AutoCAD Civil 3D 2009

Moving from Land Desktop to Civil 3D

Autodesk®

237A1-050000-PM02A April 2008

Published By: Autodesk, Inc.
111 McInnis Parkway
San Rafael, CA 94903, USA

Acknowledgements

Jerry Bartels, C.N.E., Seiler Instrument, *Help Becoming AWOL: Adept Without Land*, Autodesk University 2006

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Getting Started

This guide is intended to help you transition from using AutoCAD® Land Desktop to using AutoCAD® Civil 3D® as your primary engineering design application. It will help you understand the many benefits of moving to Civil 3D, how your current workflows may change as a result of the move, and how to prepare for the move.

This guide will be helpful for individual civil engineers, designers, surveyors, and drafters who are moving to Civil 3D, as well as for IT and CAD managers who are assessing the overall process of moving to Civil 3D.

Why Move to Civil 3D?

Perhaps your organization has already made the decision to move from Land Desktop to Civil 3D. If so this chapter reinforces why that decision was the right one. If your organization is still in the process of evaluating whether it should move from Land Desktop to Civil 3D, this chapter will help you understand the compelling arguments for doing so.

The following sections describe some of the important benefits you'll realize by moving from Land Desktop to Civil 3D.

Dynamic Model-Based Design

Projects created with Civil 3D use a dynamic engineering model that links design and production drafting. As a result, a change to one part of the design propagates throughout the entire project, greatly reducing drafting errors as well as the time it takes to implement design changes and evaluate multiple design scenarios. For example, if you adjust the vertical design alignment, Civil 3D automatically updates the road model, redisplays proposed contours, recalculates volumes, updates profile labels, and corrects section plots for the road. If you change the curve length on your alignment, the profile, corridor model, and plotted cross sections are all updated. If you lower a building pad,

you can immediately retrieve updated volumes and display the new limits of construction. Civil 3D effectively maps the civil engineer's work process into an easy-to-use and powerful software environment, saving time and money, and reducing errors.

Better Control of Standards

Civil 3D allows you to easily deploy and automatically enforce organizational standards for design data by employing style features that are built directly into drawing templates (**.dwt* files).

A variety of drawing templates with predefined styles comes with Civil 3D. These can be used as a starting point for creating your own custom templates and styles. Typically in an organization, custom drawing templates are created and maintained either by one or by a few persons, and shared with the team or teams. A CAD manager can store the templates in a read-only location where the rest of the team can access and use them, but not modify them.

When new styles are needed, it is just a matter of updating the template from the current drawing, or updating the current drawing from a template. New styles can be dragged from one drawing into a template using the Civil 3D Toolspace. Chapter 3 (page 69) of this guide discusses the use of styles and templates in more detail.

Cutting Edge Technology

At the time it was introduced, Land Desktop represented best in class technology for automating standard engineering processes. Many organizations have been using Land Desktop for as long as a decade, proving that it is a dependable platform for creating construction documents for the civil engineering industry; however, the technology platform on which Land Desktop is designed has evolved to its limit.

Civil 3D was built from the ground up to be completely integrated with AutoCAD—the world's most widely used CAD platform. It is designed to support all types of civil engineering projects, from site design and local roads, to major highways and interchanges, and utilizes three-dimensional, dynamic, model-based design technology. This advanced technology provides you with a whole new set of tools and workflows that will let you create and evaluate designs faster and more precisely.

Increase Design Alternatives

The Civil 3D dynamic engineering model lets you explore conceptual proposals and complete final designs faster than in Land Desktop. For example, you can

begin by quickly laying out various alignment alternatives for a proposed roadway. You can then begin refining alignments, profiles, and the makeup of the roadway cross section until the best design proposal has been developed. With each change, all related objects and drawings are updated automatically. This functionality allows you to evaluate more design alternatives in less time, providing your customers with a higher level of service and differentiating your firm from the competition.

Create Plan and Profile Sheets Faster

Civil 3D provides an environment where drafting is derived directly from the model using display styles. The style-based environment helps to ensure that objects and annotation in the drawing conform to production standards. Civil 3D also provides civil/survey-specific drafting tools and advanced drafting features, such as the Plan Production Tool wizards for roadway sheet generation. Tools such as these automate what would typically involve numerous steps in Land Desktop, resulting in improved production drafting efficiency.

Dynamically Link Designs with Production Drafting

Civil 3D dynamically links drafting elements, such as alignment or parcel labels and tables, with the engineering model so that a change to any part of the model produces updated annotation automatically. These intelligent labels and tables also reflect any changes in the drawing scale and view orientation. For example, if you change the scale of the plan from 1:50 to 1:100, the annotation automatically resizes to maintain the proper size in completed construction documents. If you rotate the view orientation of the plan, the annotation of the objects automatically rotate to maintain plan readability. Automatic updating minimizes time-consuming and costly manual editing of drafting elements and helps ensure the accuracy of your final construction documentation. This minimizes the need to redraft when design changes occur. After your drafting is generated, the model and Civil 3D annotation remain in sync.

Advanced Data Sharing and Project Management

Civil 3D has scalable, multiuser data sharing and project management functionality that includes the use of AutoCAD xrefs, data shortcuts, and project management support based on Autodesk® Vault. These features help small and large project teams complete projects more quickly and with less risk of errors. Multiple members of a design team can access items such as survey observations, points, surfaces, alignments, profiles, corridor models,

and pipe networks so that multiple people in different departments can work on a project simultaneously. You can share an alignment across multiple drawings—while each drawing has different annotation and object appearance. If the master alignment changes, the alignment in all your secondary drawings is updated automatically. There is no need to re-create any drafting—plan and profile remain in sync. By using one or more of these features, everyone on the team can work on files simultaneously, and be assured that everyone is using the most up-to-date project data.

Data Compatibility

You can use Civil 3D to work with any DWG™ drawing files, read and write MicroStation® DGN drawing files, and import and export Land Desktop project data. Civil 3D also works with LandXML data and GIS data formats, including ARC/INFO® coverages and Export (E00), ArcView® Shape, and more, allowing you to do conceptual studies using free or low cost data from various sources. You can also use Civil 3D to export model graphics and metadata for use outside of Civil 3D. For example, a published DWF™ file includes all of the model data, such as pipe size and material, so that people reviewing the design in Autodesk® Design Review can have all the information they need to validate the proposal.

Using Civil 3D, you can export model elements, such as parcels, pipes, and alignments, to SDF format for use in GIS applications, such as AutoCAD® Map 3D, Autodesk MapGuide® Enterprise, or Autodesk® Topobase™ software. Civil 3D also supports interfacing with the industry-leading data collectors from companies such as Leica, Trimble, and Carlson. Civil 3D data compatibility creates an integrated CAD and GIS solution that makes it easier to work with both internal and external engineering and GIS departments or consultants.

Visualization and Rendering Features

Civil 3D includes all of the rendering capabilities of AutoCAD software. These features help you quickly communicate design proposals. For example, drawing elements representing roadway components can be rendered with specific materials so that they automatically render a particular surface or subsurface material. Surface models can be easily broken into subareas that display as different materials. The rendering features are easy to use and handle a range of detail, from simple shading to photorealistic images. Civil 3D also includes utilities to help you integrate your design models into the Google Earth™ mapping interface for quickly communicating design intent to nontechnical audiences.

Because Civil 3D is built on AutoCAD software, experienced AutoCAD users can work in a familiar environment, with tools and processes they already know, while also taking advantage of the engineering, surveying, and industry-specific drafting tools that are native to Civil 3D.

Civil 3D Features and Benefits

This section discusses in more specific terms some of the key Civil 3D design features that will provide significant benefits compared to Land Desktop.

Better Project and File Management Features

Unlike the project management solution in Land Desktop, the project management solution in Civil 3D is a scalable, comprehensive multi-user project management system that provides project teams with appropriate levels of access to the data they need. It facilitates the organization of files, distribution of files over a network, version control, check-in and check-out, and rollbacks. Civil 3D includes a range of file management features that suit varying levels of project management needs—from drawing-based shortcuts and xrefs to the full-scale project management solution features.

The Civil 3D project management solution leverages the data management capabilities of Autodesk® Vault to allow project teams to work more efficiently and with less risk of coordination errors as modifications occur in the project cycle. For more information about the project management solution in Civil 3D, and how to integrate these features into your workflows, see Chapter 5.

Improved Point Features

Create points using a variety of coordinate geometry (COGO) and graphical methods. Because Civil 3D points are a part of the engineering model, and not maintained in an external file, changes made to the points are dynamically reflected in the model. For more information about Civil 3D point functionality, and how it compares to Land Desktop point functionality, see Chapter 2.

Improved Surface Features

Build surfaces from a variety of 3D source data. Analyze contours, slope, elevation, and watershed areas, and update contours, volumes, and surface analysis instantly when making surface edits. Civil 3D updates surfaces when data is added or edited, and rebuilds the surface when data is removed. For

more information about Civil 3D surface functionality, and how it compares to Land Desktop surface functionality, see Chapter 2.

Improved Parcel Features

Dynamic relationships mean that parcel collections are always up-to-date. Civil 3D integrates parcels that are within a single site topology, so a change to one parcel creates related changes in neighboring parcels.

Improved Alignment Features

The Civil 3D alignment object includes tangent, curve, and spiral features and enables the addition of any labeling required in the finished plans. You can edit using a tabular editor or graphical interface to automatically update the alignment's labeling. You can also share alignment and profile data across drawings for use by multiple project team members. For more information about how you work with alignments in Civil 3D, see Chapter 2.

Improved Profile Features

Extract profiles of multiple surfaces based on alignment geometry, automatically control the profile appearance and annotation based on the styles that you select, and update profile labeling and drafting dynamically. For more information about how you work with profiles in Civil 3D, see Chapter 2.

Improved Corridor Modeling Features

Generate a dynamic model of any road, rail, or corridor project by using design elements—such as alignments, profiles, superelevation, and other design criteria—that can apply constraints and other customized behavior into the model. Changes made to the elements that were used to create the model result in updated corridor volumes, surfaces, sections, and other analysis and output. Civil 3D provides real-time editing of individual stations or station ranges along the road. These are just some of the advanced road modeling features that are only available in Civil 3D.

Improved Subassembly Catalog

Civil 3D provides you with a catalog of approximately 100 preconfigured subassemblies of typical roadway components such as lanes, curbs, sidewalls, ditches, rails, and even a basic bridge. You can use these as is in your model or use them as starting points to design your own catalog of custom components for typical roadway sections (assemblies). They are easily accessible

from a convenient Tool Palette that includes graphical representations of the shapes.

Improved Section Features

Extract and draft surface and corridor sections. Select sections at specific stations, at intervals along alignments, or at specific points, and create section plots for a single station or full section sheets.

Improved Site Grading Features

Combine multiple grading elements into one group to find solutions for complex grading problems. Grade into surface, elevation, or distance targets. Balance cut/fill volumes dynamically for an entire site or a single grading object. Build a static or dynamic surface from grading groups. While similar tools exist in Land Desktop, you will quickly find that the way they function in Civil 3D is simpler, more intuitive, and more feature-rich.

Improved Pipe Features

Lay out sanitary and storm drainage systems as dynamic, interactive pipe networks. You can make changes to pipes and structures using graphical as well as numeric input. Changes to a pipe network automatically update the drafting (labels). You can plot and complete final drafting of the pipe network in plan, profile, and section views, and you can use rendering and visualization features to produce realistic representations.

In addition, an easy-to-use graphical interference-checking feature lets you quickly identify pipe network parts that collide with each other or exist in undesirable locations. You can also share pipe network information, such as pipe and structure material and size, with external analysis applications.

Hydraulics and Hydrology Features

Civil 3D includes three software extensions that enable you to perform storm water hydraulics and hydrology tasks, including storm sewer design, watershed analysis, detention pond modeling, and culvert analysis.

The Hydraflow Storm Sewers Extension is a comprehensive solution for watershed analysis and detention pond design, from simple sites to complex watersheds with interconnected ponds. You can automatically design pipes, inverts, slopes, and inlets based on user-defined parameters, and interactively modify and optimize your system in real time, assuring that your Civil 3D designs have the highest hydraulic efficiency at the lowest possible cost.

The Hydraflow Hydrographs Extension is used for pond design and modeling of simple or complex watersheds using the SCS and/or Rational methods. You can perform a host of functions, including hydrograph combining, channel reach and reservoir routing, and hydrograph diverting.

The Hydraflow Express Extension provides flexible calculators for performing a wide variety of hydraulics and hydrology tasks for designing culverts, open channels, inlets, hydrology, and weirs. You can quickly produce informative graphs, rating curves, and professional, easy-to-read reports.

These three extensions come with Civil 3D. They bring easy-to-use, industry-leading hydraulics and hydrology software to Civil 3D users, providing significant productivity improvements over Land Desktop hydraulics and hydrology features, as well as providing additional features that are not present in Land Desktop.

Improved Survey Features

The survey features in Civil 3D provide a consistent environment for performing survey tasks such as using the Survey Data Collection Link to convert raw data to field book files for importing, as well as functionality for least squares adjustment, editing survey observations, and reporting tolerance errors. With the Mapcheck Analysis command, you can check survey figures and parcels for closure, based on label direction and distance values. The Mapcheck Analysis command can also be used to check manually input data for closure errors, and to subsequently adjust and create AutoCAD polyline objects. Editing survey figures is simplified by using feature line editing commands available from the Survey menu.

Preparing for the Move

This section describes the items you should consider before you move from Land Desktop to Civil 3D.

Assessing Current Workflows

The first step in moving from Land Desktop to Civil 3D is to assess your organization's current workflows for designing and delivering engineering design projects. A clear understanding of your current workflows and processes will help you implement Civil 3D software successfully and be better able to validate results. For example, is your current workflow documented in any

way, either at a conceptual or detail level? You might want to consider at least diagramming your current workflow, at a conceptual level, as you assess it. This step will help you as you begin your transition from Land Desktop to Civil 3D.

An important aspect to consider is how or whether your organization utilizes IT or CAD management resources. For example, in your organization, do you have specific individuals who are responsible for installing and maintaining tools and software? Do you have one or more individuals responsible for maintaining your company's drawing standards?

This is an important aspect to consider because, depending on the size and complexity of your organization, you may need to schedule IT and/or CAD management resources during the Civil 3D implementation phase.

Choosing Pilot Projects

The next step is to determine which project or projects in your organization are the best ones to use as pilot projects. Choosing a pilot project that has the following characteristics will help make the process of learning to use Civil 3D go smoothly. It may be best to choose a project that

- has a straightforward design that your company is familiar with
- has a flexible and willing client—if you choose billable projects
- is a smaller job

In other words, a large master-planned community for a new client, in a location your organization is not familiar with, is probably not the best project to use as your first Civil 3D pilot project.

There are two general approaches to consider when deciding how to implement your pilot projects: using completed Land Desktop projects, and starting new projects from scratch. The first approach, using completed Land Desktop projects and recreating them using Civil 3D, can provide you with the following benefits:

- The timeline for the pilot project is not tied to a client deadline or milestone; in other words, the end date is open-ended.
- Encountering any unforeseen problems during this pilot effort has no impact on client-related deliverables.

- There are no budgetary constraints other than accounting for the non-billable time spent training.
- There is less pressure on team members.

However, there are some drawbacks to consider when using existing Land Desktop projects as a pilot projects:

- Without a timeline and the rush of client demands, many people find it hard to work effectively and with their usual level of detail.
- Because you are not creating a design from scratch, but rather re-creating an existing design, some portions of the design process might not be fully explored using this type of pilot, leading to a false sense of security.
- Using existing Land Desktop projects does not allow you to gather real-world metrics on design and production timelines for measuring the success of Civil 3D in a real-world project environment.

When you use the second approach—starting a new project from scratch in Civil 3D—the experience presents a broader spectrum of real-world issues and scenarios. A real-world billable project will allow you and your team to learn how to better deal with the actual design process, plan production, change orders, and plan reviews.

Dispersing Knowledge

Your pilot projects will lead the way in how you train others in your organization to use Civil 3D as a design platform. The following are some different methods to consider for dispersing the knowledge gained from working on pilot projects:

Rotating Pilots—Using this method, each design team is trained one at a time, with one group following another. This allows a group of individuals to be trained on an entire project in Civil 3D before moving on to train the next group of individuals. It is highly recommended that each design team complete a basic level of Civil 3D training before they begin a pilot project. Using this method typically means training to various levels, and covering the full extent of the product in every pilot project since each team will be new to Civil 3D for each one. This process can be expensive because expert-level trainers would be used for each team. However, with this method, because each group except the first one will have coworkers that can provide guidance to others, the learning curve for each subsequent group should lessen.

Shared Knowledge Pilots—Using this method, the initial project team consists of individuals who have already completed basic Civil 3D training, and who are using a pilot project as advanced training. This team completes the first pilot project, developing standards, styles, operating practices, and templates along the way. After this project is complete, this group disseminates knowledge to the next group. These team members then become responsible for teaching the basics to the next generation of users, honing their own skills in the process. This method can be less expensive than rotating pilots, but can also result in a slower adoption rate, and a higher risk that individuals may not be learning all of the best practices and techniques that they could be learning.

Hybrid Pilot—This method combines some characteristics of the previous two methods. A hybrid pilot methodology typically includes basic training for an initial group of individuals from an expert-level, third-party trainer. This team completes a pilot project, working in tandem with a trainer to build styles and standards in preparation for more widespread Civil 3D deployment. After this first pilot project is complete, these individuals are then used with the expert as a training core, rotating through remaining teams and acting as mentors for peers.

With this approach, the first generation of individuals learns how to use the product while having the trainer immediately available for assistance if needed. Because this method allows local users to be more involved in the training of the next generation of users, more customization based on skill levels is possible.

By reviewing your goals for implementation speed and cost, you can decide on a pilot and training methodology and begin detailed planning for your user-based training.

Understanding Training Resources

Whether it's time spent learning how to use the product on your own, or time spent attending an offsite or onsite training class, make sure that your pilot project strategy includes the appropriate amount of time for individuals to learn how to use the Civil 3D software.

The following sections describe a variety of training resources that are available for learning how to use Civil 3D. They include:

- Civil 3D product documentation
- Autodesk training programs and products

- Autodesk website
- Third-party resources

Civil 3D Product Documentation

You've already taken the first step by reading this book. After reading this book, you should peruse the other documentation components available with Civil 3D. They provide both the information you need to get started using the software and complete descriptions of all Civil 3D features.

The following is a list of the Civil 3D product documentation components that are automatically available when you install Civil 3D. These components are accessible from the product's Help menu:

- Getting Started guide
- Tutorials
- Help system (User's Guide)
- *Moving from Land Desktop to Civil 3D* (this guide)
- Best Practices Guide
- New Features Workshop

TIP For any of the documentation components that are provided in PDF format, you can print out all, or a range of, pages. For example, to print out the entire *AutoCAD Civil 3D User's Guide*, or sections of it, click the Help menu ➤ User's Guide (PDF). Then use Adobe Reader's printing features.

Getting Started—This guide introduces the most important concepts in Civil 3D. After reading through it, and perhaps completing some of the suggested exercises using the sample files, you should feel comfortable enough to start experimenting on your own. In addition to being available from within the product, this guide is also available as a PDF download from the Autodesk website. You also receive one free printed hardcopy with each Civil 3D license purchase by going to the Autodesk book request site—*http://autodeskbookrequest.com/autodesk*. Additional printed copies can be ordered from the Autodesk Store at *www.autodesk.com/store*.

Online Tutorials—The tutorials offer an in-depth guided tour of the major features, using realistic engineering drawings and data. To gain a thorough knowledge of Civil 3D, it is recommended that you explore the tutorials after

you have read through the conceptual information provided by the *Getting Started* guide.

Help System—The Civil 3D Help system is a compiled HTML Help system that provides comprehensive information about all Civil 3D features. It is available by clicking Help menu ➤ Help ➤ AutoCAD Civil 3D Help. A PDF version of the Help system, referred to as the User's Guide, is available by clicking Help menu ➤ User's Guide (PDF).

Best Practices Guide—This guide presents best practices for implementing AutoCAD Civil 3D and using it efficiently in design operations. It is designed to help you optimize your use of AutoCAD Civil 3D. Just like the Getting Started guide, this book is available from the product Help menu, and a free printed hardcopy is available with each Civil 3D license purchase.

New Features Workshop—The New Features Workshop provides a graphical preview of features that are new with each version of the product. It includes descriptions of AutoCAD and Map 3D features in addition to new Civil 3D features. If you are moving from one version of the product to another, this is a useful tool for quickly understanding what's new in the product. If everything is new to you, it is still a great way to get a quick overview of certain features. It is available by clicking Help menu ➤ New Features Workshop.

Autodesk Training Programs and Products

As you transition from Land Desktop to Civil 3D, you may want to invest in some level of formal Autodesk training. Autodesk training programs and products help you learn the key technical features of your Autodesk software quickly. For the latest information about Autodesk training, visit *www.autodesk.com/training* or contact your local Autodesk representative. The following sections describe the various Autodesk training programs and products that are available.

Autodesk Authorized Training Centers—To be more productive with Autodesk software, consider getting trained at an Autodesk Authorized Training Center (ATC®). These hands-on, instructor-led classes help you get the most from your Autodesk products. Enhance your productivity with proven training from over 1,400 ATC sites in more than 75 countries. For more information about Autodesk Authorized Training Centers, contact *atc.program@autodesk.com* or visit the online ATC locator at *www.autodesk.com/atc*.

Autodesk Official Training Courseware—Autodesk Official Training Courseware (AOTC) is technical training material developed by Autodesk. The modules are designed for 1/2-day to 5-day instructor-led classroom training. They are typically used by Authorized Training Centers and other Autodesk partners, but these materials are also well-suited for self-paced, stand-alone learning.

The manuals cover key concepts and software functionality with hands-on, step-by-step, real-world exercises. You can purchase AOTC "Essentials" courseware from your local Autodesk representative or distributor, or you can order it online from the Training Tools section of the Autodesk Store at *www.autodesk.com/store*.

e-Learning—Autodesk e-Learning for Autodesk Subscription customers features interactive lessons organized into product catalogs. Each lesson is 20 to 40 minutes in length and features hands-on exercises, with an option to use either a simulation or the software application. You can also use an online evaluation tool that identifies gaps in skills, determines which lessons will be most helpful, and gauges learning progress.

If you are a member of Autodesk Subscription, you can access e-Learning and other subscription services from within your Autodesk product. For more information about Autodesk subscription resources, visit *www.autodesk.com/subscription*.

Autodesk Website

A wealth of other resources are available from the Autodesk website. For example, you may want to check out the Civil Engineering Community portal, Skill Builder tutorials, current white papers, or webcasts, just to name a few. Also, a variety of useful items are frequently updated and posted on the Autodesk Civil 3D website.

