

# GEOPAK Civil Engineering Suite<sup>®</sup>

Proven Technology for Designing and Sustaining Transportation Infrastructure



## At-A-Glance Features and Functions



### Integrated Mapping

- Provides data interoperability
- Browse and analyze data
- Map thematically
- Generate reports

### Survey/Data Acquisition

- Read/write standard data formats automatically for:
  - » Raw survey
  - » ASCII/text data
  - » LandXML
  - » LiDAR data: ASCII and LAS
  - » USGS Digital Elevation Models
  - » Photogrammetric data
- Reduce survey data
- Support custom feature coding
- Includes Level and Least Squares adjustments
- Edit survey data graphically and dynamically
- Import and analyze Point Cloud data
- Merge surfaces automatically
- Update surface data dynamically

### DTM Analysis

- Generate contours
- Control maximum length of triangles
- Display cut and fill delineation
- Color code display by triangles, slopes, elevation, and aspect
- View slope vectors
- Analyze line of site
- View gridded and elevation models
- Support boundaries, holes, breaklines, inferred breaklines, and random points
- Manage large LiDAR datasets

### Interactive Coordinate Geometry

- Use robust, interactive geometry tools
- Create, edit, move, and delete COGO points
- Locate intersection: direction-direction, direction-distance, distance-distance, direction-alignment, distance-alignment, alignment-alignment, station-alignment
- Fit curve
- Traverse: angle, direction, curve
- Angle resection
- Parallel by element or station range
- Display inverse
- Create right-of-way
- Create parcels and legal descriptions
- Perform geodetic conversions

- Generate geometric transformations
- Create cul-de-sac

### Geometric Design

- Create horizontal/vertical by PI method or by elements
- Create circular and parabolic vertical curves
- Support complex geometry: SCSCS, SCCS, etc.
- Support tangential and non-tangential curves
- Edit elements associatively and dynamically
- Define curves by radius, degree of curvature, and pass-through points
- Edit, delete, and join elements
- Support delta angles greater than 180°
- Check geometry integrity tool
- Annotate alignments, stations, and COGO points
- Review and report geometry
- Annotate dynamically and automatically
- Display 3D geometry

### Roundabouts

- Create roundabouts using standards library
- Place roundabouts interactively and parametrically
- Provides dynamic editing of attributes
- Add or delete artery

### Regression Analysis

- Regress single or multiple elements
- Regress horizontal and vertical elements
- Review and edit regression points
- Exclude or include points by selection criteria

### Profiles and Cross Sections

- Create/generate cross sections and profiles along alignments, graphics, or between points
- Include drainage structures and utilities
- Include vertical alignments and existing and proposed surfaces
- Apply user-defined annotation of points and segments
- Cut cross sections orthogonally or at skew
- Create custom cross sections
- Update cross sections and profiles
- Generate earthwork volumes

### Typical Sections and Template Libraries

- Include components, end conditions, and features
- Create components as roadway elements such as lanes, curbs, walls, ditches, barriers
- Define parametric components graphically

- Apply constraints to components
- Place component points as free, partially constrained, or fully constrained
- Set constraints as horizontal, vertical, sloped, projected, vectors, offsets, elevations, etc.
- Constrain end conditions partially or fully
- Set end conditions to trace existing surfaces such as rock
- Drag-and-drop assembly of templates from components and end conditions
- Perform graphical tests to verify design

### Roadway Designer

- Blend horizontal and vertical geometry with 3D topography and typical sections
- Assign component control points to existing or designed features and geometry, controlling horizontal and/or vertical location
- Assign automatic overrides
- View plan, profile, and cross section interactively
- Provides heads-up dynamic, interactive parametric design
- Manage one or multiple corridors for designs
- Transition between disparate templates
- Apply superelevation through wizards, text tables, or AASHTO standards
- Allows dynamic editing of superelevation
- Apply exceptions for bridges, voids, and special end conditions
- Assists problem resolution through intelligent color coding of transitions, super runoff, etc.
- Edit stations dynamically
- Reflect edits automatically in quantities and volumes

### Site Design

- Use powerful grading tools for site design and environmental remediation
- Provides dynamic contouring and triangulation
- Project longitudinal slopes with automated benching and slope intercepts
- Set slope along objects
- Set elevations
- Generate sloped surfaces
- Use hydrologic analysis for trickle, flow delineation, and pond volumes

