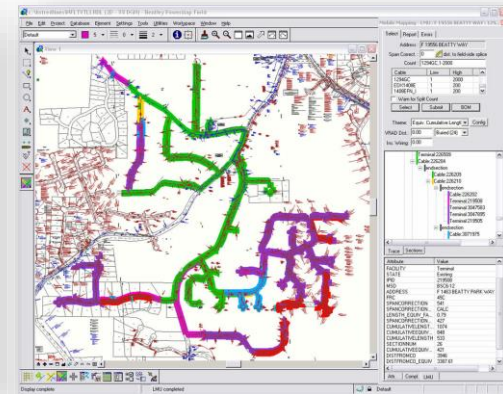
...is a suite of communications network design and management software capabilities for professionals to design and manage as-built records of outside and inside plant.



Engineer Fiber Networks
Engineer HFC Networks
Engineer Inside Plant
Engineer POTS Networks
Engineer Communications Towers



Manage Inside Plant
Manage Outside Plant
Publish Network Model




Mobile mapping and analysis for communications field workers
Emergency Preparedness and Response applications for the field



Communications GIS and Network Engineering

Network engineering to drive your bottom line



Bentley Coax



Bentley Fiber



Bentley Inside Plant



Bentley Expert Designer
Communications



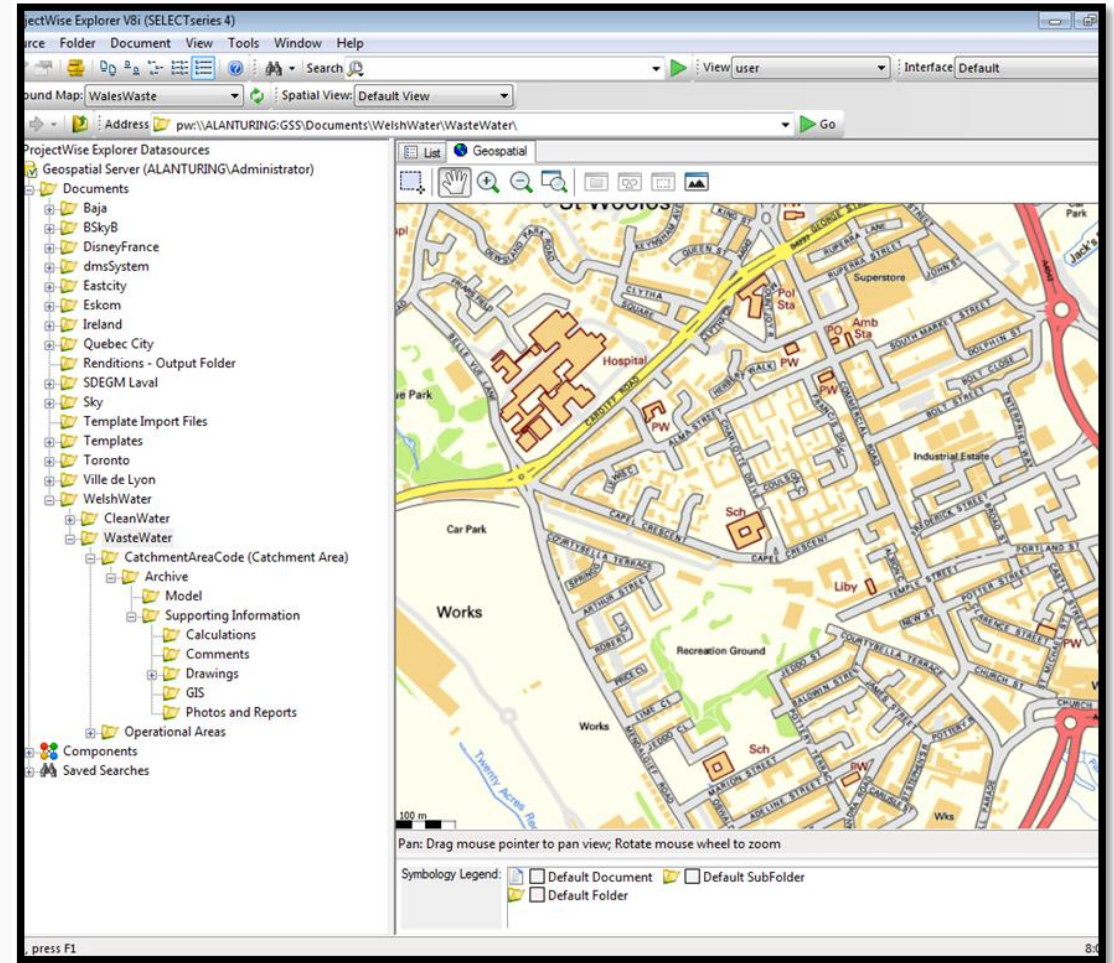
Bentley Communications
PowerView



Bentley Geo Web
Publisher for
Communications

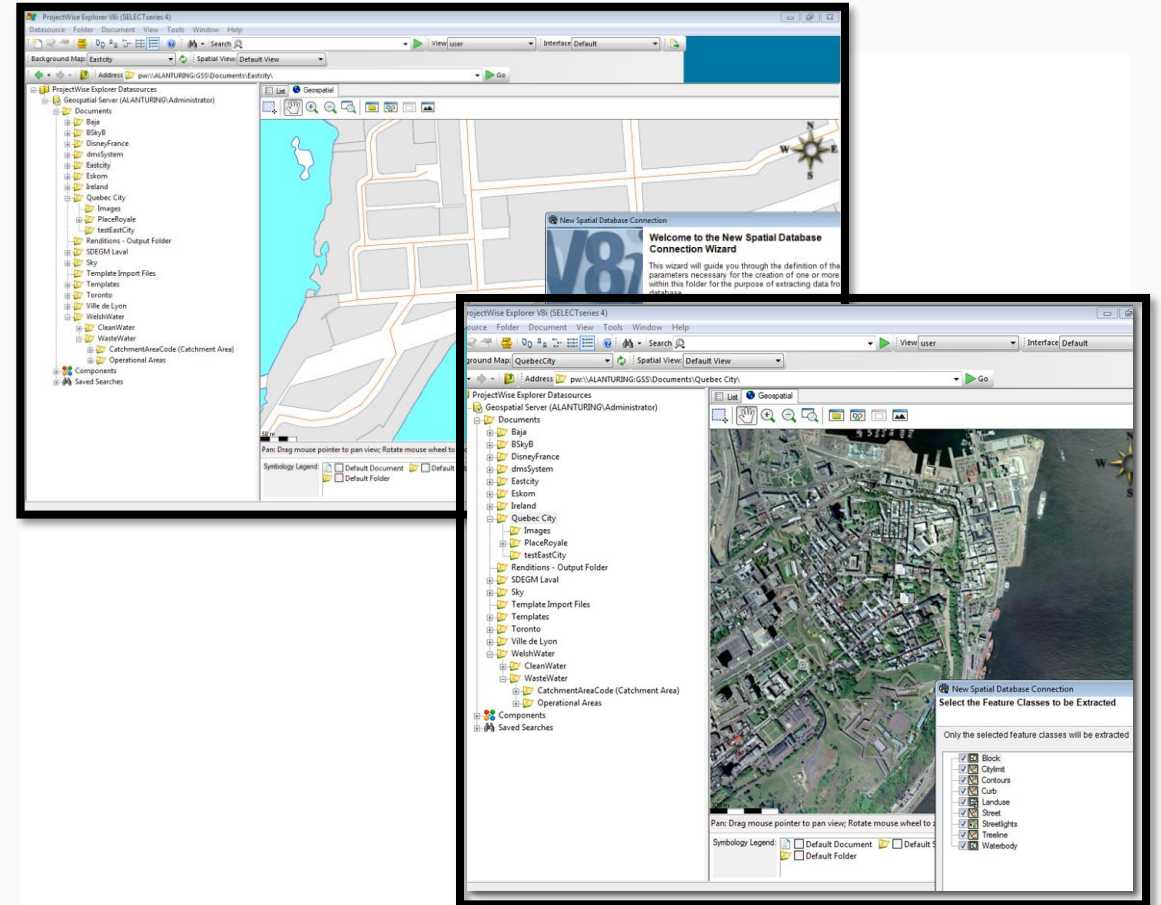
Bentley Geospatial Server

- Federated approach to managing spatial and non-spatial information
 - Find data spatially
 - Access multiple data types
 - Manage user-level access
 - Edit in spatial databases
- Integrate with ArcMap/MapInfo
- Spatial Views provide quick reports on the state of projects