Civil Engineering Community Portal—Become a member of the Autodesk Civil Engineering Community to stay current with your industry, grow your professional network, and take advantage of a host of resources. Benefits of membership include access to Civil 3D content sharing, member discussions, blogs, local events, webcasts, and user-submitted tips and tricks. You are sure to hear from other Land Desktop users who have already moved or are in the process of moving to Civil 3D. To access the portal, visit *www.autodesk.com/civilcommunity*.

Skill Builders—Civil 3D Skill Builders are advanced learning exercises you use to practice performing specific design tasks using Civil 3D drawings. To download Civil 3D Skill Builders, visit *www.autodesk.com/civil3d-skillbuilders*.

White Papers—A variety of white papers on targeted industry-driven topics are available from the Autodesk Civil 3D website. You can get in-depth technical information, competitive briefings, and valuable return on investment (ROI) analyses. To download Civil 3D white papers, visit *www.autodesk.com/civil-whitepapers*.

Civil 3D Webcasts—The Civil 3D product management and development teams host live webcasts featuring a variety of topics. This is a unique opportunity to interact with the experts and gain valuable product knowledge. From basic "Getting Started" sessions to advanced corridor modeling tasks, there is something for every type of user and skill level. The webcast sessions are recorded and are available on-demand via download. In particular, you may be interested to view the *Chronicles of Civil 3D* webcasts. This series of recorded sessions chronicles in real time the experiences of a Maine-based civil engineering firm implementing their first Civil 3D pilot project. It provides an inside look at how a small-town engineering firm, well accustomed to using Land Desktop, used Civil 3D for the first time to generate designs plans on a billable subdivision project.

To access recorded versions of the *Chronicles of Civil 3D* and other Civil 3D webcasts, visit *www.autodesk.com/civil3dwebcasts*.

Third-Party Resources

You may also want to research third-party books and learning materials that are available from a variety of sources.

Comparing Land Desktop and Civil 3D

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Maybe you knew how to do something in Land Desktop, but you need to find out how to perform the same function using Civil 3D. Where do you look in Civil 3D to find features that were familiar to you in Land Desktop? This chapter presents a variety of information that will help you quickly learn how to discover features and accomplish tasks in Civil 3D. It compares terminology, user interfaces, and some of the most commonly used features in both products.

Comparing Terminology

This section provides a list of terms that are common in the Land Desktop product and identifies the corresponding terminology that is used in the Civil 3D product.

For some features, the difference in terminology is subtle. For example, in Land Desktop a group of connected pipes is referred to as a "pipe run", but in Civil 3D they are referred to as a "pipe network" on Civil 3D menus, toolbars, dialog boxes, and in Civil 3D drawings.

For other features, the difference in terminology is quite distinct, indicating that there is more than just a difference in terminology. For example, in Land Desktop, you manage point groups using the Point Group Manager. In Civil 3D, you manage point groups using the Point Groups collection on the Prospector tab in Toolspace. Using the Toolspace Prospector is a completely different way of working with features that brings consistency across a number of tools.

Refer to the following tables to help you become familiar with terminology in Civil 3D. These tables may be handy references for you until your transition to Civil 3D is complete.

General

The following table compares the differences in terminology between some general features in Land Desktop and the corresponding features in Civil 3D:

Land Desktop	Civil 3D
User Preferences Prototype Settings Drawing Settings	Drawing template Toolspace Settings tab
Drawing Setup	Drawing Settings
Quick Section	Profiles menu ➤ Quick Profile
3D Polyline commands	Feature Line tools
Reports/File Output	Report Manager
List values	Inquiry Tool or Inquiry toolbar

Alignments

The following table compares the differences in terminology between alignment features in Land Desktop and Civil 3D:

Land Desktop	Civil 3D
Define From Objects Define From Polyline	Create By Layout Create From Polyline
Alignment Labels Station Labels	Alignment Label Styles ■ Station ■ Station Offset ■ Line ■ Curve ■ Spiral

Land Desktop	Civil 3D
	■ Tangent Intersection
Edit	Alignment Layout Toolbar

Cross Sections (Road Design)

The following table compares the differences in terminology between cross section (road design) features in Land Desktop and Civil 3D:

Land Desktop	Civil 3D
Draw Template	Create Assembly ■ Subassemblies – From Catalog ■ Subassemblies – From Polyline
Design Control	Corridor Model Properties ■ Parameters ■ Targets Assembly Properties
View/Edit Sections	View/Edit Corridor Section
Ditches/Transitions	Alignments/Profiles Subassembly logic Corridor Model Properties – Targets
Sample Existing Ground	Create Sample Lines
Section Plot Settings	Sample Line Group Properties
Section Plot	Create Views (Section) ■ Single

Land Desktop	Civil 3D
	■ Multiple
List Section Data	Inquiry Tool ➤ Section View Inquiry Tool ➤ Section
Label Sections	Section Label Styles Section View Styles Section View Band Styles Section View Labels
Total Volume Output	Quantity Takeoffs
Surface Volume Output	Composite Volumes Panorama utility Volume Surface
Road Output	Corridor Model Surface

Grading

The following table compares the differences in terminology between grading features in Land Desktop and Civil 3D:

Land Desktop	Civil 3D
Grading Wizard	Grading Creation Tools
Footprint	Feature Line
Targets and Slopes, Daylighting	Grading Criteria
Appearance	Grading Style
Grading Properties	Grading Editor Grading Properties

Land Desktop	Civil 3D
Create Surface	Automatic Surface Creation (Grading Group property)
Calculate Volume, Balance Volume	Grading Volume Tools

Inquiry

The following table compares the differences in terminology between inquiry features in Land Desktop and Civil 3D:

Land Desktop	Civil 3D
North/East Lat/Long Geodetic Inverse	Inquiry Tool ➤ Point ➤ Point Inverse
Station Offset – Alignment	Inquiry Tool ➤ Alignment ➤ Alignment Station and Offset at Point
Line/Curve/Spiral	Object Properties
Roadway Curves Railway Curves Spiral Radius	Alignment Layout Toolbar ➤ Sub-Entity Editor ➤ Alignment Grid View
Angles	Inquiry toolbar ➤ Angle Information
Distance	Inquiry toolbar ➤ Continuous Distance Inquiry toolbar ➤ Add Distance Inquiry toolbar ➤ Distance
Area by Lines/Curves, Polylines, or Points	Inquiry toolbar ➤ Area Inquiry toolbar ➤ Line and Arc Information Inquiry toolbar ➤ Locate Point

Land Desktop	Civil 3D
Contour/Surface Elevation	Inquiry Tool ➤ Surface
List Slope/Elevation at Slope	Inquiry Tool ➤ Surface Inquiry toolbar ➤ List Slope
Track North/East, Track Elevation	Coordinate Tracker

Parcels

The following table compares the differences in terminology between parcel features in Land Desktop and Civil 3D:

Land Desktop	Civil 3D
Parcel Settings	Parcel Layout Tools Toolbar Parcel Styles Parcel Label Styles
Parcel Manager	List View on the Toolspace Prospector tab Parcel Properties
Define from Lines/Curves (or Polylines)	Create From Objects
Define from ■ Points ■ Slide Bearing ■ Radial ■ Swing Line ■ Swing On Curve	Parcel Layout Tools Toolbar Transparent Commands

Pipes

The following table compares the differences in terminology between pipe features in Land Desktop and Civil 3D:

Land Desktop	Civil 3D
Settings	Pipe Command Settings Parts List
Pipe Run	Pipe Network
Pipe	Pipe
Node	Structure
Pipe Run Editor	List View in Toolspace (Panorama) View
Edit Graphical	Grip edit
Edit Data	Pipe Editor Structure Editor
Finish Draft Plan	Create Pipe Network
Finish Draft Profile	Draw Parts in Profile View
Finish Draft Section	Sample Pipe Network (Sample Line Group)
Import/Export Runs	Import LandXML Export LandXML
Align/Run Interferences	Create Interference Check

Plan Production

The following table compares the differences in terminology between plan production features in Land Desktop and Civil 3D:

Land Desktop	Civil 3D
Sheet Creation	Plan Production General menu ➤ Plan Production Tools ➤ Create Sheets wizard
Sheet Manager	Plan Production Tools General menu ➤ Plan Production Tools ➤ Create View Frames wizard General menu ➤ Plan Production Tools ➤ Create Sheets wizard
Sheet Series	View Frame Group
Frame	View Frame
Create\Edit Frame	Create View Frames wizard
Match Line	Match Line
Generate Sheets	Create Sheets (Create Sheets wizard)

Points

The following table compares the differences in terminology between point features in Land Desktop and Civil 3D:

Land Desktop	Civil 3D
Point Settings	Toolspace Settings tab, Point Command Settings

Land Desktop	Civil 3D
Point Group Manager	Toolspace Prospector tab, Point Groups collection
XDRef Manager	Toolspace Settings tab ➤ Point ➤ External Data References
Create Points (all commands)	Points menu ➤ Create Points
List Points	Toolspace Prospector tab ➤ List View Panorama Point Editor

Profiles

The following table compares the differences in terminology between profile features in Land Desktop and Civil 3D:

Land Desktop	Civil 3D
Profile (grid only)	Profile View
Vertical Alignment, Existing Grade	Profile
Profile Settings	Profile Command Settings
Set Current Surface Toggle Multiple Surfaces Select Multiple Surfaces	Create Profile From Surface dialog box
Sample Existing Ground – Sample from Surface	Create Profile From Surface dialog box
Sample Existing Ground – Sample from File	Create Profile From Surface dialog box
Create Full or Surface Profile	Create Profile From Surface

Land Desktop	Civil 3D
Create Profile ■ Grid	Create View
Create Profile ■ Quick Profile	Quick Profile
Define Vertical, Ditch, and Transition Alignments	Create By Layout (Profile Layout Toolbar)
Edit Vertical, Ditch, and Transition Alignments	Edit Profile Geometry (Profile Layout Toolbar)

Survey

The following table compares the differences in terminology between survey features in Land Desktop and Civil 3D:

Land Desktop	Civil 3D
Data Collection Input	Survey tab in Toolspace
Analysis Figures	Survey tab in Toolspace
Least Square Settings	Survey Database Settings
Survey Command Line	Survey Command Window
Equipment Settings	Equipment Databases and Equipment Properties
Figure Prefix Library	Figure Prefix Databases and Figure Prefix Properties
Astronomic Azimuth	Astronomic Direction Calculator

Terrain (Surfaces)

The following table compares the differences in terminology between terrain (or surfaces) features in Land Desktop and Civil 3D:

Land Desktop	Civil 3D
Terrain menu	Surfaces menu
Terrain Model Explorer	Toolspace Prospector tab ➤ Surfaces collection
Edit Surface	Surfaces menu ➤ Edit Surface
Surface Display	Surface Style
Contour Style Manager	Surface Style ➤ Contours tab
Contour Labels	Surfaces menu ➤ Add Surface Labels
Composite Volumes	Composite Volumes Panorama utility Volume Surface, TIN Volume Surface

Utilities

The following table compares the differences in terminology between features related to various utilities in Land Desktop and the corresponding features in Civil 3D:

Land Desktop	Civil 3D
Object Viewer	General menu ➤ Utilities ➤ Object Viewer
Notes	General menu ➤ Utilities ➤ Notes

Land Desktop	Civil 3D
Symbol Manager	Toolspace Settings tab ➤ Points ➤ Point Styles
Curve Text	General Curve Label Style
Leaders	Included in all object label styles
Multi-View Blocks	Insert menu ➤ Multi-View Blocks
Blocks	Insert menu ➤ Blocks
Lists/Legends	Object Table Styles Also, in both Land Desktop and in Civil 3D, you can use the Map 3D Map Book features to create legends on maps.
Camera	View menu ➤ Create Camera

Comparing User Interfaces

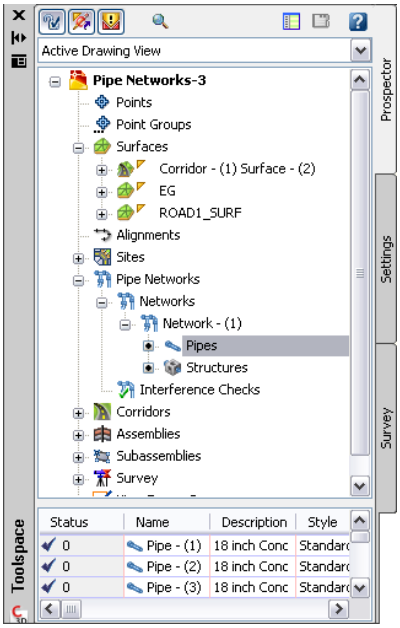
This section compares the Land Desktop and Civil 3D user interfaces. It provides an overview of some general differences in the user interfaces, and includes a discussion about differences in workspaces and menus.

User Interfaces

Many aspects of the Land Desktop and Civil 3D user interfaces are identical. Since both products are based on industry-leading AutoCAD software, Civil 3D still provides you with the familiar graphical work environment and drafting tools you already know. For example, in Civil 3D, you'll notice components like the top-level menu bar, toolbars, command line, drawing area, and model and layout tabs you already know how to use.

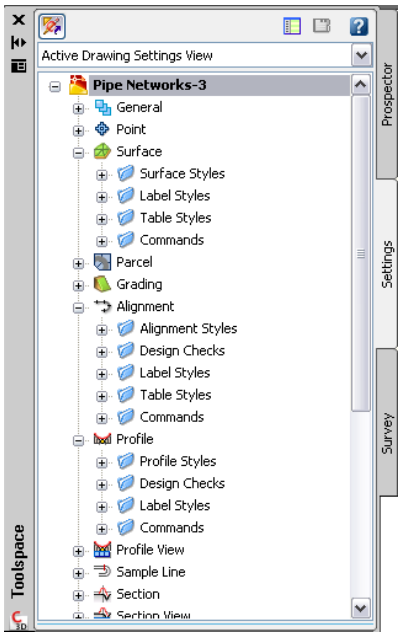
One of the most noticeable differences between the two interfaces is the Civil 3D Toolspace window—a component that Land Desktop does not have.

The Toolspace window is a concept that is totally new to Land Desktop users. Using the three Toolspace window tabs, the Prospector, Settings, and Survey tabs, you can control drawing objects and settings in ways that are not possible with Land Desktop.



For example, using the Prospector tab, you can quickly display a hierarchical list of all objects in your drawing. Items that exist as child objects to a parent object, such as pipe and structure objects associated with a pipe network (pipe run), can easily be displayed in the Prospector tab.

The Settings tab provides a powerful set of features for creating and managing object styles, as well as for controlling default object behavior.



Becoming familiar with how to use the Civil 3D Toolspace window is an important step to Civil 3D proficiency. Once you understand how it works, it's very easy to use, and you will find many ways to increase your productivity. To learn more about how to use the Civil 3D Toolspace, see The Toolspace Window in the Civil 3D Help.

Workspaces

Just like Land Desktop, Civil 3D comes equipped with a variety of workspaces that offer sets of tools commonly used for certain types of tasks. For example, in Land Desktop you can select the Survey workspace which provides access to tools and features commonly used while performing surveying tasks.

With both products you can create your own custom workspaces so that you can have quick access to a specific set of features you may want. In addition to displaying a top-level menu that contains only the features related to a specific task, the workspaces automatically display toolbars, tool palettes, and other user interface elements to make sure that all the features you need for a specific task are at your fingertips.

The following table lists the menus that are displayed in the top-level menu bar for the Land Desktop 2009 workspaces:

Land Desktop Workspaces	Land Desktop Menus
Land Desktop	File, Edit, View, Tools, Map, Projects, Points, Lines/Curves, Alignments, Parcels, Labels, Terrain, Inquiry, Utilities, Window, Help.
Land Desktop Complete	File, Edit, View, Insert, Format, Tools, Draw, Dimension, Modify, Map, Projects, Points, Lines/Curves, Alignments, Parcels, Labels, Terrain, Inquiry, Utilities, Window, Help.
Civil Design	File, Edit, View, Tools, Map, Projects, Points, Terrain, Grading, Layout, Profiles, Cross Sections, Hydrology, Pipes, Sheet Manager, Inquiry, Utilities, Window, Help.
Survey	File, Edit, View, Tools, Map, Projects, Points, Terrain, Data Collection/Input, Analysis/Figures, Inquiry, Utilities, Window, Help.

The following table lists the menus that are displayed in the top-level menu bar for the Civil 3D 2009 workspaces:

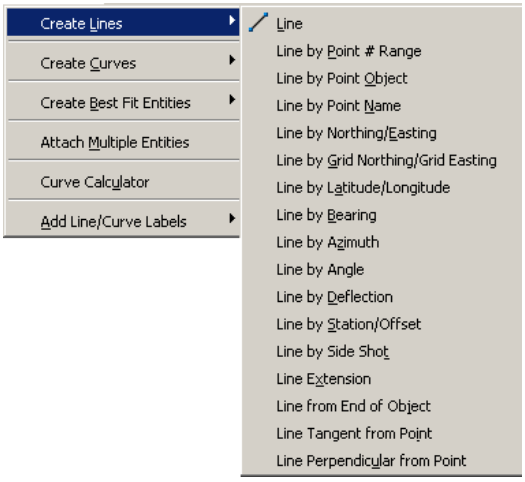
Civil 3D Workspaces	Civil 3D Menus
Civil 3D Complete	File, Edit, View, Insert, General, Survey, Points, Surfaces, Lines/Curves, Parcels, Grading, Alignments, Profiles, Corridors, Sections, Pipes, Map, Express, Window, Help.
Design	File, Edit, View, Insert, General, Points, Surfaces, Lines/Curves, Parcels, Grading, Alignments, Sections, Profiles, Corridors, Pipes, Inquiry, Express, Window, Help.

Civil 3D Workspaces	Civil 3D Menus
Annotation and Drafting	File, Edit, View, Insert, General, Annotation, Inquiry, Window, Help, Express.
Survey and Topographical	File, Edit, View, Insert, General, Survey, Points, Surfaces, Lines/Curves, Parcels, Alignments, Inquiry, Map, Window, Help, Express.
Visualization and Rendering	File, Edit, View, Insert, General, Window, Help, Express.

To become more familiar with workspaces, including how to access them, edit them, and create your own custom workspaces, refer to *Create Task-Based Workspaces* in the AutoCAD Help.

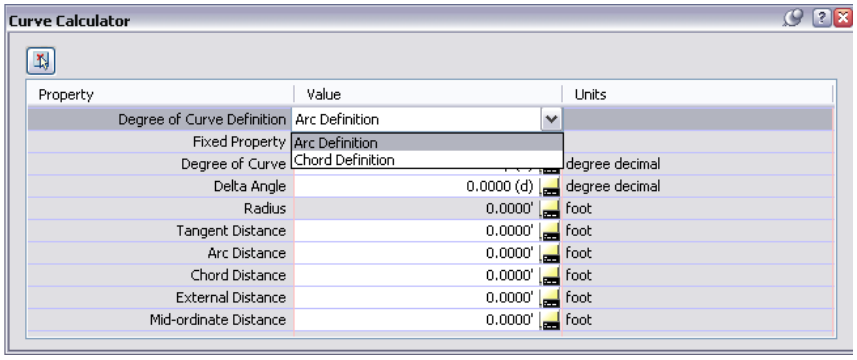
Civil 3D Lines/Curves Menu

Civil 3D has a Lines/Curves menu that is modeled after the Land Desktop Lines/Curves menu; however, it has a few additional features.



For example, on the Civil 3D Lines/Curves menu, you have the Curve Calculator, which is a tool you use to determine curve parameters based on

input. It lets you calculate horizontal curve data and simultaneously interact with active Civil 3D COGO commands as well as AutoCAD commands.



With this functionality, you can calculate horizontal curve properties based on arc or chord definitions. You can select an arc object from the drawing and display its curve properties in the Curve Calculator. Also, you can calculate properties and send a curve property to the command line interface within a current command, or send the properties to the Windows Clipboard to cut-and-paste into another application.

Comparing Features

This section explores some of the more commonly used features that exist in both Land Desktop and Civil 3D. It discusses the differences in methodologies and workflows inherent in these features in both products. Understanding the mechanics of how the features are different (for example, understanding what the Civil 3D software is doing behind the scenes, what the menus and dialog boxes look like, and what a typical Civil 3D workflow is like) will greatly reduce the learning curve.

In this section, we'll compare how the following features work in Land Desktop and in Civil 3D: points, surfaces, alignments and profiles. An important item to note as you read through this section is that many of the Civil 3D concepts and behaviors you'll learn about exist in many areas of the product. This section also illustrates how Civil 3D is much more consistent than Land Desktop in the way that it allows you to manage features.

Points

Experienced Land Desktop users will be happy to know that Civil 3D combines several of the point functionality concepts from Land Desktop into an easy-to-use Civil 3D point object. This section begins with a brief description of how points work in Land Desktop.

Points in Land Desktop

The Land Desktop point concepts you are already familiar with include point settings, point object, point symbology, point groups, and point labeling. The following table provides a brief description of how each of these concepts is implemented in Land Desktop:

Land Desktop Point Functionality	Description
Point Settings	When creating points in Land Desktop, first you need to adjust Point Settings to achieve desired output. These settings control things like the starting Point Number, whether elevations are required, if descriptions are visible, where to find symbology, text size, and so on. All points created after these Point Settings are established adopt the current Point Settings and are displayed accordingly. Points created before the Point Settings are either established or changed would remain as they are.
Point Object	Each point in Land Desktop is an individual object and is part of an external points database file (*.*mdb*).
Point Symbology	For a point to represent something like a fire hydrant, description keys can be used to automatically insert a symbol (block) at the point's insertion point.

Land Desktop Point Functionality	Description
Point Labeling	Point labels, usually combined with Point Groups, let you quickly show point descriptions on some points and not others, label data, such as northing and easting, and control settings, such as units, text height, and layers used.

Even though point functionality in Land Desktop accomplishes the work you need to do, and you are comfortable with it, it still has some limitations. For example:

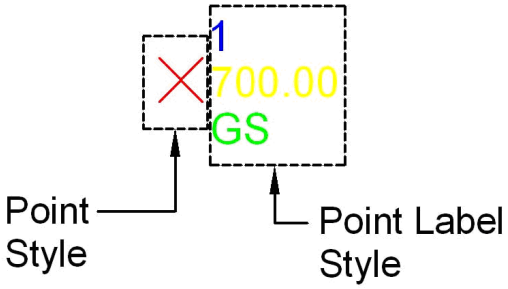
- Have you ever moved some points only to realize that your symbols did not move with them?
- Have you ever wished you could use the Undo command after accidentally moving or erasing some points?
- Have you ever wished there was a way to quickly change point sizes, with just a few clicks, so they could be used in a 50 scale drawing instead of a 100 scale drawing?
- Have you ever wanted to create a Point Group by combining several other Point Groups?
- Have you ever found it difficult to maintain standards so that points labeled by one individual on your team look the same as points labeled by someone else?

