Full Contents

Section 1: Overview Essentials

1.1 Introduction 3
Learning InRoads 3
Basic Rules 3
How to Use This Guide 4
Section Breakdown 5
Section 1: Overview Essentials 5
Section 2: Production Essentials 5
Glossary 5
Index 5
What's in a Chapter? 5
Font Conventions 6
Italic 6
Bold 6
Bold and Italic 7
Small Caps 7
Underlined Small Caps 7
How to Use the CD 7
Files on CD-ROM 7
Training Folders 7
Training Files 8
Chapter Files 10
Other CD Content 10
Software Information 10
AutoCAD versus MicroStation 10
Version Compatibility 11
Software File Paths 12

1.2 Orientation to InRoads 13
Chapter Prerequisites 14
The Bigger Picture 14
InRoads versus CAD 15
The CAD Platform 15
File Types 15
InRoads and CAD 16
The InRoads Interface 17
The Menu Bar 17
The Workspace Bar 18
The Feedback Pane 18
Status Bar 19
Toolbars 19
The Surface Model 21
Surface Origins 21
Intelligent Models 22
Surface Display 24

Geometry **25**
COGO Points 25
Horizontal Alignments 25
Vertical Alignments 27
Event Points 27
Profiles **28**
Annotation 29
Typical Sections **30**
Backbone 30
Cut and Fill Conditions 30
Layers and Components 31
Surface Intelligence 32
Roadway Models **32**
Express Modeler 33
Roadway Designer 33
Defining the Roadway 34
Running the Modeler 34
Superelevation 36
Cross Sections **38**
Custom Cross Sections 39
Cross Section Viewer 40
Annotation 40
Cross Section Editing 40
Volumes **41**
Triangle Volume 41
Grid Volume 41
End-Area Volume 42
Reporting **42**
XML Reporting 43
Preferences **45**
Tools> Options 46
The Managers **46**
Symbology Manager 47
Features - Style Manager 48
Geometry - Style Manager 50
Preference Manager 51
The Locks **52**
Pen and Pencil 52
Locate Lock 53
Snap Lock 53
Station Lock 54
Report Lock 55
Feature Filter 55
InRoads Support **56**
InRoads Help File 57
Training 57
Bentley 58
Consultants 58
Chapter Challenge **58**
Quiz Questions 58

1.3 Sample Project Defined **61**
Preliminary Design Statement **61**
Project Design Criteria 61

Scope of Work Details 62
Typical Sections *63*
Concept Sketches *64*
Design Criteria *66*
Project Vicinity Map *68*

1.4 Getting Going Now! 69
Chapter Prerequisites 70
Files Needed 70
Hands On—Get Going Now! 71
Hands-On—An Introduction 71
Orientation 71
Loading the Training Files 75
Preparing and Opening InRoads *75*
Project Defaults *76*
Creating a New Project Default Configuration *79*
Opening the Data *80*
Lock Settings 81
CAD File Preparation 81
Surface Review and Display 82
Perimeter *82*
Contours *83*
Triangles *84*
Update 3-D/Plan Surface Display *85*
Surface Properties *87*
Feature Properties *88*
View Features *89*
Horizontal Geometry File Creation 92
The Geometry Project *92*
Horizontal Alignment *94*
Vertical Alignment *95*
Horizontal Geometry Workspace Bar Review 96
Workspace Bar Shortcuts - Review *97*
Workspace Bar Shortcuts - View *98*
View Stationing *100*
Alignment Stationing *101*
Horizontal Annotation *103*
Profiling 106
Create Profile *107*
Vertical Geometry Viewing 112
View Vertical *112*
View Vertical Annotation *113*
Typical Sections 114
Templates *115*
Roadway Modeling 118
Express Modeler *118*
Running the Express Modeler *121*
Creating Cross Sections 125
Create Cross Sections *125*
Cross Section Viewer *128*
Express Modeler and Cross Section Repetition 130
Express Modeler Revisited *130*
Cross Sections Revisited *131*
End-Area Volumes 132

End-Area Volumes *132*
Chapter Challenge **136**
Additional Exercises 136
Quiz Questions 136