### Visualization

- Walk through interactively or along a defined path
- Drive virtual corridor

## Storm Drainage and Sanitary Sewer Layout and Design

- 3D modeling
  - » Create 3D drainage model relative to topography and alignments
  - » Place multiple drainage structures along alignments by spacing and offsets
  - » Supports pipes, curved pipes, channels, culverts, manholes, catch basins, and inlets
  - » Creates associative and dynamic model-based designs
  - » Build drainage networks directly from survey data
  - » Apply any material and coefficient of roughness
  - » Identify graphics as utilities and drape relative to DTM
  - » Display all network and utility objects in sections and profiles
  - » Label all attributions in any view or include in user-defined reports
- Design and analysis
  - » Analyze and design using industry-standard theorems such as Mannings, Colebrook-White, Bernouli, and continuity equations
  - » Compute Tc from 3D model or specify
  - » Analyze and design based upon HEC 22, FHWA, HDS 5, 10, 13, and Rational Method
  - » Compute drainage flows using Rational Method or SCS Unit Hydrograph Method
  - » Compute Tc via FAA, Kirpich, Overland Flow or LADOT methods

- » Use demand and demographic tables
- » Supports infiltration, population, peaking factors and land usage
- » Compute or specify flows
- » Generate reports for inclusion in project notebook
- » Define custom intensity-duration frequency tables
- » Generate drainage queries and reports
- Pond routing
  - » Calculate pond volumes
  - » Create input and output hydrographs
  - » Design inlet and outlet control structures

### Quantity Management

- Automate quantity takeoffs for estimating
- Link design to a master pay item list
- Report quantities by entire project or delineate by sheets, stations, area, or phase
- Report on design features and graphic elements
- Generate linear, area, and volume quantities
- Integrate with Trns\*port
- Apply funding splits and payer rules to quantities
- Choose from more than 30 sample reports delivered
- Modify sample reports or create custom reports

### Contract Deliverables

- Automated project delivery process with drafting and plan preparation tools
- Extract sections, drawings, and reports directly from completed 3D model

- Automate sheet generation for plans, profiles, and cross sections
- Provide standard reports for bridges, superelevation, clearances, data collection, geometry, sections, DTM, legal descriptions, design, visibility, and more
- Compute volumes by model to model (triangulated surface comparison), triangle by station, gridded, and end-area sectional volumes
- Select end area volume options for separate materials, unsuitable materials, as-builts, and more

### Publishing

- Export directly to Machine Guidance
- Support industry standards, such as LandXML
- Export alignments, surfaces and other pertinent design information to other systems via XML
- Generate PDFs and 3D PDFs
- Integrate with Google Earth™

### Integration with Bentley Content Management and Publishing Solutions

- Component-level integration with Bentley® ProjectWise® for collaborative design and engineering project management
- Integration with ProjectWise® InterPlot® for automated plot set generation and Web-based access to plot archives
- Integration with Bentley® Navigator for design review, construction simulation, or automated clash detection



Image courtesy of Ministère des Transports du Québec

Reshaping of the Route 20 freeway at the Route 171 interchange in Quebec City.

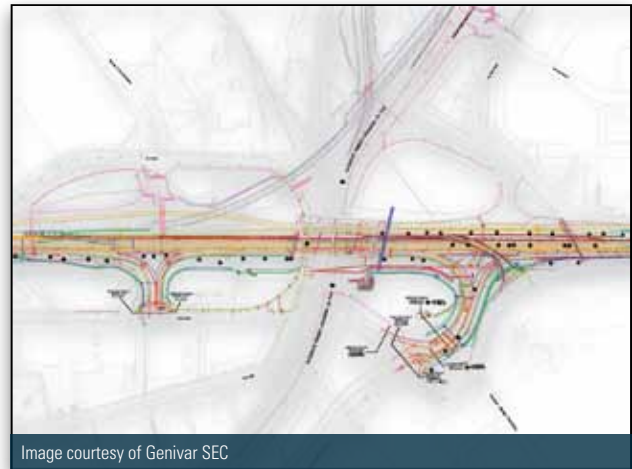


Image courtesy of Genivar SEC

Redefined exits on Charest/Bourassa Highway in Quebec City.