Points in Civil 3D

When you are working with points in Civil 3D, one of the first things that is important to understand is that in Civil 3D, each point is maintained as an individual object. Each point also always belongs to a point group, which is also an object. This means that you can manage points at different hierarchical levels. Being able to manage points this way improves overall performance and provides additional flexibility that you do not have when using points in Land Desktop.

A second concept that is important to understand is that unlike Land Desktop points, the display characteristics of Civil 3D points are based on two style

settings: the point style and the point label style. This is a concept that is employed throughout many Civil 3D object types.

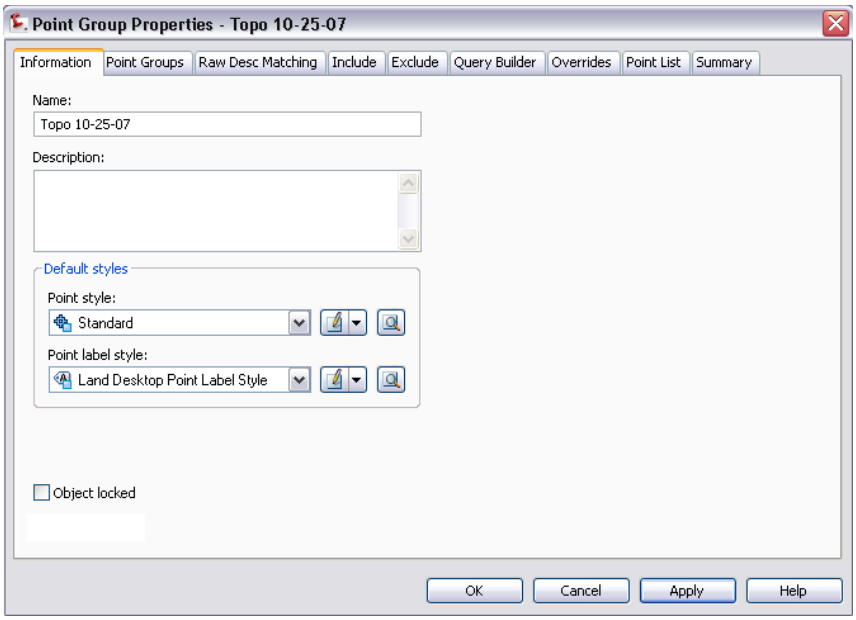


The point marker (shown as the "X" in the preceding illustration) is controlled by the point style and the label text for the point is controlled by the point label style. Setting up proper styles is one of the keys to unlocking the potential of Civil 3D. By simply setting the point style to the desired marker, which can include symbology, and setting the point label style to the desired label style, you can achieve virtually limitless combinations for displaying points.

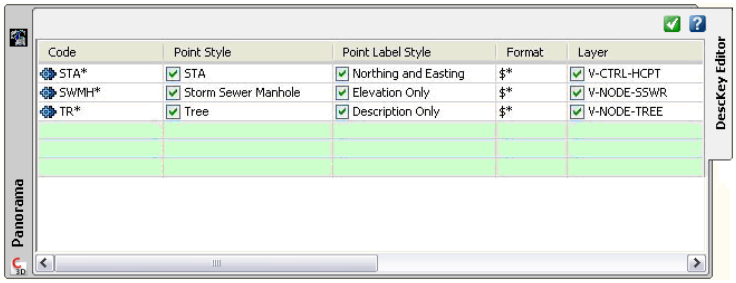
Note that in Civil 3D, when you are using symbology as part of your point style, the symbol *is* the marker. In other words, there is no separate block inserted on top of the point. Instead, the symbol is embedded in the point itself. Because points are dynamic in Civil 3D, so are the symbols. For example, there is no need to maintain multiple fire hydrant blocks to accommodate plotting drawings at multiple scales. Also, symbols never become separated from their associated points as they may have in Land Desktop. Your point styles can be set in such a way that you can still control visibility of the symbology, and the points still do what they did in Land Desktop. For example, you can still show symbols and no points, or show points and no symbols, or show neither. It is simply easier to do this in Civil 3D.

Civil 3D contains numerous styles you can begin working with right away, including ones that look like Land Desktop styles. These styles can be assigned to the points directly by selecting the point(s), and then right-clicking and clicking Edit Points. Doing it this way is like switching from a BYLAYER setting to a fixed setting.

You can also set these styles at the point group level, which means that all points in that group are updated automatically. To do this, simply click on the desired Point Group in the Project Toolspace (Prospector Tab), right-click, and click Properties.



Because you can associate a symbol with your points using the point style, does this mean that description keys are not necessary in Civil 3D? This is your decision. Description keys still exist and still function in Civil 3D similarly to how they function in Land Desktop. The major difference is that instead of inserting blocks, as you would in Land Desktop, in Civil 3D, they set the desired point style and point label style for each point. With Civil 3D, you can decide which method of handling point styles and symbology works best for your situation.

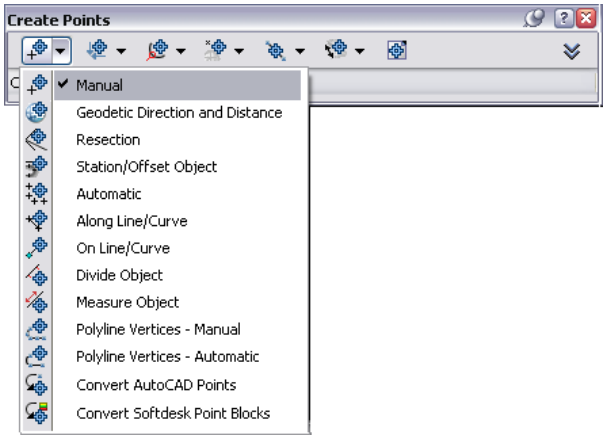


A third concept to understand when comparing Civil 3D and Land Desktop point functionality is the fact that Civil 3D project data is *drawing based* rather than *project based* as in Land Desktop. Because Civil 3D data is drawing based, the points exist in your drawing file and do not point to an external point

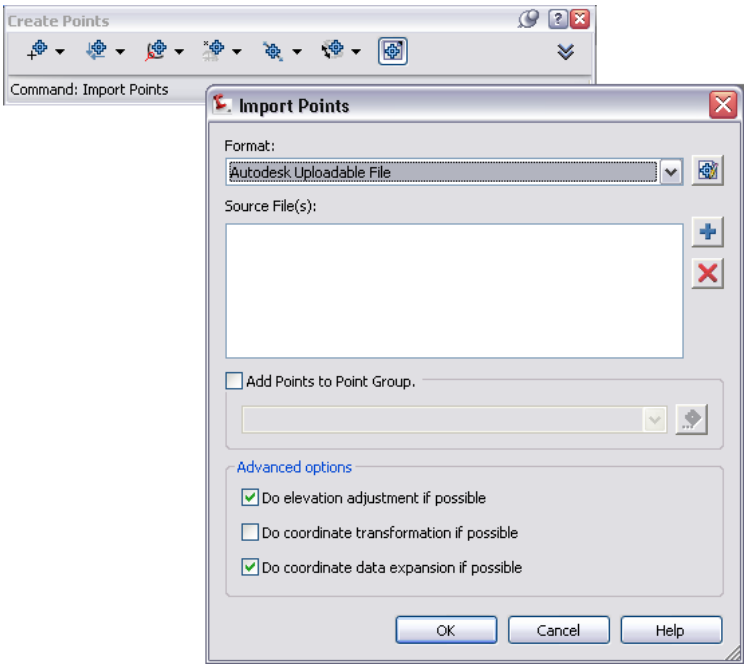
database, as they do in Land Desktop. This means that your points cannot become out of sync with an external point database, so operations such as the Undo command are no longer a problem. Without an external point database, commands like Check Points and Insert Points To Drawing are no longer necessary, as well.

Creating Points

The way that you create points in Civil 3D is very similar to how you created points in Land Desktop. For example, you can use the CreatePoints command or the individual commands from the Points menu. When you click Create Points on the Points menu, the Create Points toolbar is displayed.



Under each button on the toolbar are various drop-down options for creating points. These options should look familiar to Land Desktop users because most of the methods are the same as in Land Desktop. Even the Import Points dialog box in Civil 3D, shown in the following illustration, should look familiar.

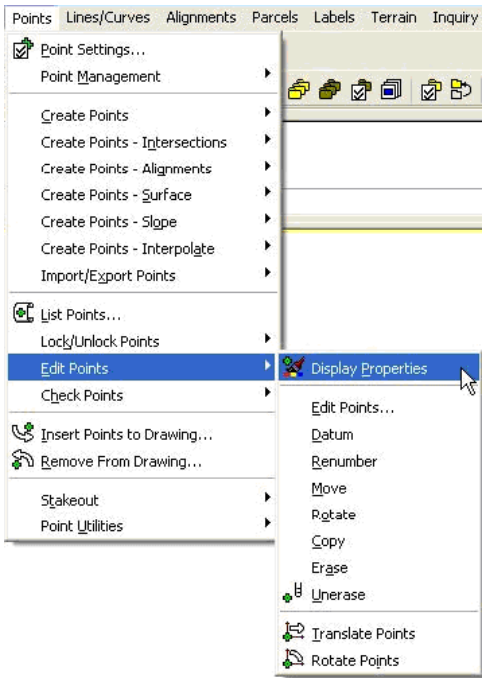


So while some aspects of using points are very different in Civil 3D, much of your Land Desktop knowledge is still directly transferable when you start using Civil 3D.

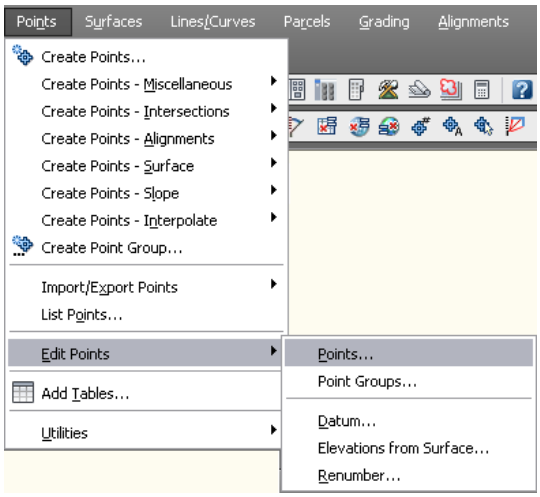
Editing Points

Editing points in Civil 3D is also not that different from how you did it in Land Desktop. For example, the following illustration shows the similarities between the editing points in Civil 3D and Land Desktop.

The following illustration shows the Land Desktop Edit Points drop-down menu:


Points
Lines/Curves
Alignments
Parcels
Labels
Terrain
Inquiry
Point Settings...
Point Management
Create Points
Create Points - Intersections
Create Points - Alignments
Create Points - Surface
Create Points - Slope
Create Points - Interpolate
Import/Export Points
List Points...
Lock/Unlock Points
Edit Points
Check Points
Insert Points to Drawing...
Remove From Drawing...
Stakeout
Point Utilities
Display Properties
Edit Points...
Datum
Renumber
Move
Rotate
Copy
Erase
Unerase
Translate Points
Rotate Points

This illustration shows the Civil 3D Edit Points drop-down menu:



Even though the Civil 3D menu has fewer options than the Land Desktop menu, this is a situation where less is more. In the Land Desktop menu, many of the Edit options are necessary because of the external point database in Land Desktop. These special Point Edit commands are completely unnecessary in Civil 3D. In other words, rather than having a special Rotate Points or Erase Points command, in Civil 3D you can use standard AutoCAD commands to do many of your edits.

Point Groups

As soon as you create your first point in Civil 3D, an "_All Points" group is automatically created. All points in your drawing are contained in the All Points group. As in Land Desktop, you can create as many additional groups as you need.

While you are examining Civil 3D, note the Point Groups tab at the top of the Point Group Properties dialog box. This tab lets you create a point group using other point groups. For example, if you have a "Road CL Group", a "Road EOP Group", and a "Road Curb Group", you can create a new "Roadway Group" using the other Road Groups. Perhaps you have a "Wednesday Group" a "Thursday Group" and a "Friday Group" that contain points to be staked on each day. You could create an overall "Stake Out Group" containing the

other three groups without having to spend more time trying to filter out points from Wednesday, Thursday, and Friday.

Summary

Now that you've explored the differences between points in Land Desktop and Civil 3D, let's review how Civil 3D can provide you with a better solution for working with points.

Land Desktop Limitation	Civil 3D Solution
Have you ever moved some points only to realize your symbols didn't move with them?	In Civil 3D, the symbol is part of the point itself.
Have you ever wished you could use the Undo command after accidentally moving or erasing some points?	Civil 3D does not rely on an external point database, so you can use the Undo command during point operations.
Have you ever wished there was a fast way to change your point sizes so they could be used in a 50 scale drawing rather than a 100 scale drawing?	Because Civil 3D points are dynamic, they will automatically adjust their size by simply changing the drawing scale.
Have you ever wanted to create a point group by combining several other point groups?	Civil 3D point groups can be created from other point groups.
Have you ever found it difficult to maintain your organization's CAD standards so that points labeled by one person look the same as points labeled by another person?	Civil 3D uses templates with built-in styles to guarantee standards compliance.

Surfaces

When you work with surfaces in Civil 3D, you will notice many differences from Land Desktop right away. What is important to understand is that all of the same functionality you had with surfaces in Land Desktop still exists

in Civil 3D. The functionality is just simplified, and in some cases, uses a different methodology to accomplish the same result. The following section provides a brief description of how surfaces work in Land Desktop.

Surfaces in Land Desktop

The Land Desktop concepts and tools that are built into the Civil 3D surface object include the Terrain Model Explorer, Surface Editing, Contour Creation, and the Contour Object. The following table briefly summarizes how these features work in Land Desktop:

Land Desktop Surface Functionality	Description
Terrain Model Explorer	You create surfaces in Land Desktop using the Terrain Model Explorer where you can select data from sources such as point groups or boundaries to build a surface. Once built, the surface is written to an external file, which is actually a folder of data under the Land Desktop Project/DTM folder. Having the surface connected to this external file presents several of the same issues you might have with points.
Surface Editing	If you want to edit your newly created surface, you must first import 3D lines. This is because the surface exists in an external file, and not in the drawing. After importing the 3D lines, there are numerous options available for performing edits. For example, if you want to "flip face", you must do it one at a time. Furthermore, after each flip, you must rebuild the surface, reimport the contours, and possibly, re-label all the contours. This type of workflow can result in designers having to perform these tasks over and over again.
Contour Creation	After you finish editing a surface, you must create contours using yet another tool.

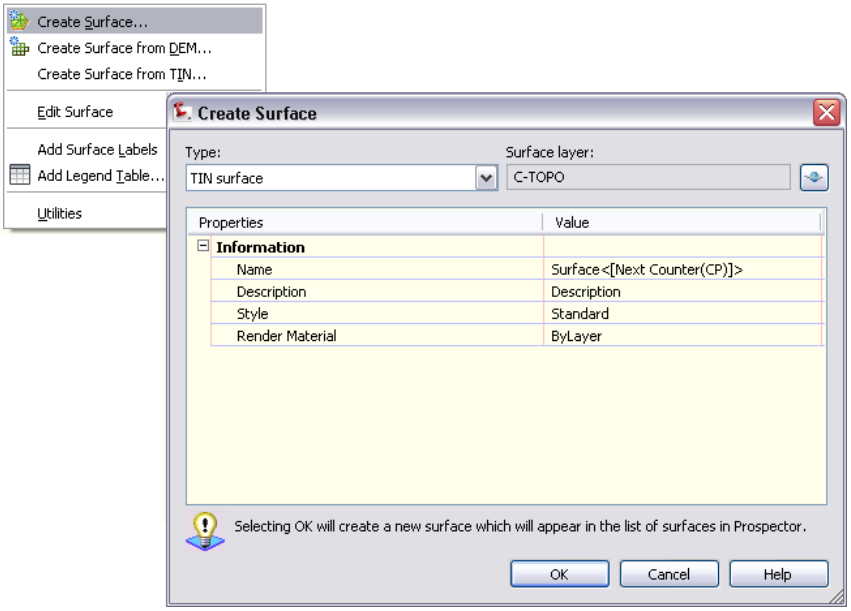
Land Desktop Surface Functionality	Description
Contour Object	Each contour is a separate object with no association back to the original surface. Editing the surface means you must recreate contours.

Building surfaces in Land Desktop involves many steps, and the process is not very intuitive. Although the process lets you accomplish the work you need to do, it does have several limitations. For example:

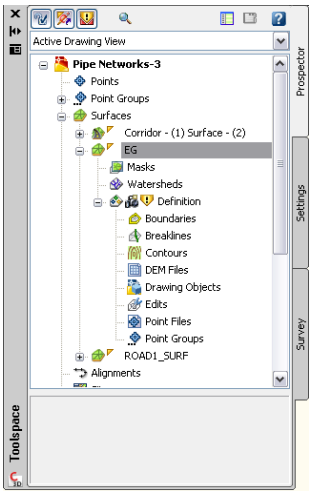
- Have you ever created a surface and wished there was some immediate visual feedback to show what you created?
- Have you ever edited a surface and wished your contours would update automatically?
- Have you ever wished you could use the standard Undo command to fix a mistake you made to your surface?
- Have you ever had to extensively edit a surface created from contours to correct areas not interpolated correctly?
- Have you ever wished your contour labels could faithfully be used for multiple scale drawings?

Surfaces in Civil 3D

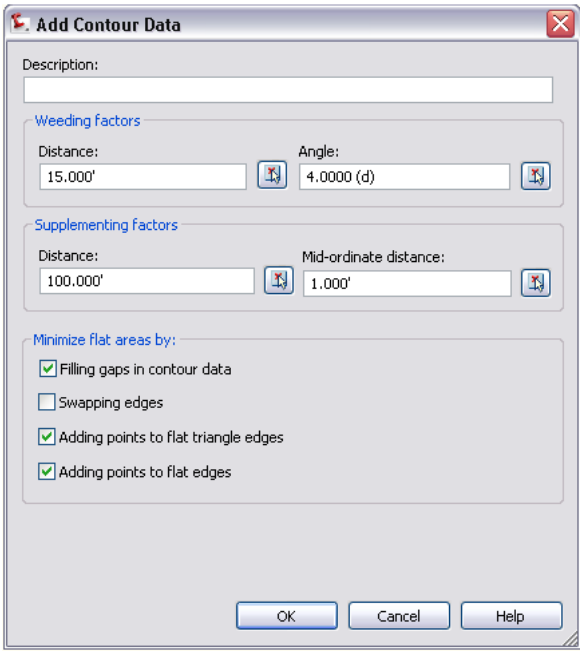
In Civil 3D, you can create surfaces on the Prospector Tab in the Toolspace window by right-clicking on the Surfaces collection, and clicking Create Surface. Or you can also select the same command from the Surfaces menu. A dialog box prompts you to assign the surface a name and a style. If you don't assign the surface a name, it is given a default name which is typically Surface[1]. This default object naming is just one of the useful conventions used in many Civil 3D features.



After supplying a name for the surface and clicking OK, the new surface object is displayed in the Prospector tree. Similar to the Land Desktop Terrain Model Explorer, you can expand the + symbol next to the newly created surface to view the items beneath it and assign the data you want to use to build the surface. You'll notice that the list of available data types contains primarily the same types that are available in Land Desktop.



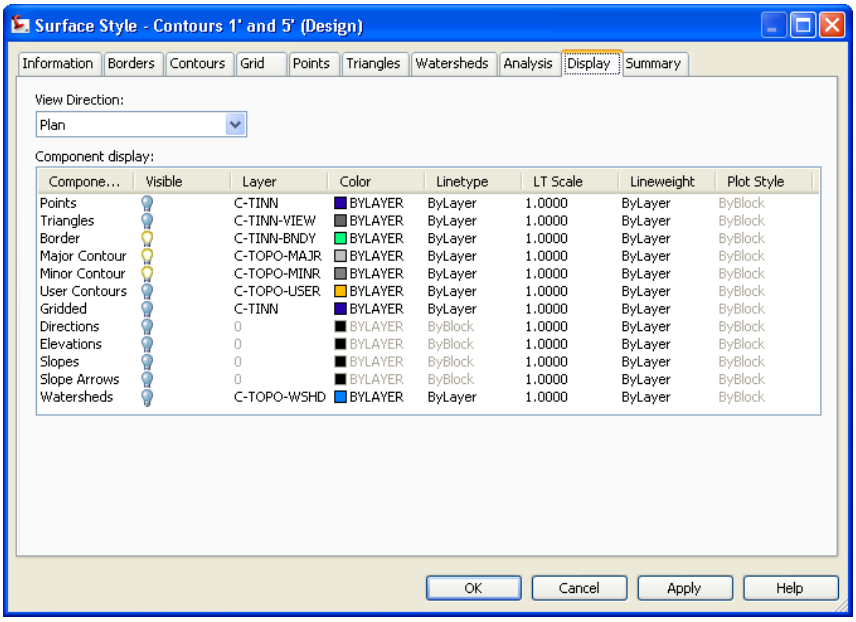
By right-clicking on a data type (such as Contours, for example) and adding the necessary data, the surface is automatically built and displayed in model space according to the style settings.



The process of building a surface from contour data in Civil 3D produces far superior results than what can be created with Land Desktop. For example, in Civil 3D, if you display contours on a newly created surface that was created from contour data, the contours will match the original. This is a significant improvement over the surface capabilities in Land Desktop.

Another aspect of Civil 3D surfaces that is important to understand is the surface style. In Civil 3D, the surface is the object, and the contours are subsets of that object. This is another area where the capabilities of Civil 3D far exceed Land Desktop. Because the contours are a subset of the surface, by simply changing the surface style you can present the surface in a wide variety of ways. For example, you can show contours at different intervals, with slope arrows, elevation banding, and more. Showing contours at 1' and 5' intervals after they were originally displayed at 2' and 10' intervals is as simple as a few clicks. The same is true for displaying components like elevation banding. Performing a similar task in Land Desktop would take many minutes as opposed to just a few seconds in Civil 3D. To display a particular subset of the surface, you need only turn it on in the Display tab for the surface style. To

configure a specific subset like contours, simply click on the appropriate tab and set the values as desired.