Section 2: Production Essentials

2.1 Starting Up **141**
Chapter Prerequisites **141**
Knowledge Prerequisites 141
Data Prerequisites 141
Files Needed 141
Hands On—Starting Up **142**
Selecting a CAD Platform 142
Starting InRoads 143
InRoads Versus CAD *143*
The InRoads Interface 145
The Menu Bar *145*
The Workspace Bar *146*
Workspace Bar Shortcuts *148*
Active Data *149*
Repositioning *150*
The Feedback Pane *151*
Toolbars 152
Standard Issue Toolbars *152*
Modifying a Toolbar *153*
Restoring Toolbar Defaults *154*
Building a Custom Toolbar *155*
Exporting and Importing Toolbars *156*
Project Defaults 157
Creating a New Configuration *157*
Application Add-ins 159
Saving InRoads Data 160
Bentley Embedded Help 160
Exiting InRoads 162
Chapter Challenge **163**
Additional Exercises 163
Variable Manager *164*
Quiz Questions 166

2.2 Settings, Styles and Symbology **167**
Chapter Prerequisites **167**
Knowledge Prerequisites 167
Data Prerequisites 167
Files Needed 168
Hands on — The Managers **168**
Managers Overview *169*
Using the Symbology Manager 170
Using Named Symbology - Part 1 ..... *172*
Using Named Symbology - Part 2 ..... *174*
Using Named Symbology - Part 3 ..... *175*
Introduction to Intelligent DTMs 176
Style Manager - DTM Features 176
Style - Surface Display *179*

Style Manager - Geometry 179
Geometry Style - Details *182*
Creating a New Geometry Style 185
General Information *186*
Assigning Symbology *186*
Assigning New Symbology *189*
Defining the Settings *192*
Geometry Styles - Assigning 193
Preferences 195
Preference Manager *197*
Changing the Default Preference *198*
Preferences Expanded *199*
Chapter Challenge 203
Additional Exercises 203
Quiz Questions 204

2.3 Surface Essentials 207
Chapter Prerequisites 207
Knowledge Prerequisites 207
Data Prerequisites 207
Files Needed 207
Hands On—Surface Essentials 208
Getting Started with Surfaces 208
Starting Checks *208*
What is a DTM anyway? 209
DTM Basics 210
Surface—New *210*
The Basic DTM Point Types *211*
Surface Properties *212*
The Existing Surface 213
Feature Properties *213*
The Three Feature Characteristics *214*
Introduction to the Locks 215
The Pencil Setting *215*
The Pen Setting *215*
Surface Viewing 216
Perimeter *216*
Contours *216*
Triangles *216*
Update 3-D/Plan Surface Display *217*
View Features *218*
Text Import Wizard - ASCII DTM Data 219
Confirming Data Import *229*
Processing Imported Surface Data *229*
Viewing Imported Surface Data *230*
Surface Import from Graphics, Utilities *231*
Drape Surface, Utilities *234*
Surface Import From Graphics, Contours *237*
DTM Data Viewing 240
Triangulation 241
Triangulate Surface *242*
Saving Surfaces 244
Chapter Challenge 246
Additional Exercises 246

Quiz Questions 247

2.4 Horizontal Geometry 249
Chapter Prerequisites 249
Knowledge Prerequisites 249
Data Prerequisites 250
Files Needed 250
Hands On—Geometry 250
Project Scope Orientation 250
The Geometry Project File 251
Opening Existing Geometry 251
Existing Geometry—Examination 252
Workspace Bar Assessment 252
Feedback Pane Assessment 253
Viewing Assessment—Preparation 253
View Horizontal Alignment 255
Point Symbology 255
Review Horizontal Alignment 260
View Stationing 262
Viewing Assessment - Continued 263
Review Geometry Points 264
Horizontal Annotation—Cogo Points 265
Horizontal Layout Discussion 268
Layout Methods 268
Project Orientation 269
Main Road Layout 269
Layout Option 1 269
Creating Geometry 270
Saving Geometry 271
Horizontal Curve Set—Add PI 272
PI—Precision Key-in 273
Review/Save Horizontal 274
Horizontal Curve Set—Define Curve 275
Defining the Beginning Station 277
View Stationing 278
Alignment Completion 279
Import Geometry from Graphics 280
Completion Steps 282
Chapter Challenge 283
Additional Exercises 283
Layout Option 2 283
Create/Edit Alignment by Cogo Points 283
Horizontal Alignment Annotation 285
Copy Geometry 287
Viewing Geometry 288
Delete Horizontal PI 289
Delete Horizontal Element 290
Alignment Discontinuity Check 294
Add Horizontal Free Curve 295
Defining the Beginning Station 297
View Stationing 297
Layout Option 3 298
Add Fixed Line 299
Add Horizontal Free Curve 301