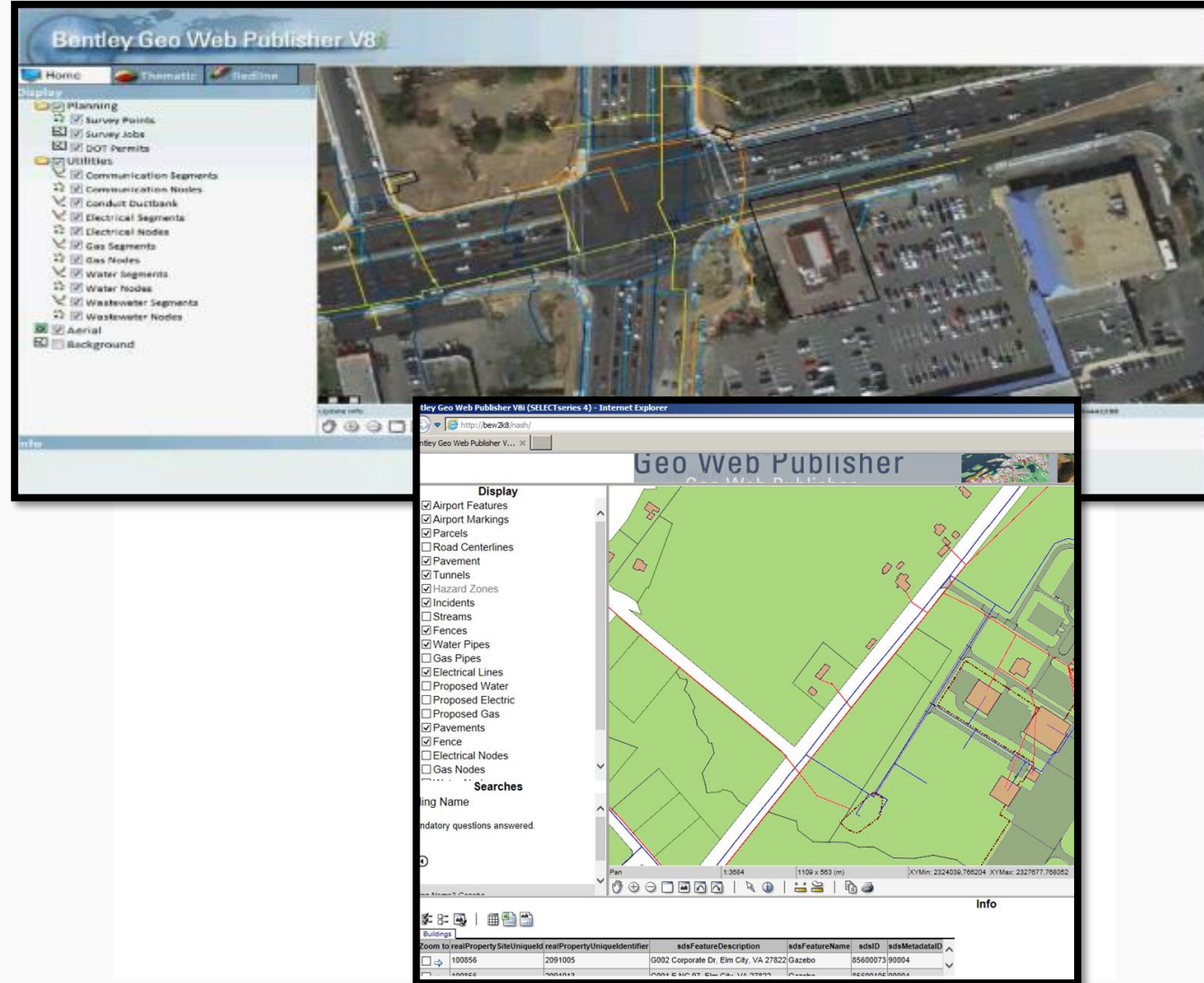
ProjectWise Connectors for Oracle (Spatial) /ArcGIS

- Access ArcSDE and Oracle Spatial databases via ProjectWise
 - Complement engineering data with GIS features and attributes
 - Select region to extract via the ProjectWise background map
 - Read-only or Update
 - Engineering and GIS data via one interface
- Support for multi-user access
- ProjectWise security and audit trail



Bentley Geo Web Publisher

- Author and Deploy Web GIS Applications
 - Integrate graphical & non-graphical data
 - Tools for navigation, querying, analysis, reporting, mark-up, and editing
- Access CAD, GIS, Raster and Spatial databases
- Share geospatial data with other GIS clients via WMS/WFS
- View and interrogate 3D Panoramas



Thank's for your
attention !

Special thanks to the
product management for
providing the slides