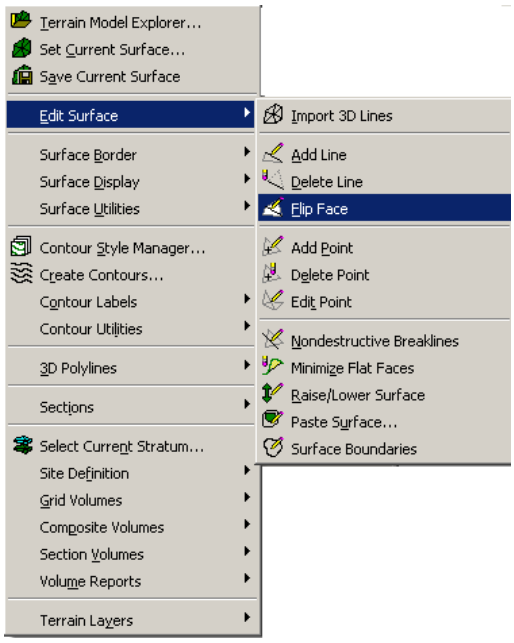
Civil 3D includes drawing templates that contain numerous predefined surface styles you can choose from or use as a starting point for creating your own.

Surface Editing

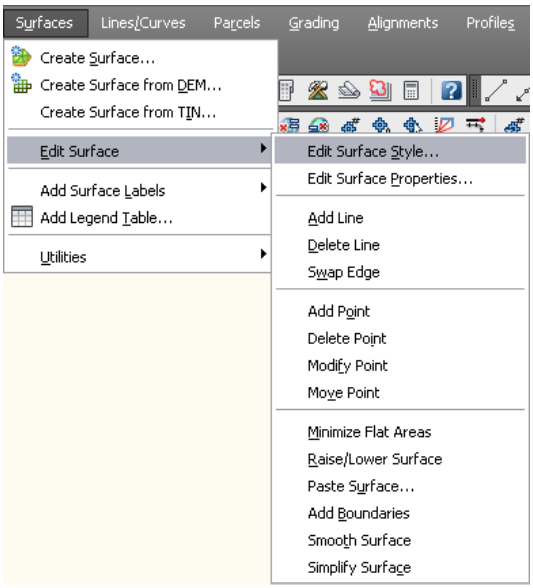
To edit a surface, you can set up the surface style to display both triangles and points. You might even want to consider creating a style specifically for editing.

In Civil 3D, all Surface Edit functions are conveniently located either from the Surfaces collection in the Prospector tree, or from the Surfaces drop-down menu in the top-level menu bar. These options should look familiar to Land Desktop users. If you compare the Land Desktop Edit Surface drop-down menu to the Edit Surface menu in Civil 3D—with the exception of Flip Face being renamed to Swap Edge—you'll notice that they are virtually identical.

The following illustration shows the Land Desktop Edit Surfaces drop-down menu:



The following illustration shows the Civil 3D Edit Surface drop-down menu:



Because a Civil 3D surface is not connected to an external data file, many steps that were required in Land Desktop become unnecessary, such as using commands like Import 3D Lines, Create Contours, Build Surface, and Quick View. Also, other commands become a lot simpler to use—for example, Undo, Redo, Move, and Rotate. Have you ever wished that you could simply Undo an errant surface edit? With Civil 3D, you can.

Because the surface object is the only representation of the surface data, you no longer have to worry about whether the surface displayed in your drawing actually matches the surface in your data file. For example, with Land Desktop, you sometimes had to worry that someone might modify the contours displayed on the screen, and as a result, the surface might not match the surface file currently being staked in the field. By maintaining a single surface object, the process of creating and editing a surface is simpler, and the chances of errors are reduced.

Like Civil 3D points, surfaces can also be dynamic. By simply modifying the underlying data used to create the surface, the surface is updated automatically. For example, in Civil 3D, if you move a point or grip edit a boundary, the surface is updated. Unlike the static methodology used in Land Desktop, using the dynamic model-based design in Civil 3D, you can automatically roll forward any changes made to your data.

Labeling Contours

Labeling contours in Civil 3D is similar to labeling contours in Land Desktop. Actually, the process is similar but the end result is different. Basically you drape a Contour Label Line across multiple contours. This is the same as using Label Group Interior in Land Desktop. Everywhere a contour intersects the Contour Label Line, a contour label appears. The contour labels themselves remain on the Contour Label Line and not on the contour itself. If you drag the label line to different locations, the labels move with it. If you alter contour intervals, for example, and if the new contours intersect the label line, they are automatically labeled. This new contour behavior in Civil 3D may take some practice to get used to, but the time savings of being able to make minor to extensive changes to your surface without having to constantly re-label the contours is substantial. You access the contour labeling features by selecting Surfaces menu ➤ Add Surface Labels, and then clicking Contour - Single, Contour - Multiple, or Contour - Multiple At Interval.

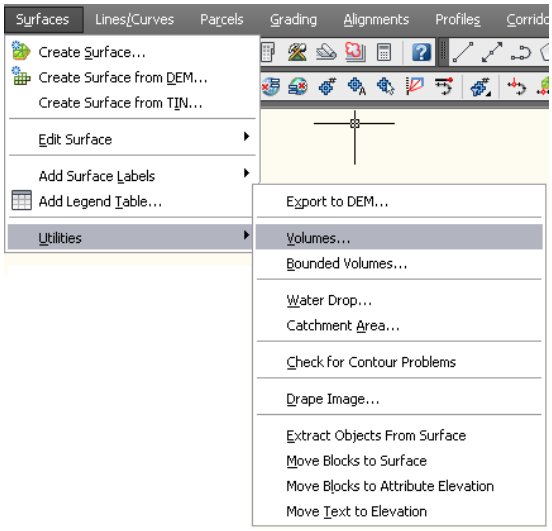
After selecting a contour labeling command, you are prompted to pick two points in model space. The line defined by these points becomes your Contour Label Line. Like everything else in Civil 3D, contour labels are controlled by

styles. By modifying these styles, you can adjust the label look-and-feel to match your particular organization's requirements.

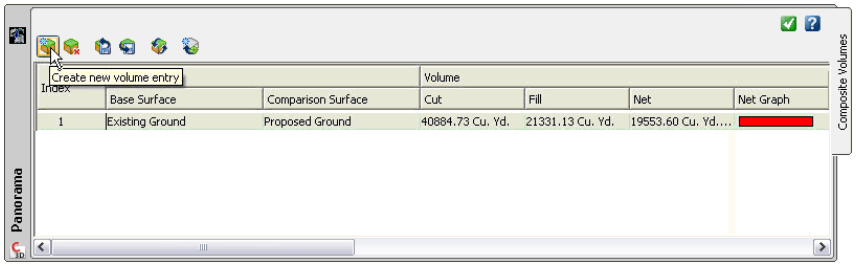
Calculating Earthwork

In Land Desktop, the process of calculating earthwork is complicated to say the least. For example, as a minimum it can involve creating a stratum, defining a site, having to understand the difference between grid, section, and composite, and so on. Furthermore, many designers find that they do not perform earthwork functions very frequently, which can make the task even more difficult. Fortunately, Civil 3D makes the process of calculating earthwork simple.

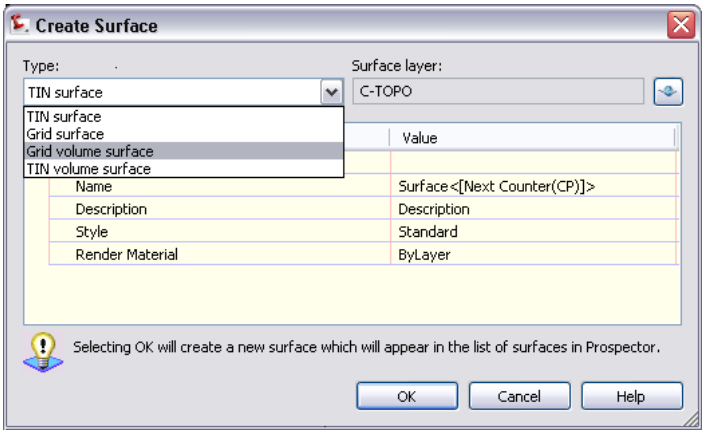
All you need are two surfaces and you can begin the process of calculating earthwork by clicking Surfaces menu ➤ Utilities ➤ Volumes.



The Panorama is displayed. You first create a new volume entry in the list by clicking the Create New Volume Entry icon (upper left corner of the Panorama window). Then click in the cell under Base Surface and select the starting surface, select a surface in the cell under Comparison Surface to select your finishing surface. In a few seconds, Civil 3D performs a composite calculation between the two surfaces and displays the result.

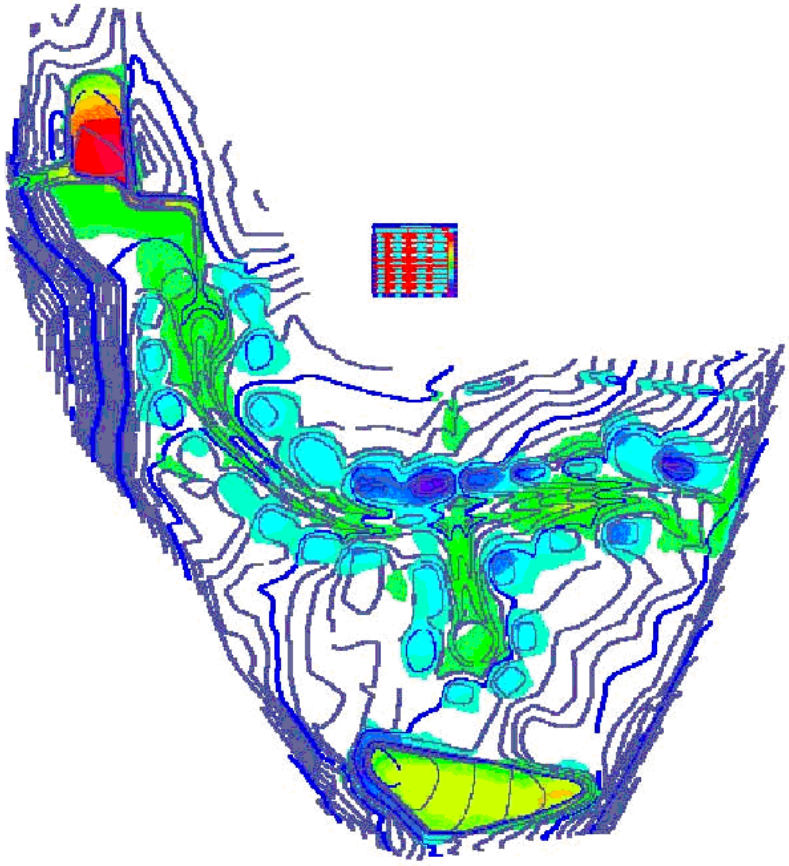


You can still perform an earthwork calculation using multiple methods, as in Land Desktop. The two possible methods are Grid and Composite. You can perform these types of calculations just as easily in Civil 3D as in Land Desktop. It is no more difficult than creating a new Volume surface. These types of surfaces (Grid Volume Surface and TIN Volume Surface) are created using the same tool as a regular surface. Rather than specifying components like Point Group and Contour Data as data types to build the surface, you need only select two surfaces to compare.



As a result of performing a calculation this way, you have the added benefit of creating a surface that can be used to display cut and fill contours or elevation banding to validate earthwork numbers.

The following illustration shows an example of a surface style being used to display earthwork cut and fill data by using elevation banding. Colors can be used to indicate cut and fill areas. For example, a color such as dark red could be used to indicate deepest cut, and dark blue could be used to indicate highest fill. Civil 3D can also automatically prepare and insert a legend to define the coloring.



Summary

Although working with surfaces in Civil 3D is very different from working with surfaces in Land Desktop, there are many benefits. From creation to completion, working with surfaces in Civil 3D is more intuitive, requires fewer steps, and helps eliminate the possibility of error. The following table provides

a quick review of how Civil 3D solves many of the issues you may have had when working with surfaces in Land Desktop:

Land Desktop Limitation	Civil 3D Solution
Have you ever created a surface and wished there was some immediate visual feedback to show what you created?	Civil 3D uses surface styles to display your surface from the minute you add your first piece of data to it.
Have you ever edited a surface and wished your contours would update automatically?	In Civil 3D, the contours are a subset of the main surface object. Editing the surface automatically updates your contours.
Have you ever wished you could use the standard Undo command to fix a mistake you made to your surface?	Because Civil 3D surfaces are not connected to an external data file, using commands like Undo is not a problem.
Have you ever had to extensively edit a surface created from contours to "fix" areas not interpolated correctly?	Creating surfaces from contour data in Civil 3D produces significantly more accurate results, thereby reducing the need for extensive manual editing.
Have you ever wished your contour labels could faithfully be used for multiple scale drawings?	Civil 3D surfaces and labels are dynamic. Changes to drawing scale and rotation will automatically adjust label height and orientation, even when the surface is an xref.

Alignments and Profiles

When you work with alignments and profiles in Civil 3D, you'll notice many differences from Land Desktop. Just as with other features, accomplishing alignment and profile tasks in Civil 3D is easier and more powerful than in Land Desktop. The following section provides a brief description of how you worked with alignments and profiles in Land Desktop.

Alignments and Profiles in Land Desktop

As with other Land Desktop features, working with alignments and profiles in Land Desktop involves working with, and having to maintain, data in external files or databases.

Land Desktop Functionality	Description
Alignment Creation	Create alignments from objects or polylines by selecting the desired entity, selecting a reference point, and then giving the new alignment a name and station information. If you are creating from a polyline, you had to guess if it was originally drawn in the direction you need. Once defined, the alignment is created in an external alignment database.
Station Label Settings	At some point you must establish station label settings by clicking Alignments menu ➤ Station Label Settings. Make choices in the Alignments Station Label Settings dialog box.
Station Label Creation	Once station label settings are established, create the labels by clicking Alignments menu ➤ Create Station Labels. A prompt asks if you want to delete the old station labels and replace them with the new ones. (Many users have noted that at this point in the workflow, it's a little too easy to inadvertently delete all the station labels for all your alignments.)
Profile Settings	Before creating a profile, verify that the profile settings are as desired. These settings control components like sampling, layers, and labels.
Profile Creation	First set the desired surface and alignment as current, then you can create a Profile from a Surface, from a File, or from Sections. A command line message indicates when the profile is created. The profile data is maintained in an external data file. To view the profile, select Profile menu ➤ Create Profile. After making choices in the Profile Generator dialog box

Land Desktop Functionality	Description
	and picking a point in the drawing, the profile is displayed. Moving it, however, can cause problems.
Vertical Alignment Editing	If you would like to add a proposed (finished ground) profile, you have two options. You can generate the proposed profile graphically (using several tools) or you can use the Vertical Alignment Editor. Both options are available on the Profile menu. If you want to add the proposed profile, complete with labels, to the existing profile, use the Import utility.

Most Land Desktop users are comfortable working with the alignment and profile functionality because it is a process they already know. It does however, have some limitations. For example:

- Have you ever had to reverse the direction of an alignment?
- Have you ever wished you could rename an alignment?
- Have you ever edited alignment geometry and then realized that you now have to recreate the profile?
- Have you ever had to rework a drawing because someone moved your profile?
- Have you ever wished you could create more than one finished grade profile for an alignment?

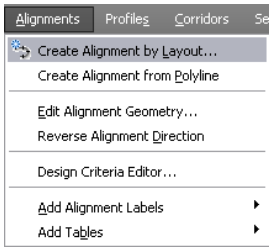
Alignments and Profiles in Civil 3D

In Civil 3D, one of the most significant differences in working with alignments and profiles is that the alignment and profile data exists in the drawing file, not in an external database or file. There are several other significant differences too, such as the fact that Civil 3D alignments and profiles are dynamic objects.

Alignments

Just as in Land Desktop, in Civil 3D you can create alignments in a few different ways. From the Alignments menu, you can choose to Create

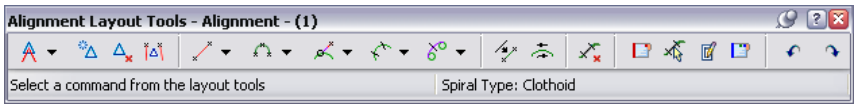
Alignment By Layout, or Create Alignment From Polyline. There is no "Define From Objects" option on this drop-down menu, but you can create alignments in a variety of shapes, using precision tools to perfect your geometry, by using the Alignment Layout tools toolbar.



The process of creating an alignment from a polyline is nearly identical to that same option in Land Desktop. Once the polyline is created, you select it and then use the Alignments menu to convert it into an alignment (Alignments menu ➤ Create Alignment From Polyline).

You can also use the Create Alignment From Network Parts command, which is available from the Pipes ➤ Utilities menu. The Create Alignment From Network Parts option is very similar to the Create Alignment From Polyline command. Use it to quickly create an alignment from an existing pipe network (pipe run) in your drawing.

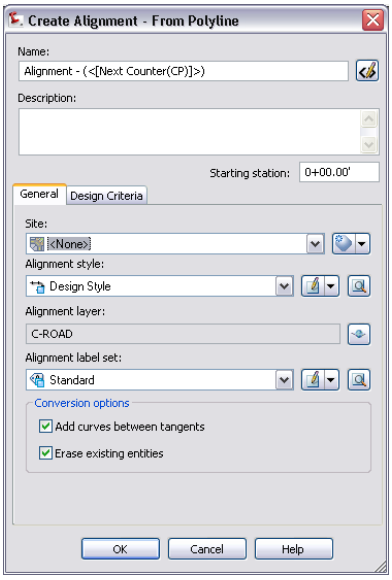
Creating an alignment using the Layout tools is a new concept for Land Desktop users. To access the Alignment Layout Tools toolbar, choose Alignments menu ➤ Create Alignment By Layout, or enter CreateAlignmentLayout on the command line. When you do one of these, the Alignment Layout Tools toolbar is displayed.



Basically, you use this toolbar to construct alignments with specific engineering rules or constraints built in. It provides you with a variety of options for creating your alignment.

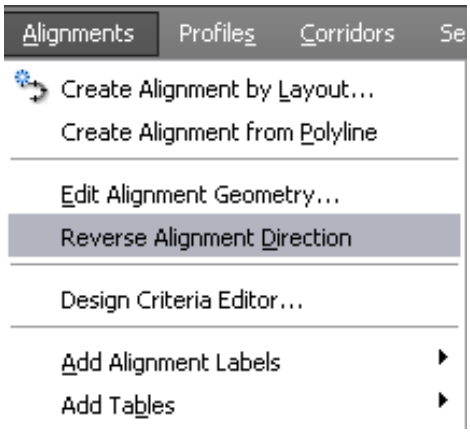
The advantage of creating your alignment using the Alignment Layout tools is that you can incorporate design criteria directly into your alignment. For example, you can create an alignment that requires that an arc must pass through a particular point. Using this toolbar, you can create complex geometry that would be challenging and time-consuming to construct in Land Desktop.

No matter which alignment creation method you use, you are eventually prompted to enter some basic alignment object creation information, such as name, description, style, layer, label set, and so on.



Another important concept to understand is that after it is created, the alignment itself is an object. As such, by default it contains station labels. Therefore, you no longer have to add them. Because in Civil 3D an alignment object is not connected to an external database, you can edit your alignment as often as necessary without having to go through any re-creation process. For example, in Civil 3D, you can grip edit alignments, as well as all the labels, curves, and bearing/distances associated with it. In Land Desktop, to do the same requires that you update each of these individually.

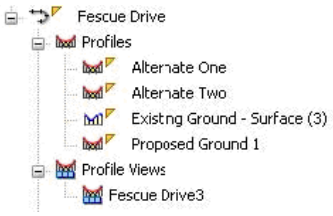
Have you ever needed to change the length of an alignment part of the way through a project? How about having to rename one? In Civil 3D, tasks like this are no longer an issue. Also, you should note that there is a handy “Reverse Alignment Direction” option.



Profiles

You'll find that the way you work with profiles in Civil 3D is dramatically different from the way you worked with profiles in Land Desktop. In Civil 3D, a profile is simply a vertical representation of data from an alignment (and a surface). In other words, a profile is more or less a linear object. In Civil 3D, the profile itself does not contain the grid lines, stationing information, and elevations, as profiles do in Land Desktop. Instead, the grid lines, stationing, and elevation data for a profile are stored in a separate, new object type called a *profile view*. The profile view is simply a container to display profiles. It maintains the data associated with the actual linear profile (the profile object) item, such as the length, start and end points, and station and elevation data of the alignment it represents. It also creates and controls the actual grid in which you display the profile data, along with information such as the bands of data you want to display along the X-axis above or below the grid.

At first glance, this may seem complex, but this methodology actually makes working with profiles easier. For example, using Land Desktop, have you ever wanted to have more than one proposed profile for a single alignment, so that you could show several options for a proposed road design? Land Desktop only allows you one. Below is an example of this concept. It shows the Civil 3D Prospector tree with an alignment called Fescue Drive that contains four profiles (one existing and three proposed).

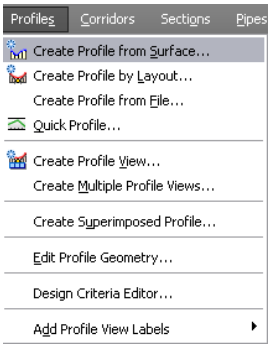


Below those profile entries are any profile views for Fescue Drive. In this case, there is only one. If you want to compare your Existing Ground to Alternate One, you can create a Profile View to display them together on the same grid. If you would like to compare the Existing Ground to Alternate Two, you can create a second Profile View to display those as well. There are really many ways you could display this data.

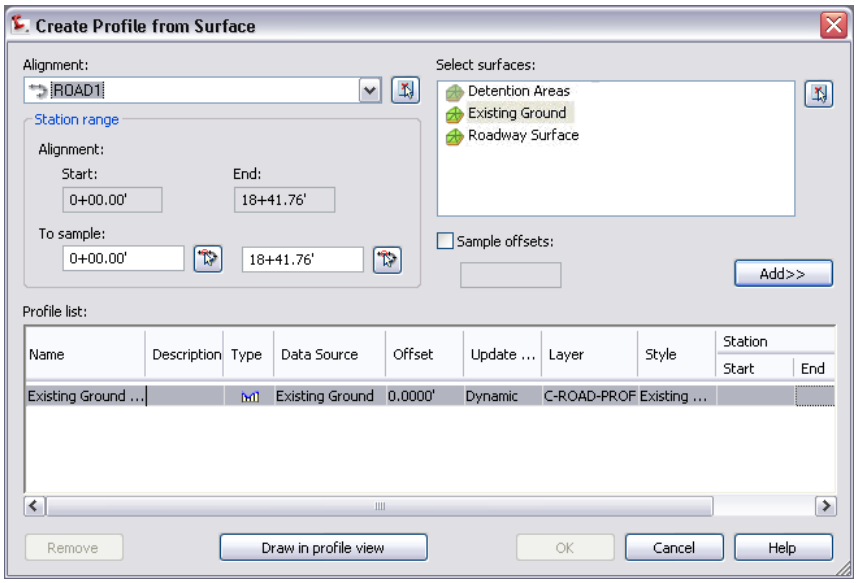
Creating Profiles and Profile Views

Now that you have an understanding of profiles and profile views, let's explore how you create them in Civil 3D. This section explores creating an existing and a proposed profile, and begins by using the Profiles menu.