Defining the Beginning Station *302*
View Stationing *302*
Copy Geometry *302*
Side Road Centerline Layout 304
Horizontal Regression 304
Regression Deviation Check *304*
Side Road Regression Check *308*
Quiz Questions 309

2.5 Profiling 311
Chapter Prerequisites 312
Knowledge Prerequisites 312
Data Prerequisites 312
Files Needed 312
Hands On—Profiling 313
Creating Profiles 313
Updating the Profile Overview 315
Updating the Profile 318
Profiles—Other Commands 319
Chapter Challenge 320
Additional Exercises 320
Create Profile Settings 321
Create Profile - General Leaf 321
Set Name *321*
Direction *321*
Exaggeration *321*
Surface Symbology *322*
Create Profile - Source Leaf 324
Create Profile - Controls Leaf 324
Limits *325*
Window Clearance *325*
Create Profile - Offsets Leaf 326
Create Profile - Include Leaf 327
Crossing/Projected Features *327*
Styles and Display *327*
Bandwidth *329*
Create Profile - Symbology 330
Quiz Questions 331

2.6 Vertical Geometry 333
Chapter Prerequisites 334
Knowledge Prerequisites 334
Data Prerequisites 334
Files Needed 334
Hands On—Vertical Geometry 335
Vertical Layout Discussion 336
Layout Methods *336*
Vertical Alignment Layout Prerequisites *336*
The Project Orientation *337*
Main Road Layout 338
Layout Option 1—Import from DTM 338
Import Vertical from Surface *339*
View and Review *340*
View Vertical Annotation *341*
Matching or Paralleling Existing Grade *343*

Saving Vertical Alignments *343*
Creating New Vertical Geometry 343
Layout Option 2—Vertical Curve Set 344
VPI—Precision Key-in *345*
Vertical Curve Set Tools *345*
Preparation *345*
VPI Dynamics *346*
Vertical Curve Set – Add PI *346*
Review Alignment *348*
Adding More VPIs *348*
Vertical Curve Set—Move PI *349*
Vertical Curve Set – Insert PI *351*
Vertical Curve Set—Define Curve *352*
Move Curve PI *353*
Completion Notes *354*
Vertical Alignment Annotation *354*
Chapter Challenge **355**
Additional Exercises 355
Side Road Vertical Layout *355*
Vertical Alignment Layout Option 1 ..... *355*
Previous Chapter Challenge Work *355*
Layout Option 3—Vertical Element 355
Update Profile *357*
Element Command Overview *357*
Vertical Starting Point *358*
Add Fixed Vertical Line *360*
Add Fixed Vertical Line *362*
Add Free Vertical Curve *364*
Add Fixed Vertical Curve *365*
Vertical Alignment Discontinuity Check *366*
Add Floating Vertical Line *367*
Add Free Vertical Curve *368*
Vertical Discontinuity Check *369*
Add Floating Vertical Line *369*
Upcoming Vertical Assessment *371*
Copy Elements *372*
Add Free Vertical Curve *373*
Add Fixed Vertical Line *374*
Add Free Vertical Curve *375*
Vertical Completion Checks *375*
Vertical Alignment Annotation *376*
Quiz Questions 376

2.7 Typical Sections **379**
Chapter Prerequisites **380**
Knowledge Prerequisites 380
Data Prerequisites 380
Files Needed 380
Hands On—Typical Sections **381**
Creating a Template Library 381
Opening a Template Library 384
Reviewing a Template Library 384
Viewing Templates 387
View Controls *389*

Styles and the Intelligent DTM 390
Components 392
Components Expanded 394
Template Review 395
Template CAD Display *397*
Template Layers *400*
Component Constraints 403
More on Constraints *405*
New Template #1 406
New Template Placeholder *406*
Template Section Details *407*
Drag and Drop Insertion Point *408*
Template Options *409*
Last Minute Settings *410*
Dragging and Dropping Components *411*
Last Edit Undo / Redo *413*
Component Mirroring *413*
Template #1 Completion *416*
Adding Cut / Fill Slopes *418*
Component Merging *421*
Constraint Release *424*
End Condition Testing *428*
Create Template Command Summary 429
New Template #2 430
Saving Templates *430*
Additional Template Topics 431
Preparation *431*
Add Details Step by Step *431*
Multiple Passes *432*
Independent Control Notes *432*
Copy Typical Sections *433*
Chapter Challenge **434**
Additional Exercises 434
Template Basics Checklist *435*
Component Creation 436
Simple Components 436
Preparation *436*
Construction and Placement *439*
Component Properties *442*
Point Properties *443*
Using a Simple Component *446*
Simple Component - Template Review *449*
Simple Components Continued 452
Template Construction *455*
Template Points - Names 457
Constrained Component #1 460
Component Curb Details *461*
Component Construction *462*
Component Review *466*
Unconstrained Components 467
Unconstrained Component #2 ..... *470*
Component Construction 471
Bike Path / Walkway *471*
End Conditions 472