For the most part, existing profiles are created using the Create Profile From Surface command, and proposed profiles are created from the Create Profile By Layout command.



After selecting Create Profile From Surface, the following dialog box is displayed:

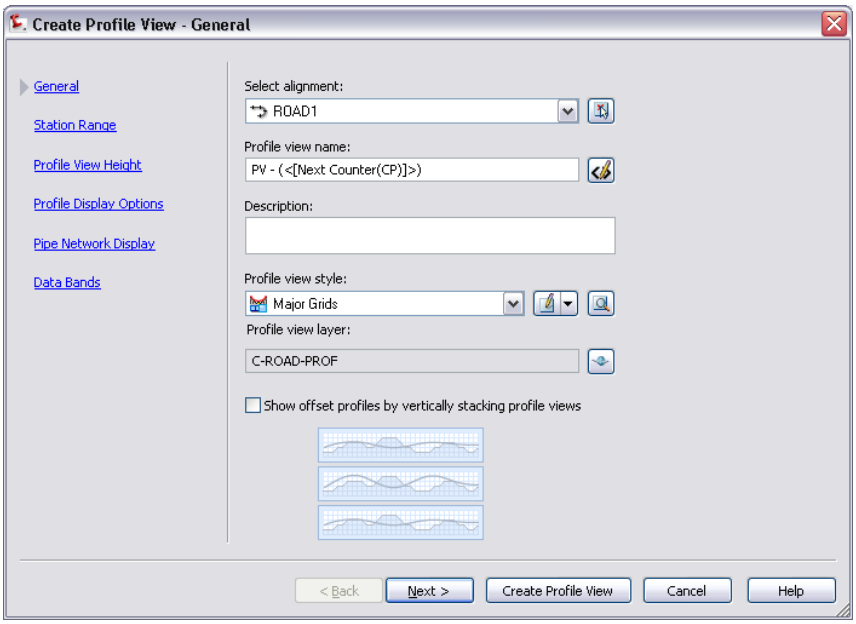


After selecting the desired alignment and surface, click the Add>> button to create your new Existing Ground Profile in the Profile List. If you look closely at the dialog box, you will see options for controlling which portion of the alignment is sampled, as well as the ability to sample offsets. This is not very different from Land Desktop.

After adding your new profile to the list, you can present it in a profile view by clicking Draw In Profile View at the bottom of the dialog box.

NOTE Throughout the process, having to select both the alignment and the surface in the various dialog boxes reduces the possibility of error. It also means you don't have to worry about what is current and what is not as you do with Land Desktop.

Remember that the profile view is just a container that displays the profiles. Conceptually, you only need to select your alignment and the desired profiles you want to display. After you click Draw In Profile View, Civil 3D opens an easy-to-use wizard that guides you through the process of creating a profile view.



As you step through the choices in the wizard dialog boxes, you'll be able to configure the following to determine the organization as well as the presentation of your profile view:

Profile View Name—To assist in keeping things organized, you must give this profile view a name. As with all Civil 3D objects, you can accept the default name that is displayed automatically, if you wish (for example, PV 1).

Station Range—If your profile is very long and you only want to present a small portion of it, you can specify a desired station range.

Profile View Height—If you want to provide some additional white space (margin) at the top or bottom of your view, just increase the View Height.

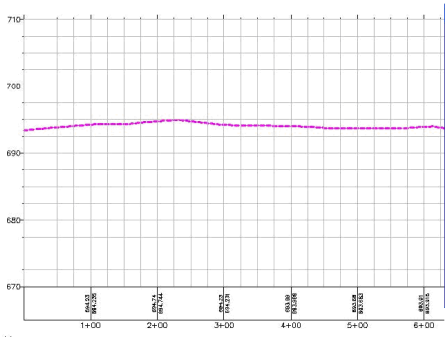
Profile View Style—The profile view style controls how the profile view looks. In other words, it defines components such as grid spacing, vertical exaggeration, titles, view direction, and so on.

Band Set—Selecting a band set adds preconfigured labeling to the top or bottom of your profile view.

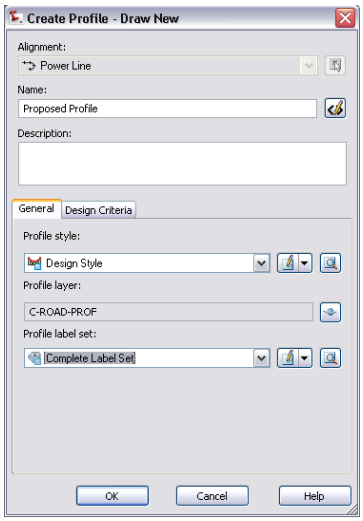
When finished specifying options, click Create Profile View and you are asked to select a point in Model space to display the new profile view. Just as in Land Desktop, you are selecting where the lower left corner of the profile view will be placed.

Once these choices are defined, they can be easily changed using the Profile View Properties dialog box. Just right-click on a profile view and click Properties from the right-click menu.

After the insertion point is selected, the profile view is displayed. Using the Move command on a profile in Land Desktop was problematic, but in Civil 3D it's not a problem. To move the profile view, you can use the standard AutoCAD MOVE command to relocate it, or use the grip at the lower left corner of the profile view.



It's now time to create your proposed profile. From the Profiles menu, select Create Profile By Layout. You are then asked to select which Profile View you will be using to create your new profile. After clicking on the desired Profile View, the following dialog box is displayed:



NOTE When you are trying to select a Profile View in a drawing, you must make certain that you click on a *grid line* rather than on a *profile line*. The grid lines are part of the profile view object. The profile lines are profile objects. Even though the two object types can be displayed together, it is important to understand that the profile view and the profile are two separate and distinct object types.

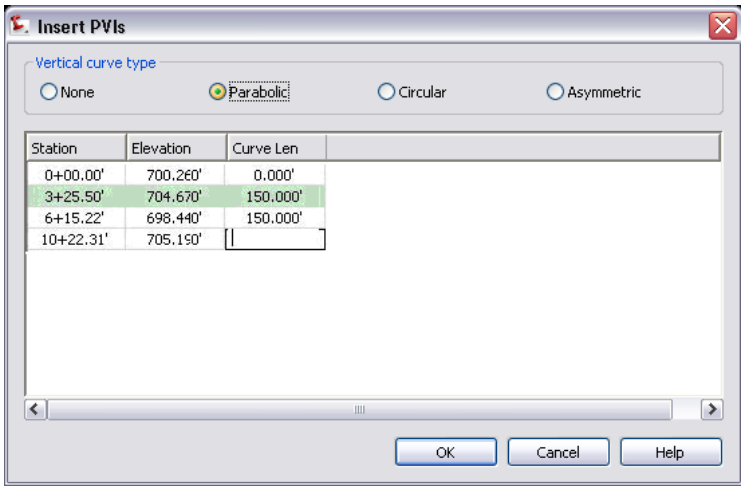
Using this dialog box, you can give your proposed profile a name as well as select styles to control how it is displayed and labeled. Accepting the defaults will produce a proposed profile that looks very similar to a Land Desktop profile.

After clicking OK, the following toolbar is displayed. Notice that the Profile Layout Tools toolbar is very similar to the Alignment Layout Tools toolbar. This is another example of the standardized user interface in Civil 3D.

In Land Desktop, you could create proposed profiles graphically, through an editor, or a combination of both depending on the information you have to work with. The next section explores performing the same tasks using Civil 3D.

Create a Proposed Profile from Scratch Using the Editor

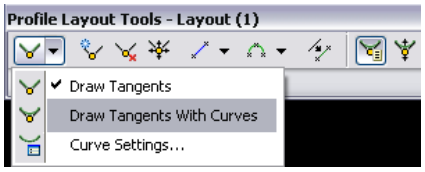
By clicking the Insert PVIs - Tabular button  on the Profile Layout Tools toolbar, a dialog box displays that lets you create the profile by typing in PVI stations, elevations, and vertical curve information. If you look at the top of this dialog box, you'll notice that you can now create asymmetrical vertical curves.



Create a Proposed Profile from Scratch Graphically

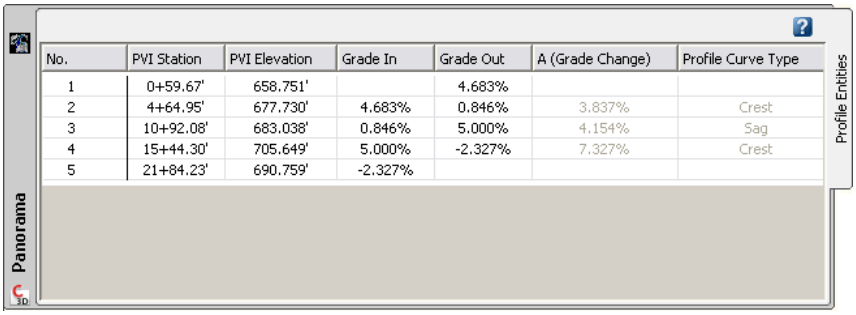
You can also use the Profile Layout Tools to create the geometry graphically. You do not draw it using AutoCAD, and then convert it into a profile later, as you did in Land Desktop.

By clicking the  button, you can select either Draw Tangents or Tangents with Curves. On the drop-down menu, you can also select Curve Settings to set the defaults. Once the command is initiated, you can simply draw the Proposed Profile. As the profile is drawn, all of the necessary annotation is created automatically.



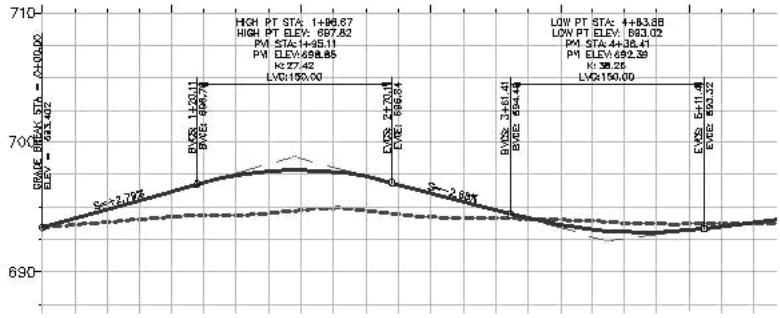
Define Proposed Profile Geometry Using the Editor

After creating some or all of the Proposed Profile graphically, you can click the Profile Grid View button  to open the editor (Panorama window). In the editor, you can create or refine the Proposed Profile geometry.



No.	PVI Station	PVI Elevation	Grade In	Grade Out	A (Grade Change)	Profile Curve Type
1	0+59.67'	658.751'		4.683%		
2	4+64.95'	677.730'	4.683%	0.846%	3.837%	Crest
3	10+92.08'	683.038'	0.846%	5.000%	4.154%	Sag
4	15+44.30'	705.649'	5.000%	-2.327%	7.327%	Crest
5	21+84.23'	690.759'	-2.327%			

The column headings are similar to those in Land Desktop. This is another example of where your Land Desktop experience is very relevant. Notice of the "Grade In" Column. In Civil 3D, unlike Land Desktop, you can grade in both directions.



Summary

It's easy to see that creating alignments and profiles in Civil 3D is more powerful and requires fewer steps than in Land Desktop. Also, the use of built-in style features in Civil 3D assists in maintaining standards throughout

your organization. Now that you have an understanding of how Civil 3D handles alignments and profiles, let's review how Civil 3D solves many of the issues you may have had when working with these features in Land Desktop.

Land Desktop Limitation	Civil 3D Solution
Have you ever needed to reverse the direction of an alignment?	You can now quickly and easily reverse the direction of an alignment. Just clcik the Alignments menu ➤ Reverse Alignment Direction.
Have you ever wished you could rename an alignment?	Renaming an alignment in Civil 3D is simple and reliable. Right-click the alignment in the Prospector tree and click Properties. Change the alignment name in the Name field and click OK.
Have you ever had to edit your alignment geometry and as a result had to recreate your profile?	Because alignments and profiles are dynamic objects, when you edit an alignment, the corresponding profiles are automatically updated as well.
Have you ever experienced undesirable results caused by someone moving your profile?	Profile View objects do not rely on connections to external files. Therefore, they can be moved using standard AutoCAD commands.
Have you ever wanted to create more than one finished grade profile for your alignment?	In Civil 3D, numerous profiles can be associated with each alignment.

Plan Production

This section explores the plan production features in Civil 3D, and compares them to Land Desktop plan production features.

Plan Production in Land Desktop

Plan production in Land Desktop involves using the Sheet Manager to create plan, profile, plan/profile, and cross section sheets that can be plotted. The process involves many steps. Along the way, if any changes to your model or annotation occur, frequently the plan production (sheet generation) process would need to be started over again from the beginning. In many organizations, these tasks are not started until a project has reached a certain state of completion. This is to avoid having to do the same tasks over and over again as designs evolve.

Plan Production in Civil 3D

The Civil 3D plan production features provide faster, and much more automated functionality than the plan production features in Land Desktop. The first thing that is important to understand is that in Civil 3D, the plan production features are comprised of two wizards that allow you to quickly create sheets along a selected alignment.

The first wizard—the Create View Frames wizard— creates objects called "view frames" which are similar to viewports. This wizard asks you to select an alignment in your model, and to specify some other options. You can accept the defaults, or make changes to them. When the wizard completes, the "view frames" are placed automatically along that alignment.

The second plan production wizard—the Create Sheets wizard— automatically creates sheets from the data that exists within the boundaries of the view frames, and displays it according to choices you make on the wizard dialogs. Both wizards reference templates, which you specify, and which of course also play a part in defining how the data in the sheets is displayed.

Just like the Create View Frames wizard, the Create Sheets wizard takes just a few seconds to use. It is very easy to play around with this feature, creating, adjusting, deleting, and recreating view frames and sheets until plans look just the way you want.

Summary

Now that you've reviewed plan production features in Land Desktop and in Civil 3D, refer to the following table for a summary of how Civil 3D provides the more efficient solution.

Land Desktop Limitation	Civil 3D Solution
In Land Desktop, creating plan sets is a task that typically must wait till a project has reached a state of near completion. Drafters must wait till designers and engineers give them a green light to begin the plan production phase.	With Civil 3D, plan production tasks can occur simultaneously with many engineering and design tasks. Drafters can begin creating plan sets while designers and engineers are still working on model data. This enables plan production tasks to begin and complete much earlier in the project cycle, reducing the overall project timeline.
Have you ever spent hours or days revising plan sets just because minor changes to your model had to be implemented?	With Civil 3D, because plan production features are dynamically linked to your model data, updating plan sets when model data changes can take just a few seconds.
In Land Desktop, ensuring that plan sets adhere to company standards is a tedious, and error-prone process. Often visual editing or checking is the only way to ensure that annotations and other data are represented as desired.	Because CIvil 3D includes style-based objects and labeling, keeping plan sets in adherence with company standards is faster and easier.

Setting Up Styles in Civil 3D

3

As you move from Land Desktop to Civil 3D, you will want to take some time to understand styles. Using styles provides you with enormous gains in productivity, precision, consistency, and quality.

Styles control the appearance and sometimes the behavior of Civil 3D objects. By using styles in Civil 3D, you have great flexibility in the presentation of design elements, including labels and tables.

This chapter provides an overview of styles, explains how styles fit into the hierarchy of Civil 3D settings, and describes how to get started creating customized styles in Civil 3D.

Overview of Styles in Civil 3D

In Civil 3D, styles control the display of all the visual elements of objects, labels, and tables. Using the styles you create, all elements of the design object are automatically set to a specific linetype, color, and layer reference.

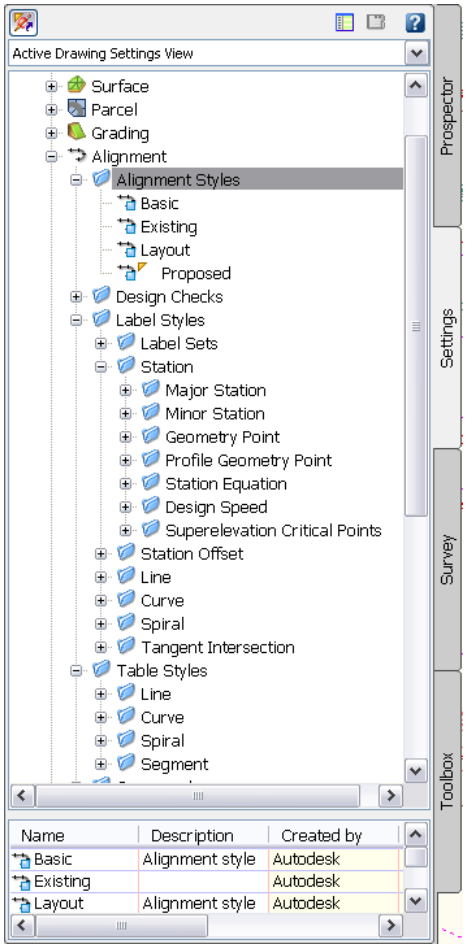
To get the most from Civil 3D, organizations can create customized styles, according to their standards, which, along with various other drawing settings, can be saved in a drawing template file (*.dwt*) for easy reuse. Having a drawing template with styles that meet your company standards is one of the most important steps you can make to ensure that you have a successful transition to Civil 3D. As mentioned earlier in this guide, you need to make sure to devote appropriate resources to developing styles for your organization.

In Civil 3D, there are various levels at which you can apply styles. For example, you can assign styles at the object level (alignments, profiles, surfaces, pipe networks, and so on), as well as at the object sub-component level (for example, pipes and structures within a pipe network), and even specific styles for the

various components of pipes or structures. You can also create styles for object labels and tables. Having the ability to automatically update objects and labels by simply changing a style is a tremendous time-saver over what you must do in Land Desktop to update the appearance of an object.

You can create Civil 3D styles based on a company standard to represent all the phases of a development project. For example, you may have a set of styles that are applied to existing elements, and another set of styles for proposed elements.

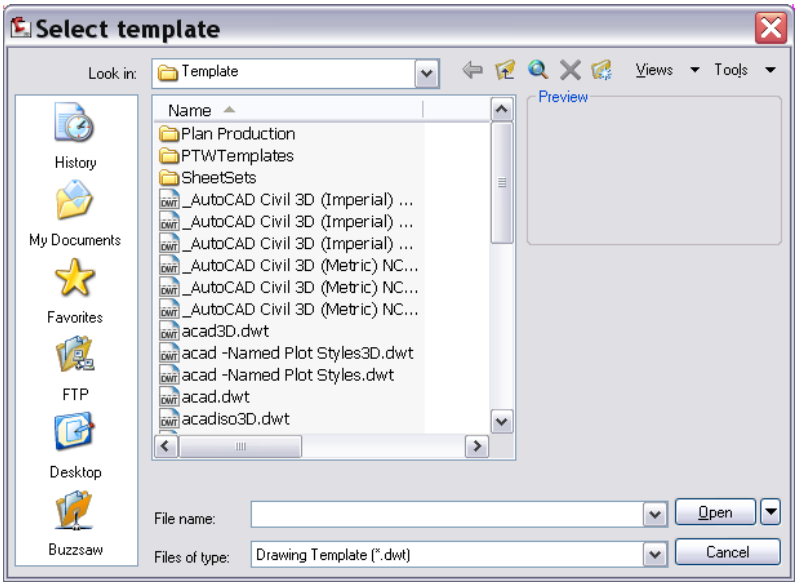
Alignment style collection on the Settings tab in Toolspace



Style Considerations

Creating hundreds of styles can seem like a daunting task, but it is important to remember that you do not have to create all styles at once. Review the default Civil 3D templates and choose one of these templates as a starting place. By modifying the styles in an existing template, you can create a template specific to the needs and standards of your company.

Template choices in Civil 3D



Civil 3D provides several drawing templates (imperial and metric) based on National CAD Standards. These templates contain many pre-defined styles for typical use in the land development industry. Use one of these templates as a starting point to become familiar with styles.

Template	Description
NCS Base	This template contains a basic style for every element. It is designed for the CAD manager who wants to build a style catalog from scratch. This template should be used only by experienced Civil 3D users because there is little material in the template file to modify.

Template	Description
NCS LDT	This template contains styles that reflect the built-in appearance of the AutoCAD Land Desktop profiles, sections, points, and label styles. This template provides a familiar feel to the software, making it easier for you to move to Civil 3D and get acceptable results quickly and easily.
NCS Extended	This template contains multiple styles for almost every Civil 3D object. The variety of use cases in this template makes it a good place to start. The less experienced CAD manager can use it to explore how styles and labels are built. It also provides more experienced CAD managers a wide variety of use cases.

Read the following section before you decide which approach to style creation best fits your organization:

Who should create styles?

Before you start to develop a catalog of styles for your company, you have to decide what approach to take. The amount of time and money that you can afford to invest in style development are important factors when considering the following options:

- **Hire a consultant**—If you have well-defined CAD standards in place, you can hire a consultant to create your style catalog. With minimal guidance and using existing work, he or she can create a template with styles that will closely match your existing work. This approach will ease the burden on a CAD manager.
- **Do-it-yourself**—If time allows, and your company wants to have an on-site styles specialist, designate someone in your firm to build styles. This provides an opportunity to develop a strong internal technical resource who will develop competency in using Civil 3D while building styles.
- **Combined approach**—This approach is ideal if you can hire a well-trained consultant to get you started with style development by meeting with your team. He or she can help you set up your basic styles and instruct you about style creation. You can make progress on a project using basic styles and then create or modify styles as needed while work on a project continues. After the initial style development, a designated resource person can continue adding to your style catalog.

ByLayer or Style

Another consideration is to determine whether you want the display of objects and labels to be ByLayer or as defined in the style. On the Display tab of the object style dialog box, you can either set up the style to obtain values ByLayer or specify hard-coded values for each object component type. There are pros and cons to consider for each approach.

	PROS	CONS
Values defined in Style	■ Hard-coded display enforces standards. ■ Fewer layers to manage because many elements are on one layer. ■ Display of most styles is done through one dialog box and is faster than using the Layer Manager.	■ Difficult to manage downstream data. ■ Not intuitive to layer oriented users. ■ Requires a style for every object component. ■ Limitations in sharing data with those not using Civil 3D.
Values controlled ByLayer	■ Familiar to AutoCAD users and display is easily manipulated through layer control. ■ Easier to share Civil 3D content between AutoCAD products.	■ Requires layering and AutoCAD Civil 3D standards to ensure controls. ■ Object component display is difficult to track and change.

Styles Workflow

This section describes a basic workflow for creating and using styles.

To enforce CAD standards, styles should be managed through a drawing template.

1. Create a drawing template (*.dwt*) that contains text styles, linetypes, layers, and blocks that are standard for your organization. One way to get started is to modify the styles in one of the *.dwt* files in Civil 3D. To access the drawing templates, in Toolspace on the Prospector tab, select Master View. Scroll to the Drawing Templates folder.

2 In the drawing template, create styles for objects, labels, and tables. You can start by copying the existing styles in the template and making modifications to resemble your company standards.

3 Adjust the drawing and feature settings in the template so that new drawings based on the template will contain your customized styles.

4 Save the drawing template on a server or some other location that is accessible to all users.

5 When you create new objects, apply the desired styles.

6 Override style settings as necessary for specific objects or labels, to obtain results for unique needs in a project.

7 Use the drag and drop capabilities to drag styles from one drawing into another. You can drag styles between drawing collections on the Settings tab, or into a drawing that is open in the drawing editor.

Styles Hierarchy and Creation

The Settings tab in Toolspace contains all the object style collections. The templates in Civil 3D have pre-defined styles called Standard or Basic for each object. Standard or Basic styles can be copied and modified to meet specific display requirements. After you create an object style, you can assign the style when you create an object. If necessary, you can change the specified object style by modifying the object properties.

To create a new style

1 On the Settings tab in Toolspace, expand an object collection.

2 Select the object styles collection. Right-click ➤ New.

3 In the Style dialog box, click the tabs and specify settings.

All styles have tabs for Information, Display, and Summary, and depending on the object, there may also be tabs specific to that object.

Note that on the Display tab, by setting the View Direction to Plan, Model, Profile, or Section, you can specify different display options for an object or for an object type, depending on the type of view. For example, in plan (2D) views, you may want pipe objects to display as red, but in profile views, you may want them to display as black. Using the View Direction options on the Style dialog box Display tab, you can easily and quickly make these style decisions.

The default object styles can be controlled at the object level or the command level.

To set style defaults at the object level

1. On the Settings tab in Toolspace, select an object collection. Right-click ➤ Edit Feature Settings.
2. In the Edit Feature Settings dialog box, expand the Default Styles Property. The default styles for the feature object are listed.
3. Click a cell in the Value column and click  .
4. In the feature Style dialog box, choose from the following options:
   - Select a style from the drop-down list.
   - Click  to pick a style from the drawing or click the drop-down arrow for commands to create, copy, or edit.
   - Click  to view the Style Detail dialog box. The Information tab lists the name and creation information. The Preview tab displays a preview of the style. To preview other feature styles, select the style from the Style drop-down list.

To set style defaults at the command level

1. On the Settings tab in Toolspace, expand an object collection.
2. Expand the Commands collection, right-click a command ➤ Edit Command Settings.
3. In the Edit Command Settings dialog box, expand the Default Styles Property. The default styles for the command are listed. You have the same options to create, copy, edit, or pick from drawing.

NOTE Assigning a new style default at the command level will override the style that is assigned at the object level. The Override check box is selected when you assign a style at the command level.

Label Styles

Using label styles, you can easily annotate design elements. Like objects, if you assign a new label style, labels are automatically updated to reflect the applied style.

The basic process for creating and working with label styles is similar to object styles, but because labels have more attributes, the specifics for label styles are more detailed. However, the user interface for creating label styles is consistent for all objects. Label styles are composed of general label properties, layout parameters, and the dragged state display characteristics.

Like object styles, label styles are grouped in collections for each feature on the Settings tab in Toolspace. Each object type has varying types of label styles. For example, surface label styles include styles for contours and slope, while alignment label styles include styles for stations and station offsets.

Label styles also have parent-child relationships. You can create a child style that has the same properties of the parent style, but you can make changes to these properties at the child level. Any property you don't specifically change will be controlled by the parent style.

The General collection in Toolspace contains the Multipurpose collection of styles. These styles are not associated with a specific object. In the General Label Styles collection there are label styles for lines and curves that you can use on Civil 3D objects such as parcels and alignments. In the General Label Styles there is also a label style for Notes which can be used in situations where you need to add a general purpose note that is not attached to a specific object. You create the Note label styles in the same way as other label styles. They also maintain dynamic text sizing based on the viewport scale.

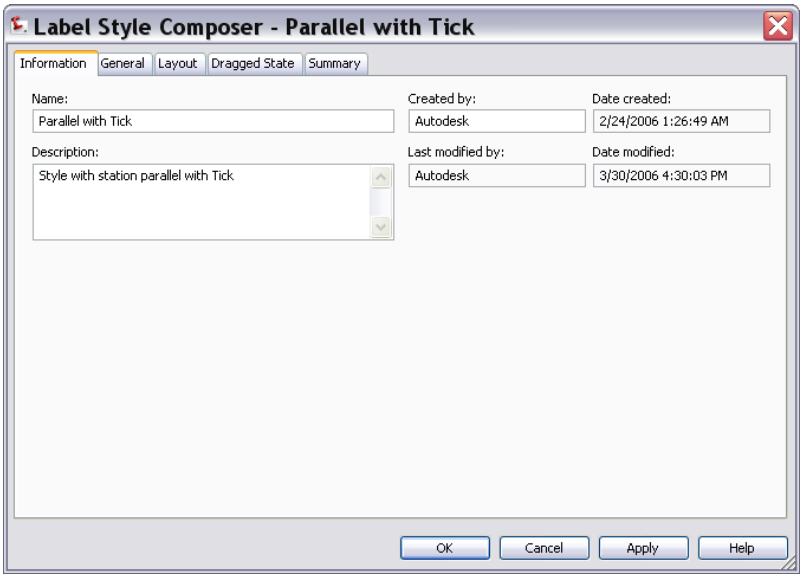
In the Label style collections for Alignments, Profiles, and Sections, you can create label sets. After you define the label style elements, you can group the types together and create a label set to assign to an object.

The Label Style Composer

Use the Label Style Composer to create or edit the format and content for label styles. The Label Style Composer has five tabs with the Information and Summary tabs being similar to object styles. You use the General, Layout, and Dragged States tabs to enter the specifics for the elements in a label.

The Information Tab

This tab is where you specify a style name that reflects what the label style will be, for example Parallel With Tick.



The General Tab

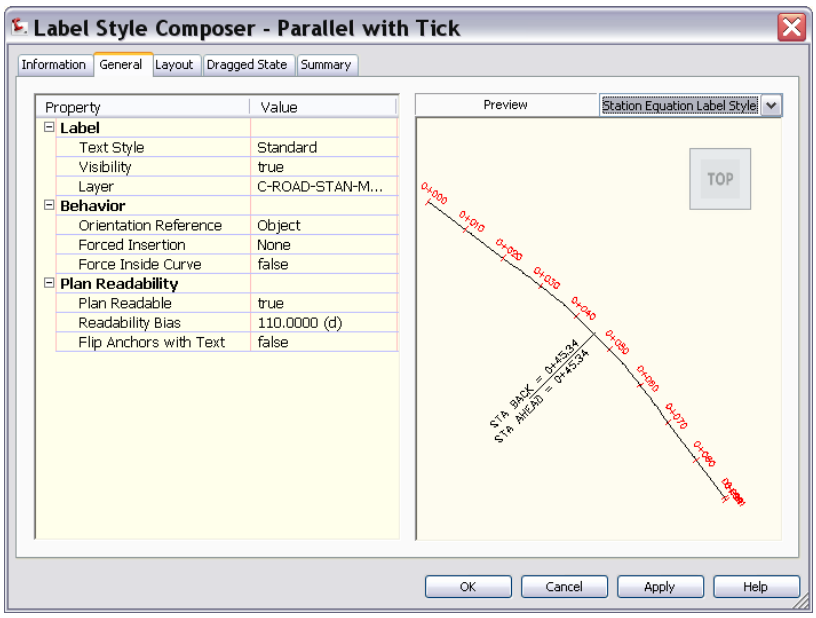
This tab is where you specify the following visibility and orientation properties:

Label—Controls the text style, visibility, and layer for the label.

Behavior—Defines the location and orientation of the label.

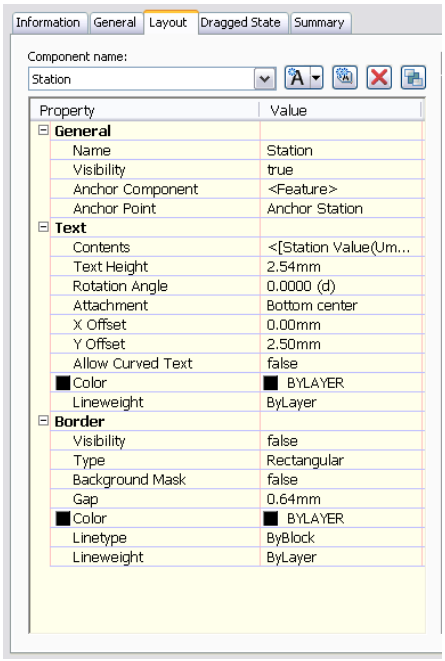
Plan Readability—Determines the text readability in relation to the page.

Preview Window—Displays a preview of the selected style.



The Layout Tab

This tab is where you define the object components and their associated text labels. You select a component name in the component list, such as Major Station or Tick, and then specify properties. The list of properties varies, depending on the selected component. For more information about the properties of the Layout tab, see Managing Layout Properties for Labels in the Civil 3D Help.



The Dragged State Tab

This tab controls the behavior of labels if they are dragged from the default location. It has the following properties:

Leader—Controls the display of the leader.

Dragged State Components—Defines the text display, border elements, text height, and leader attachment.

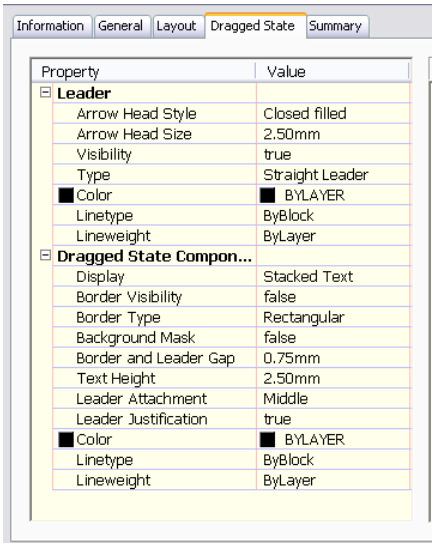


Table Styles

You use tables to represent Civil 3D data for points, parcels, alignments, surfaces, and pipe networks. The process of creating table styles is similar to that of objects and labels. For more information on table styles, see Table Styles in the Civil 3D Help.

Tips for Working with Styles

Use the following tips when you start working with styles:

- There are potentially over 300 styles in Civil 3D. Don't try to create every style at once. Start by modifying a Civil 3D template to create the basic styles for your pilot project and add new styles as necessary.
- While it is important for everyone using Civil 3D to be familiar with styles and their application, in order to maintain consistency in company standards, a best practice is to have one person control the creation and maintenance of the styles template.
- After you create a template that contains your styles, you can use the drag and drop functionality to copy styles from the Settings tab into drawings.
- You may want to create several *.dwt* files for the various aspects of a project, for example Grading Plans or Finish Plans.
- The defaults for the display of geometry label text in a drawing are set on the Abbreviations tab in the Drawing Settings dialog box.
- Use the View Direction field on the object style Display tab to set up component appearance for the following types of views: plan (2D), model (3D), profile, and section.

Tools for Moving Data 4

This chapter describes the variety of tools and methods that are available for moving Land Desktop data into Civil 3D.

There are many reasons why you may need to move or share data between Civil 3D and Land Desktop. Perhaps you want to move data from a Land Desktop drawing into Civil 3D drawing, or use Land Desktop for some tasks and Civil 3D for others, and move the data back and forth. While the recommended approach is to start with a new project in Civil 3D, you may have situations that require moving Land Desktop data into Civil 3D.

Overview of Moving Land Desktop Data into Civil 3D

The following is a summary of the various ways that you can move Land Desktop data into Civil 3D. Each of these is discussed in more detail in the following sections.

- **Open a Land Desktop Drawing in Civil 3D**—You can open a Land Desktop drawing in Civil 3D to view Land Desktop objects in Civil 3D as proxies or as objects.
- **Import Data From Land Desktop command**—Use this Civil 3D command to import surfaces, description keys, alignments, profiles, parcels, and pipe runs from Land Desktop drawings and projects into Civil 3D.
- **Convert Land Desktop Points command**—Use this Civil 3D command to convert Land Desktop points to Civil 3D points.
- **Import a Land Desktop Point Data File**—You can import an ASCII text file or *.mdb* file of a Land Desktop points database into a Civil 3D drawing.

- **LandXML**—Use the Civil 3D Import LandXML command to import LandXML data that you previously exported from Land Desktop.

It is important to note that the process of sharing data between Land Desktop and Civil 3D is not dynamic. In other words, changes that you make to the data in one program will not be automatically transferred to the other program.

Before you begin moving data between Civil 3D and Land Desktop, you should always verify that you are using the same coordinate and unit system to avoid conflict and confusion.

Opening a Land Desktop Drawing

When you open a Land Desktop drawing in Civil 3D, Civil 3D does not convert the data. However, you can view Land Desktop objects in Civil 3D as proxies or as objects.

When you open a Land Desktop drawing in Civil 3D, the following occurs:

- Geometric data, such as contours, quick sections, grading objects, and curve text, are displayed in Civil 3D as Land Desktop objects. For more information, see the Civil Object Enabler Help.
- Geometric data, such as alignments, profiles, sections, pipe runs, hydrology graphs, sheet layouts, and plotted sheets in paper space, remain in the drawing as AutoCAD primitives (lines, arcs, and text).
- Land Desktop labels remain in the drawing as AutoCAD MText components.

Each drawing is associated with various settings that are specific to Land Desktop, which are stored in an external file named <*drawing name*>*.dfm*. This data is not brought forward into Civil 3D.

Setup Object Conversion

Civil 3D reads the setup object as soon as the Land Desktop drawing is opened in Civil 3D and translates certain aspects into the Civil 3D drawing settings for the session.

NOTE If you close the drawing without saving it, then the original setup object remains intact and you can open the drawing again in Land Desktop.

Some information in the Land Desktop setup object is translated into Civil 3D and some is not, as described in the following table:

Land Desktop Setup Object	Civil 3D Drawing Settings
Linear units	Translated to drawing units
Angle units	Translated to angle units
Angle display style	Not translated
Linear, Coordinate, Elevation, and Angular precision	Translated to similar entries in the Ambient Settings
Horizontal scale	Translated to scale
Sheet size	Not translated
Coordinate system (zone)	Translated to Zone settings in Units and Zone Settings
Base Point and North Rotation	Not translated
Miscellaneous information (for example, border)	Not translated

Using the Import Data From Land Desktop Command

If you need to import surfaces, description keys, alignments, profiles, parcels, or pipe runs from a Land Desktop project or drawing into Civil 3D, you can use the Civil 3D Import Data From Land Desktop command.

This command imports the Land Desktop data into the current Civil 3D drawing. Because Civil 3D stores all objects in drawings, the drawing does not have to be associated with a project. However, if you are using the Civil 3D project management features (Autodesk Vault), you can associate the current

drawing with a Civil 3D project and check the data (points, surfaces, and alignments) in to a specified project.

It is important to note that data units cannot be converted when using the Import Data From Land Desktop command. Therefore, you must import an imperial-based project into an imperial-based drawing, for example. If you want to convert units during the import, you must use the LandXML import feature.

It is also recommended that you import one data type at a time. For example, first import surface data and then repeat the procedure to import description keys or other data types, one data type at a time.

To import data from a Land Desktop project

1. Click File menu ➤ Import ➤ Import Data From Land Desktop, or enter ImportLDTData at the command line.
2. In the Import Data From Land Desktop Project dialog box, enter a valid path, or click  to browse to the project root folder and select a path. For example, C:\Land Projects <version number>.
3. In the Project Name list, select a project from which you want to import data.

   After a valid project name is selected, the available data that you can import is displayed in the dialog box.
4. Specify an Alignment Site. If you leave the default site at None, the Alignment data is placed in the Alignments collection, rather than in a Site collection.
5. Navigate to the data you want to import.
6. Select or clear the check boxes for one or more of the following features:

TIP To obtain the best results, import only one data type at a time.

- **Description Keys**: Imports description keys. When you update a drawing template, it is a best practice to select this option.
- **Surfaces**: Imports surface data.
- **Alignments**: Imports alignment data.

NOTE To migrate a Softdesk alignment database, you must convert it into a Land Desktop 3.x through Land Desktop 2009 database before importing it into Civil 3D.

- **Profiles**: Imports both EG (existing ground) and FG (finished ground) profiles.

  NOTE When importing a profile without an associated surface or alignment, the profile will be static in Civil 3D.

- **Parcels**: Imports parcel data that was created using the Land Desktop parcel manager to the specified site.
- **Pipe Runs**: Imports pipe run data.

  NOTE Before importing Land Desktop pipe run data, make sure that the Civil 3D pipe network Parts Catalog (Parts List) has the part sizes that make sense for the pipe network you will be importing. For more information, see Part Catalog and Parts Lists in the Civil 3D Help.

7. Optionally, create new sites to separate the data. Right-click Sites ➤ New. The new site will appear under the Sites collection. You can move parcels and alignments (and associated profiles) by dragging them into different sites.
8. Either click Apply, to iteratively import and check messaging, or click OK.

   A message box is displayed, indicating the status of the import. Click OK.
9. Either go to Step 10 or, if you have completed an iterative import process using Apply, click OK.

   NOTE Imported objects take on the default style for each object.
10. Verify the data using the following methods:
    - **Description keys**: In Toolspace, on the Settings tab, expand the Description Key Sets collection under the Point collection and verify that the description key files are listed.
    - **Surfaces**: In Toolspace, on the Prospector tab, click the Surfaces collection (for the current drawing) and verify that the new surface

is included. (You may need to right-click the feature and click Zoom To to see the surface in the drawing.)

- **Alignments** : In Toolspace, on the Prospector tab, if you specified a Site in the Import Data From Land Desktop Project dialog box, verify that the site is included. If you did not specify a Site, expand the Alignments collection and verify that the alignments are included.
- **Profiles**: In Toolspace, on the Prospector tab, if you specified a Site in the Import Data From Land Desktop Project dialog box, verify that the site is included. If you did not specify a Site, expand the Alignments collection and verify that the profiles are included.
- **Parcels**: In Toolspace, on the Prospector tab, , verify that the site you specified for the parcels is included. If you did not specify a Site, expand the Parcels collection and verify that the parcels are included.
- **Pipe Runs**: In Toolspace, on the Prospector tab, click the Pipe Networks collection and ensure that the pipes are included.

Converting Point Data from Land Desktop

In Civil 3D, you can use the Convert Land Desktop Points command to convert Land Desktop points in a Civil 3D drawing to Civil 3D points.

You may choose to use this command if you do not have Land Desktop installed, or anytime you have non-Civil 3D point objects (for example, Land Desktop point objects) in your drawing that need to be converted to Civil 3D point objects.

Using this command, you can set a variety of point settings. For example, you can set default layers, point creation settings, and more for the points you will be converting. You can automatically add the converted points to a newly-created point group or to an existing point group. The existing Civil 3D point number and point name conflict resolution rules are used if a point ID conflict occurs during the conversion.

For more information, see Converting Land Desktop Points in the Civil 3D Help.

To convert Land Desktop points

1. In Civil 3D, click Points menu ➤ Utilities ➤ Convert Land Desktop Points, or enter ConvertLDTPoints at the command line.

2 In the Convert Land Desktop Points dialog box configure point setting parameters by expanding the parameter, selecting a setting, and then specifying a new value in the Value column.

3 To assign the Land Desktop points to a point group, select the Add Points To Point Group check box, and then either select a point group from the list or create a new point group. If you create a new point group, it is added to the Add Points To Point Group list.

4 To keep the existing layers referenced by the Land Desktop points, select the Preserve Original Point Layer check box.

NOTE When this check box is selected, the existing layer of the Land Desktop point is assigned to the Civil 3D point when it is converted. In the Point Creation settings, if the Disable Description Keys setting is set to False, and the Land Desktop point matches a description key, the original point layer will still be preserved.

5 Click OK.

Importing Point Data from Land Desktop

If you need to import point data from a Land Desktop project, you can import the external Land Desktop point data (database) file into Civil 3D.

Civil 3D can import point data from an ASCII (text) file or a Microsoft® Access *.mdb* file into a drawing. Before you import points into Civil 3D, you must create a point file format that describes the layout of the point data in the point data file. For more information, see Understanding Point File Formats and Creating Point File Formats in the Civil 3D Help. You can add the imported points to a point group, make adjustments to the data as it is imported, including elevation adjustments, coordinate transformation, or coordinate data expansion, and specify how the imported points are numbered as they are created.

For more information, see Importing Point Datain the Civil 3D Help.

To import point data

1 In Civil 3D, specify the Point Identity settings, which control the point numbers of the created points. For more information, see Editing the Point Identity Settings in the Civil 3D Help.

2 Click Points menu ➤ Import/Export Points ➤ Import.

3 In the Import Points dialog box, specify the point file format that describes the layout of the data in the point data file you are importing.

4 In the Import Points dialog box, select External Project Point Database as the format type and select the Land Desktop point database *.mdb* file as the source file.

5 Optionally, specify a point group to which the imported points are added.

6 Optionally, specify advanced options for elevation adjustment, coordinate transformation, or coordinate data expansion.

7 Click OK to import the points.

Using LandXML Export and Import

Using the LandXML export and import features, you can export data from Land Desktop and import it into Civil 3D.

The LandXML import and export features are based on the LandXML schema. For detailed information about exporting and importing using LandXML, go to www.landxml.org, or you can refer to the Civil 3D or Land Desktop Help. The following sections summarize how this functionality works.

LandXML Export

Whether you are exporting from Land Desktop or from Civil 3D, the process is similar. To export a LandXML file from Land Desktop, click Projects menu ➤ Export LandXML. The LandXML Export dialog box is displayed. You can choose to export the point, surface, parcel, alignment, and pipe run data from the drawing.

In Civil 3D, to export data to a LandXML file, either click File menu ➤ Export ➤ Export To LandXML, or right-click an object collection in the Prospector tree and select Export.

In Civil 3D, when you export from the Prospector tree, the Export To LandXML dialog box contains a pre-defined selection set of the data in that collection. When you export from the File menu, all drawing data is selected by default, and you can adjust the selection by clearing check boxes. Alternately, you can specify the objects to export by selecting them from the drawing.