Fill Slope Creation *472*
Set Dynamic Origin *477*
Reset Dynamic Origin *479*
Dynamic Origin Alert *479*
Cut Slope Creation *480*
Building Template #1 481
Template Drag and Drop *482*
End Condition Testing *484*
End Condition #3 ..... *487*
Add Additional End Condition *489*
End Condition Re-Test *489*
Building Template #2 490
Merging Components 490
Component Summary 491
Component Types *491*
Terminology *491*
Component Concept #1 ..... *492*
More on Point Controls 492
Create Your Own 493
Quiz Questions 493

2.8 Corridor Modeling 495
Chapter Prerequisites 496
Knowledge Prerequisites 496
Data Prerequisites 496
Files Needed 496
Hands On—Corridor Modeling 496
Opening Earlier Data 497
New Roadway Design File 497
Saving the Roadway Design File 498
The Project File 499
Modeling Basics 502
Prerequisites *502*
The Roadway Designer 502
Menu Commands *502*
Corridor Management *504*
Project Scope 505
Adding Template Drops 507
Continuing Template Drops *509*
End Condition Exceptions 510
Saving the Roadway Design File 512
Corridor Review 513
Transition Bands *514*
Connecting Transition #1 Points *517*
Connecting Transition #2 Points *521*
Pre-Processing the Corridor 522
Create Surface 524
Name and Preference *525*
New Surfaces for Each Corridor *526*
Empty Design Surface *526*
Add Exterior Boundary *527*
Densify Curves *527*
Triangulate *527*
Create Surface(s) from *528*

Add Transverse Features *528*
Display Features in Plan View *529*
Final Set-up *529*
Creating the Design Surface 530
Surface Properties 532
Saving the Design Surface 533
Viewing Roadway Features 534
Updating the Project File 536
Chapter Challenge 538
Additional Exercises 538
Superelevation Basics 539
Fundamentals of Superelevation *539*
Superelevation Slope Rate *540*
Superelevation Transition Locations *541*
InRoads Superelevation 542
AASHTO Wizard - Step 1, Criteria *544*
Rate Calculator *546*
AASHTO Wizard - Step 1 Revisited *550*
AASHTO Wizard - Step 2, Definitions *552*
AASHTO Wizard - Step 2 Revisited *556*
AASHTO Wizard - Step 3, Controls *559*
Point Controls *562*
Deleting Conflicting Point Controls *566*
Viewing the Superelevation *567*
Editing the Superelevation - Rate *570*
Editing the Superelevation - Transitions *574*
Superelevation Rollover Locks *576*
Superelevation Report *582*
Creating the Surface DTM *584*
Viewing the Superelevation Diagram *586*
Superelevation Design Complexities *593*
Use of Spirals *593*
Various Superelevation Related Tips 594
Working with Superelevation Alternatives *594*
Superelevation and Alignment Adjustments *595*
Superelevation and Compound Curves Note *595*
Quiz Questions 595

2.9 Cross Sections 597
Chapter Prerequisites 597
Knowledge Prerequisites 597
Data Prerequisites 598
Files Needed 598
Hands On—Cross Sections 598
Creating Cross Sections 600
Cross Section Viewer 602
Adding and Displaying New Features 602
Symbology Manager *603*
Style Manager *605*
Adding Geometry to the DTM *606*
Feature Properties *609*
Drape Surface *609*
Updating the Cross Sections Overview 611
Styles and Cross Sections *613*

Updating the Cross Sections 614
Display On *614*
Refreshing *614*
Component Updating *615*
Cross Sections—Other Commands 616
Chapter Challenge 617
Additional Exercises 617
Create Cross Section—Settings 617
Cross Section Interval *618*
Surface Symbology *621*
Use Features Only *622*
Create Cross Sections - Source Leaf 623
Create Cross Sections—Controls 623
Create Cross Sections—Include Leaf 624
Crossing & Projected Features *624*
Components *625*
Styles and Display *625*
Show Features Outside *625*
Create Cross Sections—Symbology 626
Cross Section Layout 626
Custom Cross Sections 628
Quiz Questions 629

Glossary 631

Index 643