The following sections provide step-by-step information on the process.

To export LandXML data from Land Desktop

1. In Land Desktop, either click Projects menu ➤ Export LandXML, or enter LandXMLOut at the command line.

   The LandXML Export dialog box is displayed.

   To refine the data selection, use any or all of the Points, Surfaces, Parcels, and Alignments buttons. Each of these buttons displays a dialog box in which you can specify data in the project to export.

   To export the selected data, you must select the check boxes next to the buttons. For example, to export pipe runs, select the All Pipe Runs check box. If you clear a check box, then the data is not exported.

   If you choose to export surfaces, parcels, or alignments, you can export COGO point references instead of coordinates for the parcel and alignment geometry.

2. Under Export Options, click Data to specify the precision settings for the exported data, the imperial unit foot type, the units of exported angles and directions, and whether to export raw descriptions, full descriptions, or both.

3. Under Export Options, click File and specify the reference location for the schema, the default destination location for the exported LandXML file, and whether to export detailed or minimal XML. You can also specify that the exported file is read-only.

   It is recommended to set the coordinate precision to six places when exporting data for data exchange, transfer, or archiving. You can change the coordinate precision in the LandXML Export Data Options dialog box.

To export LandXML data from Civil 3D

1. In Civil 3D, either click File menu ➤ Export ➤ Export To LandXML, or enter LandXMLOut at the command line.

   The Export To LandXML dialog box contains a data tree, where you can select any of the major data collections for export to the LandXML file.

2. Do one of the following:

   - Select or clear the check boxes to filter the data types that you want to export to the LandXML file. Then click OK.

NOTE The check boxes have a tri-state display. If only some objects are selected under a collection, the check box is dimmed ☑; if all the items are selected, the check box is selected ☑; if all the items below the collection are cleared, the check box for the collection is cleared ☐.

- If you want to select data in the drawing, click  and select the objects in the drawing. Press Enter when you finish selecting the objects.

3 In the Export To LandXML dialog box, enter the name of the LandXML (**.xml*) file you want to export. Click Save.

LandXML Import

After you have Land Desktop data exported to a LandXML file, you can easily import it into Civil 3D using the LandXML Import command.

To import data from a LandXML file into Civil 3D, first specify the import settings that control the data for import. Then, select the files and the specific data in the file that you want to import.

The LandXML import functionality automatically handles the conversion between the units specified in the LandXML file and the current drawing units specified in Civil 3D.

It is important to note that LandXML does not transform coordinate systems automatically. Therefore, no specific coordinate system transformation is applied other than what is specified by the translation and rotation settings. For more information, see Translating and Rotating LandXML Data in the Civil 3D Help.

The following section provides step-by-step information on the process.

To import LandXML data

IMPORTANT Before importing an .xml file, you must open a drawing, such as a drawing based on a Civil 3D template, that contains Civil 3D styles. .

1 In Civil 3D, either click File menu ➤ Import ➤ Import LandXML, or enter LandXMLIn at the command line.

2 In the Import LandXML dialog box, select or browse to the LandXML (*.xml) file you want to import. Click Open.

3 In the Import LandXML dialog box, select a site for the parcels. For the alignments you can specify a site or specify None.

4 The data tree displays each of the major data collections in the LandXML file. Use the data tree to:

- Navigate to a data collection and view its subcomponents.
- Expand the collections. Select or clear the check boxes to filter the data types that you want to import into the drawing. By default, all data components are selected for import.

NOTE The check boxes have a tri-state display. If only some objects are selected under a collection, the check box is dimmed ☑; if all the items are selected, the check box is selected ☑; if all the items below the collection are cleared, the check box for the collection is cleared ☐.

5 Click OK to import the LandXML file.

After you click OK, the data is imported into the drawing. The data components are added to the applicable data collections in the Prospector tree.

As each object is imported, you can use the Event Viewer Vista dialog box to view the status of each operation. For more information, see The Event Viewer Vista in the Civil 3D Help.

Civil 3D Migration Commands Summary

This section provides a quick summary of the Civil 3D migration commands that have just been discussed. Note that in Civil 3D, you can access the migration functionality either on the menus, or by using the following commands at the command line.

Command	Description
ImportLDTdata	Imports description keys, surfaces, alignments, profiles, and parcels from a Land Desktop project into Civil 3D.

Command	Description
LandXMLIn	Imports LandXML data into Civil 3D.
ConvertLDTPoints	Converts Land Desktop points in the drawing to Civil 3D points.
ImportPoints	Imports external project point databases into Civil 3D.

Adopting Civil 3D Project Management

5

Civil 3D includes a range of features for managing your engineering projects. Once you understand these features, you can determine the best data structure and workflow to use in your organization. This chapter takes an in-depth look at Civil 3D project management options and discusses how to implement them in your organization.

Overview of Civil 3D Project Management Features

Because designers, civil engineers, and drafters typically work in teams, Civil 3D provides several methods for sharing data. The ways that you choose to use these features will be a factor in deciding how you want to manage shared data, and in deciding what level of project management features you need to implement in your workflow.

The three main methods that can be used for sharing data in Civil 3D are:

- External references (xrefs)
- Data shortcuts
- Object references in Autodesk Vault

Each option is discussed in the following sections.

Using External References

An external reference (xref) inserts the entire contents of another drawing into the current drawing as a display-only object. Since this is a standard AutoCAD function, and since Land Desktop and Civil 3D are both built on top of standard AutoCAD functionality, this function exists in both Land Desktop and in Civil 3D.

To insert external references in Civil 3D, or Land Desktop, click Insert menu ➤ External Reference and insert a specified *.dwg* into your current drawing. Objects in the referenced drawing cannot be edited, but you can use the Layer Manager to control the display of separate components.

When deciding if you should use external references, consider the advantages and limitations noted in the following table:

Advantages	Limitations
External references are versatile and easy to use for different *.dwg* types, whether they contain a single object or a complete design. You can also label xrefed objects, as well as create section views from a corridor xref.	Because they are display-only, external references provide limited access to object data, such as surface elevations or alignment length. For example, you cannot create a surface profile from a surface in an external reference. Both data shortcuts and Autodesk Vault object references provide access to object data.
Updates to the external drawing appear automatically in the host drawing when the drawing is opened, and notification of updates is provided during the host drawing session.	External references provide no inherent security. Anyone can break links by moving or renaming referenced files.
All the content of the reference drawing is displayed, such as a base drawing containing parcel layout, existing ground information, or a proposed grading plan.	
External references can be used with either data shortcuts or Autodesk Vault.	
Labels can be applied to xref objects.	

Some sample uses for this feature include:

- Display a parcel layout within an alignment drawing.
- Display existing ground information within a design drawing.
- Display adjoining project phases in a plan set drawing.
- Reference a corridor drawing into a sections drawing.

The following best practices are recommended when using external references:

- Select Relative Path as the path type when creating external references. Where all document users share the same network environment, use UNC (universal naming convention) paths to provide a flexible but accurate path to each referenced file.
- It is recommended that you use external references when you will not need to manipulate objects within the referenced file. This might be the case when you import drawings of adjoining surfaces into a drawing.

Using Data Shortcuts

Data shortcuts are a feature specific to Civil 3D. The feature does not exist in Land Desktop or in basic AutoCAD. In Civil 3D, a data shortcut provides a complete reference copy of an object that you can import into one or more other drawings.

Data shortcuts can be created only for surfaces, alignments, profiles, pipe networks, and view frame groups (a Civil 3D object used in plan production). They provide reference links between drawings without the use of a database. When you create data shortcuts from a drawing, they appear on the Data Shortcuts node of the Prospector tree. From this location, you can insert a reference object into another open drawing by right-clicking its shortcut.

Objects in the consumer drawing have access to the geometry of the reference object in the data shortcut. This geometry can be modified only in the source drawing. However, display styles and labels for the reference object can be modified in the consumer drawing.

The working folder represents a single work environment, including the complete set of related drawings and data shortcuts for one or more engineering projects. The Data Shortcuts node on the Prospector tree displays only the shortcuts from the current working folder. Each shortcut is defined in a small

XML file, stored in the _Shortcuts folder of the working folder. Most users do not need to work with these XML files.

When an object is updated in the source drawing, notification appears in the main application window and in the Civil 3D Toolspace Prospector.

When deciding whether to use data shortcuts, consider the advantages and limitations noted in the following table:

Advantages	Limitations
Data shortcuts provide a simple, direct mechanism for sharing object data that is based solely on drawings, without the added server space and administration needs of Autodesk Vault. This can be ideal for small teams or small projects.	Data shortcuts cannot provide data versioning.
Data shortcuts offer access to object geometry in a consumer drawing while ensuring that the object geometry can only be changed in the source drawing.	Data shortcuts provide no security or data integrity controls.
Reference objects in the consumer drawing can have styles and labels that are different from the source drawing.	Unlike Autodesk Vault, data shortcuts do not provide a secure mechanism for sharing point data or survey data.
Reference objects automatically update when you open a file in which you have referenced data.	Maintaining the links between the source drawings and the consumer (referenced) drawings requires a static location on the shared file system.
During a drawing session, you are notified when a source drawing has been modified, both in the Communication Center, and on the Prospector tab in Civil 3D Toolspace.	If you want to check a drawing (*.dwg*) that has data shortcuts into Vault, the shortcuts must be deleted, then rebuilt as Vault object references.

Note that if you want to implement Vault later, you can import your data shortcut projects. The shortcuts are automatically converted to Vault references.

Some sample uses for this feature include:

- Reference a surface and a pipe network into a drawing where you want to design a grading plan. You can grade to the target surface even though it is just a reference.
- Reference a surface and a related alignment into a drawing where you want to create profiles in a profile view. This data structure enables you to keep profiles in a separate drawing from the alignment in accordance with the best practice of "one object per drawing."

As a best practice when using data shortcuts, in a network environment, it is recommended that you use UNC paths to provide a flexible but accurate path to each source drawing.

Using Autodesk Vault

Autodesk Vault is the recommended project management solution for large design teams working with Civil 3D.

When using Autodesk Vault, a main database resides on a designated server, such as a file server on the network, and client software is installed on each computer that requires access to the database. If you have offices in different locations, you can use the multi-site option in Autodesk Vault. This means that multiple offices with local file stores can share a single SQL instance and manage files like a single database.

Using Autodesk Vault, you can share surfaces, alignments, profiles, pipe networks, points, survey data, and view frame groups.

When deciding whether you should use Autodesk Vault project management features, consider the advantages and limitations noted in the following table:

Advantages	Limitations
Autodesk Vault is a robust database management system that provides user security, data integrity protection, version control, and backup and restore functionality.	Autodesk Vault requires at least double the disk space needed by other project management systems, because all files exist both in the Vault file store, and in one or more external working folders.

Advantages	Limitations
Autodesk Vault facilitates design collaboration among large teams, and is easily scalable as a team grows.	Autodesk Vault requires ongoing server administration activities.
Autodesk Vault incorporates new features from Autodesk and Microsoft as they become available with software upgrades.	The learning curve for adopting the Vault workflow is slightly more complex than for the other two data sharing methods.
Shared objects can be easily created when a drawing is checked in to the database and these are managed effectively by Vault.	
You can use "project templates" that come with Civil 3D when creating projects in Vault.	
Autodesk Vault provides a workflow and technology that ensures that design data and drafting remain in synch across all project drawings.	
In addition to managing surfaces, alignments, and other objects, Autodesk Vault references also provide secure management of survey data and point data.	
An optional multi-site feature supports the sharing of individual vaults by geographically separated workgroups. This feature supports the same data management and backup functionality as Vault on a local network.	

Some sample uses for this feature include:

- Reference a surface and an alignment into a drawing where you want to design a parcel network. The parcel design can read the surface and alignment geometry. You can also apply display styles and labels that are relevant to the parcel design process to the surface and the alignment.

- To create a plan set drawing, reference in several profiles and a surface created from a corridor.

The following best practices are recommended when using Autodesk Vault:

- Designate one team member to be trained as a system administrator who will regularly perform Vault administrative duties.
- Assign database access permissions to user groups rather than individuals. This means you can change the permissions for an entire group, and change the permissions for an individual(s) by moving them to another group.

Understanding Autodesk Vault

Integrated into Civil 3D software, Autodesk Vault is a data management system for sharing design data across project teams, and across multiple locations. Autodesk Vault allows you to manage not only DWG files, but all of your engineering and related data, such as hydraulic designs, analyses, and data generated from Microsoft® Office applications or other design software.

As a comprehensive file management and version control solution, Autodesk Vault provides an effective way for engineering teams to simultaneously share design objects within the same project. It includes a server component that acts as the database and provides administrative tools, a client component that is integrated with Civil 3D, and a stand-alone file system management tool.

With Autodesk Vault, your data stays secure and is less likely to be unintentionally corrupted, because you determine who can manipulate data, and who can just view it. By providing multiple team members with parallel, controlled access to designs, Autodesk Vault helps you maintain data integrity across large and complex projects. With Autodesk Vault, your project teams work more efficiently, complete projects faster, and reduce the risk of errors.

Implementing Autodesk Vault

By implementing Autodesk Vault, your project teams can access the data they need to complete their work. This section outlines how to:

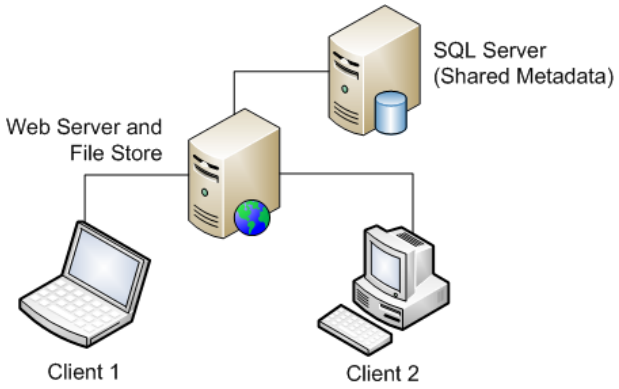
- Choose between single-site or multi-site Vault architecture
- Organize your projects

- Set up working folders

Single-Site or Multi-Site Architecture

A single-site configuration is recommended for most teams. The Autodesk Data Management Server (ADMS) component is installed on one system, and the client component is installed on each computer that must communicate with that server. The server stores all master copies of data files, and the clients can access the files stored on the server. For best performance, a dedicated server is recommended for the ADMS component.

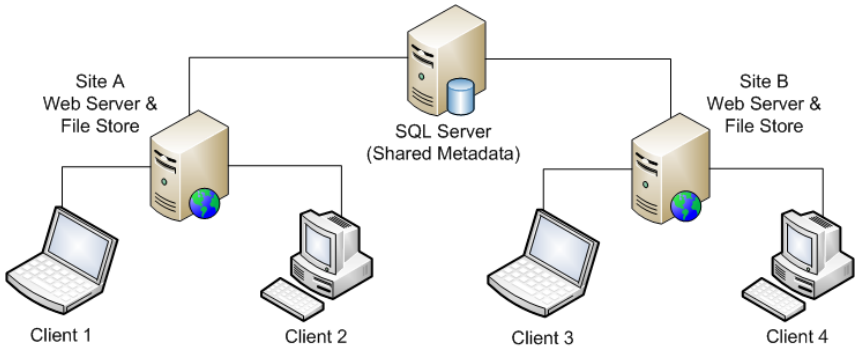
Vault single-site architecture



You have flexibility within this model to choose a configuration that suits your requirements, based on criteria such as the number of users who must share data, how your users are divided into design teams, and the amount of project data you expect your users to generate. For more details, refer to the *Autodesk Data Management Server Installation Guide*.

The optional multi-site feature in Vault is designed to support geographically dispersed workgroups sharing vaults. A single instance of remote SQL manages multiple servers, each with its own file store, at separate office sites. Depending on their level of permissions, all users can see all files at all sites as if the system is a single database.

Vault multi-site architecture



When a user checks out a file that is stored at another site, the system replicates that file at the user's site. As long as the file remains shared, the system remembers to update that copy with any changes. Vaults and individual files are replicated only where they are really in use. Backup and restore operations can be managed from any site that has all vaults enabled. For more information, see ADMS Console Help.

Organizing Your Projects

Autodesk Vault can be set up in a variety of ways, so you can manage and store your projects in the manner that best meets your business needs. Below you will find information about three ways—using a single vault, using multiple vaults, or using folder permissions—to organize your Civil 3D projects within Autodesk Vault.

Single Vault—The simplest way to organize your projects with Autodesk Vault is to use a single database—also referred to as a "vault"—to store all projects and their information. You create only one database on the server and store all Civil 3D projects in that database. All team members have access to this one location, and you set up access control and user names only once. By using a single vault to house all projects in the same location, you centralize project access for all team members, making it easier to find project data.

It is best to use a single vault for all projects when you have a single office or your teams are centrally located and connected through a local area network (LAN). With a single vault, you reduce both your IT and project management overhead. If your organization has multiple offices connected through a wide area network (WAN), you can still employ a single vault. In this case, all users simply access the vault through a virtual private network (VPN). The drawback

to this scenario is that if the WAN connection is compromised, remote offices are cut off from the project server.

Alternately, organizations with multiple offices can choose to set up an Autodesk Vault in each office, configuring each with a single vault database for all projects. While this puts more maintenance burden on your IT staff, it does allow your project teams to access project servers regardless of the WAN status.

While user permissions are assigned at the vault level, they can be refined at a lower level, such as a project, or a folder within a project. For example, the Alignments folder in the Source Drawings folder of the <Project> can have read-only access for the Drafting group, and edit permissions for the Design group, and so on.

Multiple Vaults— In some cases, it may be advantageous to partition your data into multiple vaults on the same server. For example, you may choose to keep projects organized by year, in which case you would create a vault for every year. Thus, you could have several office locations with their own Autodesk Vault to log onto, using the following hierarchy: Location \ Year \ Project.

For example, a project named "J06068" could reside in the "2006" folder that is in the "Jackson" folder. In other words, the folder structure would be: \Jackson\2006\J06068.

Folder level	Description
\ Jackson	This denotes the location where the Vault server resides.
\ 2006	This denotes the year of the project.
\ J06068	This denotes the name of the project, and includes a meaningful prefix. In this example, the project name uses a "J" prefix to indicate the office that originated the project—in this example "Jackson."

Folder Permissions—This approach works well if you have several departments within your organization that use Civil 3D. Each department—such as your survey, site, or highway departments—gets its permissions according to project folders. This allows you to manage departmental permissions and access to projects separately. For example, you can assign write access to your surveyors to only their folders within the project, while providing site and highway

teams with read-only access that allows them to consume (use, copy, display) but not edit survey data.

Organizations with very large, multi-phased projects may want to assign a separate vault for each project for ease of project management. If you elect to partition your data into multiple vaults on a server, your project teams will experience shorter project lists and tighter control over data access. However, there are some disadvantages. Projects reside in different locations and your users have to remember multiple vault names and locations. Also, backing up and maintaining multiple vaults is more work for your IT department.

Note that user permissions apply within a single vault, and cannot be shared across vaults. The *Autodesk Data Management Server Installation Guide* provides more detailed information on the difference between a single vault configuration and a multiple vault configuration.

Setting Up Working Folders

When you work on particular design objects, such as road alignments or pipe networks, you check the associated drawings out of a vault and work with them in working folders (the location where checked-out or open work in progress is stored). Working folders mirror the project folder structure in Autodesk Vault.

When you check out or get files from a project, they are physically copied from the file store to the working folders and then tagged as "checked out" in Autodesk Vault. You can then edit the files from within the working folders, with the assurance that while other users can still get read-only copies of the files, they cannot check them out for editing until you have checked them back in. This way, you maintain a single version of each drawing while still allowing team members to share data within the drawing.

When you check a file back into a project, Autodesk Vault copies the revised version from your working folder to the File Store on the server. Autodesk Vault marks the file with the appropriate revision data and makes it available to other users.

You can change the location of the working folder by accessing the Prospector Toolspace from Civil 3D and selecting Set Working Folder. If your project manager or administrator has already enforced a specified location for a working folder, any custom location is overridden.

You have three choices for setting up working folders:

- Individual users on a project can have their own working folders on their desktop computers.
- Everyone in the organization can share a working folder on the server.
- Individual users can each have a dedicated working folder on the server.

Working Folders on Individual Local Computers

When working folders are kept on local computers, it minimizes network traffic and accommodates team members who may work offline from the field or a home office. By setting up working folders locally, users create network traffic only when they check in or check out files from the vault. The disadvantage of this choice is that the project files are stored on the local machine, which can make them unavailable for the backup system. In addition, using external references (xrefs) and Sheet Set Manager (SSM) to share files is a more manual process. This set-up also requires more storage capacity on the local machines, because the project files that users check out are copied locally.

Individual Working Folders on the Server

By maintaining private working folders on the server, you secure an individual's work-in-progress from other users who may be less familiar with the proper means of interacting with Autodesk Vault data. Locating these folders on the server also allows for nightly backup of the data. The drawback to having individual network working folders on the server is the increase in network traffic. Additionally, if you do a nightly backup of the folders, you may have a lot more data than you really need, because you may back up multiple copies of the same files in each folder.

Working Folders on the Server in a Common Folder

With this approach, all users in your organization access a common folder on the file server when checking out and modifying files. It may also be more familiar, as many organizations already use a centralized data or projects folder for their drawings. Similar to individual working folders located on the server, a shared working folder can be backed up nightly, ensuring project data security. However, since it is a common location, the backups will be smaller in size than with the backups of individual working folders. The benefit of this approach is that drawings that have data references or external references will be notified and updated every time they are saved, rather than only when they are checked back into the vault, as with the other two approaches. The

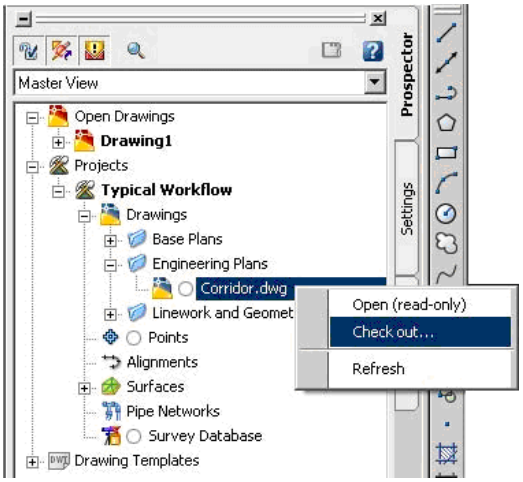
drawbacks to having a common working folder on the server are the increase in network traffic and the inability of users to take full advantage of securing data as they can when using local working folders.

Project User Interfaces

To work in and manage Civil 3D projects stored in Autodesk Vault, you can access one of two user interfaces: either the Civil 3D Prospector Toolspace or the Autodesk Vault administration tool. Often you can use either for a specific task, but in certain situations there are distinct advantages to using one or the other. You can also perform certain functions, such as checking in files, from some Microsoft Office applications. These interfaces are explored in the following sections.

Prospector Toolspace

It is recommended that you use the Prospector tab in the Toolspace window within Civil 3D to create all projects. After creating a new project, it will show up in the project tree in Civil 3D. You can also view, edit, and manage drawings and Civil 3D object data stored in a vault with the Prospector tab in Toolspace, as shown in the following illustration:



If you are logged in to Vault, you can use the Prospector tree to create a new project in the project database. You create the project using either the default Sample Project template, or another template you have saved. Project templates

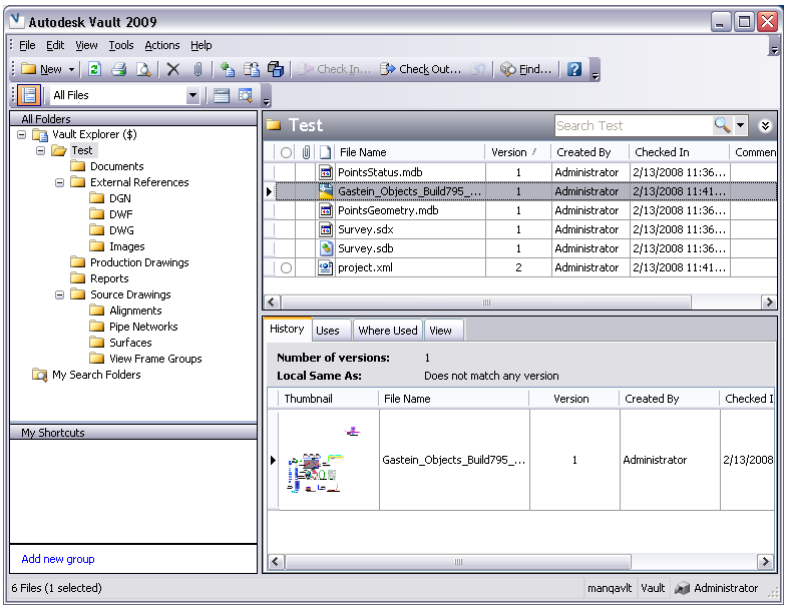
provide the capability to create a new project with a predetermined folder structure, where each folder can also contain files of any type. The template folders are found in the Civil 3D Project Templates folder on your local disk.

To work on a drawing, use the Check Out command on the Prospector tab in Toolspace to copy the file to your working folder and then open it for editing in Civil 3D. After you finish working on the drawing, use the Check In command to save changes to the master folders in the file store. If you need to view a file without editing it, you can use the Open Read Only command. To save a new file to a project, you choose Add To Project on the Prospector tab in Toolspace.

NOTE Civil 3D includes project templates, which provide a standard folder structure for projects.

Vault Administration Tool

The Vault Administration tool is a stand-alone application that you can use to manage project files in a vault—from outside of Civil 3D. It is installed automatically when you install Autodesk Vault. The Vault Administration tool window, shown in the following illustration, lists projects as folders, and includes a list of all versions of a selected file. Whenever a file is checked in, the version number automatically increases by one—and you can view all external file dependencies occurring in the file. This could include externally referenced drawings, images, XML surfaces, and Land Desktop Triangulated Irregular Network (TIN) and PNT surface files.



The Vault Administration tool also lists all drawings where the selected file is used as a reference and displays DWF versions of the drawing files, so you can quickly find the version you need.

You can use the Vault Administration tool to conduct many administrative activities. For example, an Autodesk Vault administrator can set up working folders and enforce their location—such as in individual folders on the server, shared ones on the server, or folders on individual computers, as explained previously.

The Vault Administration tool can also be used to create a secure working environment by assigning unique user accounts and passwords for a particular vault. You can add and edit users or groups of users. You can also assign roles and permissions to individual users and folders within a project, defining what actions they can take and what vaults they can access. For example, one group of users with Autodesk Vault consumer permissions can get read-only copies of project drawings while another group with editor permissions can create and edit them.

Using the Vault Administration tool, you can also easily restore a previous version of a file—a helpful process when a client decides to go back to an earlier design iteration—without restoring the entire project. If you need to start a new drawing using an existing drawing as the basis, you can use the Vault Administration tool interface to do this without opening the drawing. It's as easy as right clicking on a drawing name, selecting the Copy Design option, assigning a new project for the drawing, and naming the new drawing.

You can also use the Vault Administration tool interface to label project milestones for easy identification. Firms often need to submit deliverables to a client at certain levels of completion, such as 30%, 50%, and 75% completion intervals. For a 30% complete submittal, you can label all drawings in a project "30%." When you create this new label, the most recently checked-in version of every file in the project and all reference files are assigned the label. If, at a later time, you need to restore the 30% completion project files, you can easily restore the project to this milestone by simply restoring the 30% label, instead of doing it drawing by drawing.

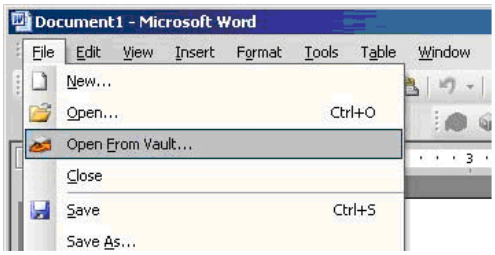
Another helpful administrative task that you can perform is Pack And Go, in which a label and all of its referenced files are combined into a single package and sent to either a folder outside the vault or to an e-mail recipient. All files referenced by a selected label are automatically included in the package unless otherwise specified. You can use Pack And Go functionality to archive a file structure, copy a complete set of files while retaining links to referenced files, isolate a group of files for design experimentation, or send a data set to e-mail recipients, such as subcontractors or clients.

Because Autodesk Vault allows you to store every electronic file related to your project—such as Microsoft Word documents, e-mails, spreadsheets, and design outputs from third-party applications—you should also use the Vault tool when you need to manage files that are not AutoCAD software-based or Civil 3D drawings.

It is *not* recommended that you use the Vault Administration tool interface to check in or check out drawings that contain Civil 3D data. In the rare case that these drawings do need to be managed in this way—for example, when an employee may be out sick or unavailable, and yet they still have files checked out of a project—an administrator can force a check-in of the files through the Vault Administration tool interface.

Microsoft Office

You can access Autodesk Vault from within Microsoft® Word, Microsoft® Excel, and Microsoft® PowerPoint® applications. When Microsoft Office is installed on the same computer as Civil 3D and an Autodesk Vault client, the File menu for these three Microsoft applications is automatically customized. An Open From Vault command and an Autodesk Vault submenu are both added to the File menu, as shown in the following illustration. Using these, you can log in to Autodesk Vault and check in documents from within the Microsoft application.



Backup Procedures

This section discusses the issues to be aware of for implementing backup systems for data that is maintained by Autodesk Vault.

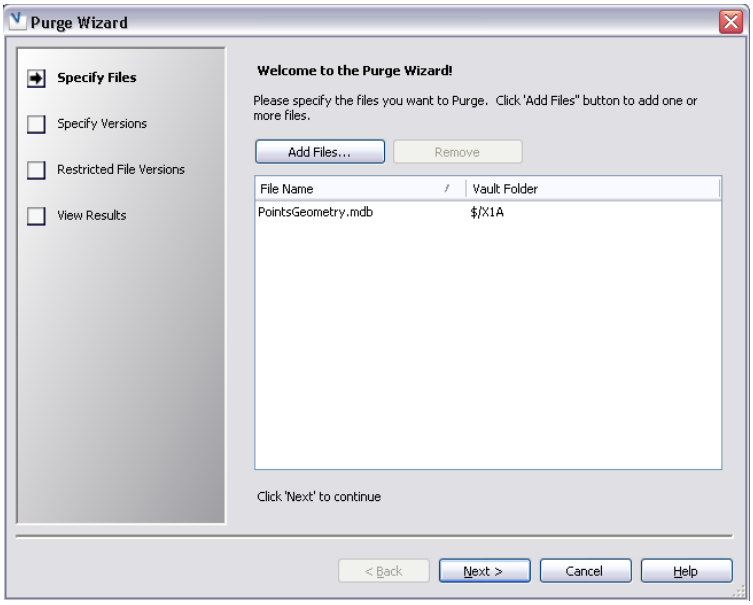
If you are using Autodesk Vault, it is critical to have a secure, reliable system in place for backing up project data. Without an appropriate backup system, your project data may be seriously compromised if an unforeseen event occurs, such as the accidental deletion of data or projects, file corruption, or power outage. Because of the live SQL database Autodesk Vault employs, you cannot back up Autodesk Vault data using a tape backup device on the Autodesk Vault database and file store.

To back up your data, you must use the Vault Manager, which is a set of tools within Autodesk Vault for maintaining users and vaults. Using the backup

routine in Vault Manager ensures that the database and file store remain in sync with each other. You will need the user name and passwords of your Autodesk Vault administrator to run the backup process. After the backup is complete, you can direct your tape backup system to the Autodesk Vault backup directory for archiving. To make backups easier, you can have this procedure automatically occur on a regular basis, using scripts.

Because your drive space may be limited, you may occasionally need to purge old file versions. For example, on the file server, the Vault file store keeps a version of each document that has been checked into the Vault database. You should keep everything that you may need to reference later, as well as some versions for archival and milestone purposes. To allow adequate drive space, you may want to institute a process for purging old files at set intervals based on your firm's workload.

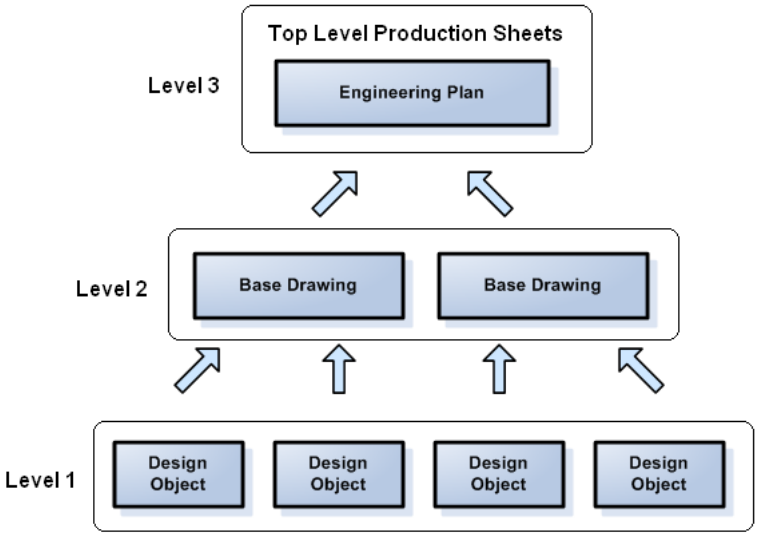
To purge your data, use the Purge Wizard. Only users with a role of Administrator can perform this function. You can purge a certain number of versions, purge versions older than a given number of days, or exclude versions with a specific notation.



Civil 3D Workflow with Autodesk Vault

This section discusses how you can use Autodesk Vault to create an efficient project management workflow in Civil 3D. Note that this type of workflow can also be created using data shortcuts.

For most civil engineering projects, multiple team members need parallel access to design data. With Autodesk Vault, you protect data sharing throughout the project life cycle and streamline the design process by ensuring that your team stays coordinated and each member gets the project data he or she needs without having to wait for the next person to finish. The following illustration, and the sections that follow, provide details of a suggested workflow for using Civil 3D and Autodesk Vault to help your teams work collaboratively and efficiently.



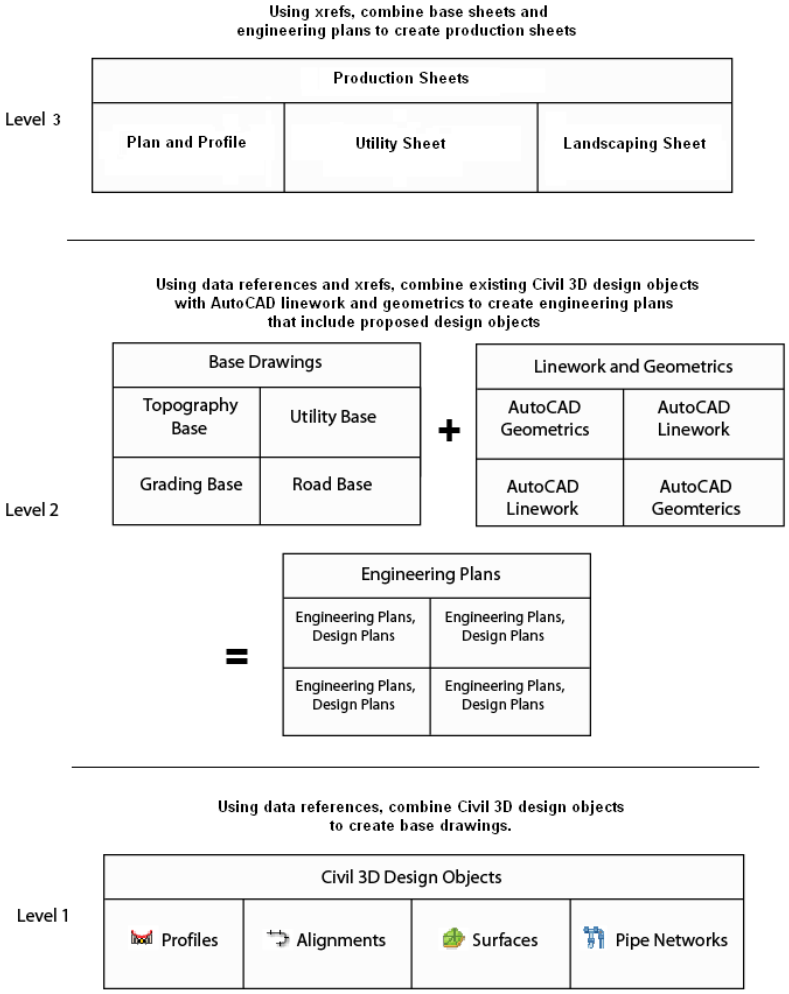
This workflow consists of three levels as illustrated in the preceding illustration. In Level 1, you create individual design objects, such as alignments, surfaces, and pipe networks. These provide the foundation on which the rest of your project is built. After you create your design objects and check them in to a vault, you use data references to reference these object drawings to create base drawings in Level 2. Data references are essentially shortcuts that point to individual objects in a drawing. These shortcuts can then be loaded into other drawings, creating a "reference" of the object that a user can stylize and use

for more design work, but can't edit. This allows you to share your design objects across multiple drawings. When you edit a design object (Level 1), drawings that reference the design object (Level 2 and Level 3) are also updated.

For example, you can design all of your individual alignments in Level 1, and then data-reference them in Level 2 to create a geometric base drawing. The same process is true for items like surfaces (Level 1) and topographic plans (Level 2), as well as pipe networks (Level 1), and a utility base (Level 2). It is also important to note that you need to combine data references and external references (xrefs) in order to include all project information in your drawings. For example, to create a proposed alignment and profile drawing, you would need to combine a data reference of the existing ground surface with an external reference of the existing conditions plan (containing AutoCAD entities).

Once you have checked these Level 2 base drawings in to a vault, you can create a production sheet (Level 3), such as a plan and profile sheet, by using external references to combine the base drawings. By maintaining this drawing structure, you can take maximum advantage of the dynamic model that is integral to Civil 3D. That is, when a change is made to any of the objects in Level 1, it is automatically reflected in both your Level 2 base drawings and Level 3 production sheets.

By using this workflow, you also take advantage of the dynamic link between labels and referenced objects in Civil 3D. This ensures that all your annotation is synchronized throughout all the drawings in the project.

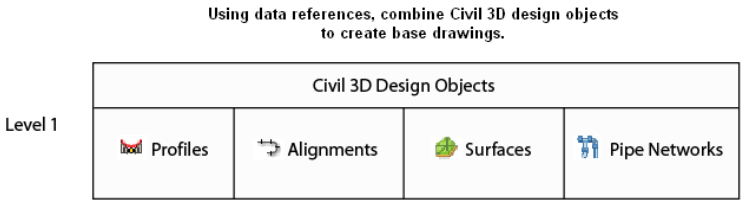


The previous illustration shows that in Level 1 you can combine design objects to create base drawings in Level 2 using data references. In Level 2, you create engineering plans by combining design objects with linework and geometry. In Level 3 you can combine base sheets and engineering plans to create production sheets.

The following sections explore each level of this workflow in more detail.

Level 1: Creating Individual Design Objects

In the first level of the workflow, you can set up the source drawing—the drawing in which the object is created and stored—in one of two ways. You can either create one object per drawing, or you can include several objects in a single drawing. Use the following sections to help you decide how to set up your source drawing, and how to manage drawings, survey data, and points.



One Object, One Drawing

In this scenario, you save each design object in its own drawing. If you know that team members will have to share or edit an object at the same time, it is recommended that you adopt the one object, one drawing approach. Autodesk Vault controls data-sharing using the source drawing from which a design object is created. If you place two or more design objects in the same source drawing, only the user who has checked out the drawing from a vault can edit the design objects. In effect, a drawing locks any design objects contained in it, so that only the user who has checked it out can make changes. Therefore, to allow multiple people to edit multiple design objects, you need to place the objects in separate drawings. For example, if your project design has five alignments and multiple team members need to edit these alignments simultaneously, then you need to store each alignment in its own drawing. By doing so, each team member with write access can edit the alignments as needed, while other team members can still concurrently reference the alignments for other design tasks.

The one object, one drawing approach allows you to continue to share objects collaboratively among team members, like you may have done with Land Desktop. The main difference is that with Land Desktop, anyone working on a project can edit objects. With Civil 3D and Autodesk Vault, you can set roles and permissions for individual users, defining what actions they can take. By using the one object, one drawing approach in Civil 3D, as many people as possible can work simultaneously on projects in a secure way. The extra time it takes to create and name a new drawing for each new design object is minimal—and you gain the ability to keep your project progressing quickly.

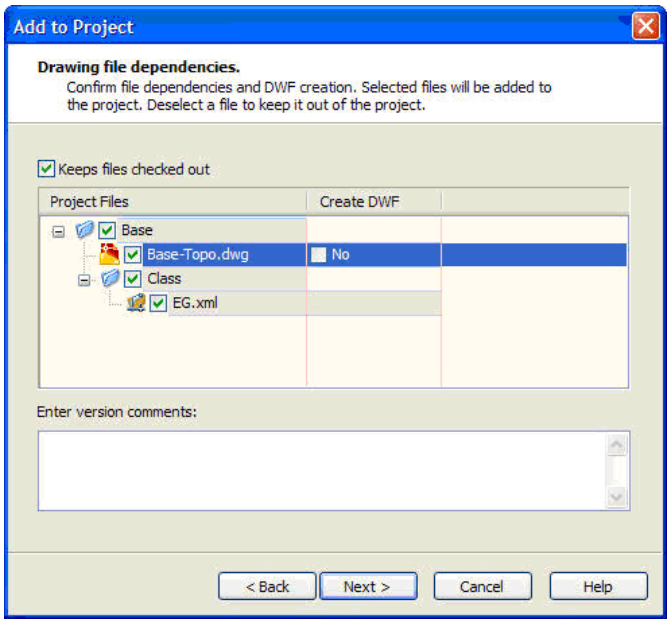
Multiple Objects, One Drawing

If you have only a few team members who will edit a design, you do not need to follow the one object, one drawing approach. You may choose to keep some design objects together in a source drawing when creating a Level 1 drawing. For example, if you have several pipe networks in your design, but only one person on the design team is responsible for designing and editing these, then you can store all the pipe networks in the same drawing. When that drawing is checked in to the project, all of the pipe networks are available for reference by other team members. Taking this multiple objects, one-drawing approach can reduce the amount of drawings in a project and provide a single source for editing.

Other Considerations

There are several guidelines you should follow when managing drawings in Level 1 of the workflow. These practices apply whether or not you use the one object, one drawing or multiple objects, one drawing approach.

For each drawing you create, you need to assign a unique file name and save it to the designated project working folder in Autodesk Vault (see Setting Up Working Folders (page 105) for more information about setting up the project folder structure). It is recommended that you do not use the default file names. Instead, provide a unique name for each drawing with a clear reference to the object it contains (for example, *Maple_Street_Centerline.dwg*). To check your drawing and object data in to the vault, you'll use the Add To Project wizard that is part of the Civil 3D project management functionality.



This wizard will guide you through the entire process. Consider the following options when checking in your drawing:

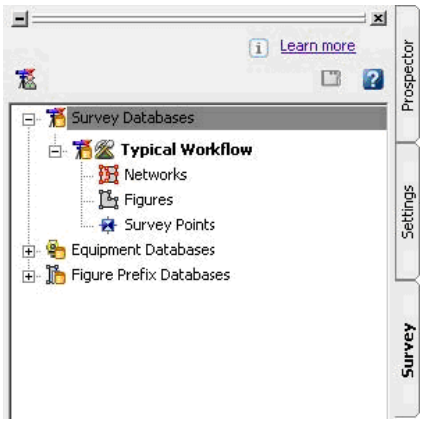
- Check in not only your drawing, but all file dependencies as well. This may include external reference drawings, LandXML files, TIN files, and so on.
- Leave the Keep Files Checked Out option selected if you want to save the drawing to a vault, but continue to work on it.
- Create a DWF snapshot of the file so you can quickly see its contents should you need to find the drawing several revisions later.
- Add a version comment that may help you remember the attributes of the version (for example, noting whether a survey has taken place, or including the date).
- Select the object as "shareable," so that other team members can use a reference copy of the object in other drawings.

Repeat the process of creating, saving, and checking in design objects as described above. After you have created your design objects— either one object in its own drawing, or multiple objects in a single drawing — you can data-reference them to create base plans, such as a utility base or grading base,

or combine them with externally referenced AutoCAD linework and geometry to develop proposed design objects —tasks that you perform at Level 2 of the workflow.

Survey Data

Civil 3D uses a unique database called the Survey Database to store, manage, and edit survey information. This database is created outside the Autodesk Vault environment, but is stored in the working folder with all other project data. When you need to add survey data to your project, just check the database into the project. This will make all of the points, figures, and observations stored in the database available for use by other team members. You can manage the survey database once it is checked in to a project using the Civil 3D Prospector tab in Toolspace.



Once you have the Survey Database checked out, follow these steps:

1. Open the Survey Database from the Survey tab in Toolspace.
2. Add survey data by importing or manually creating it.
3. Close the Survey Database on the Survey tab in Toolspace.
4. Check the Survey Database back in to the survey project using the Prospector tab in Toolspace.

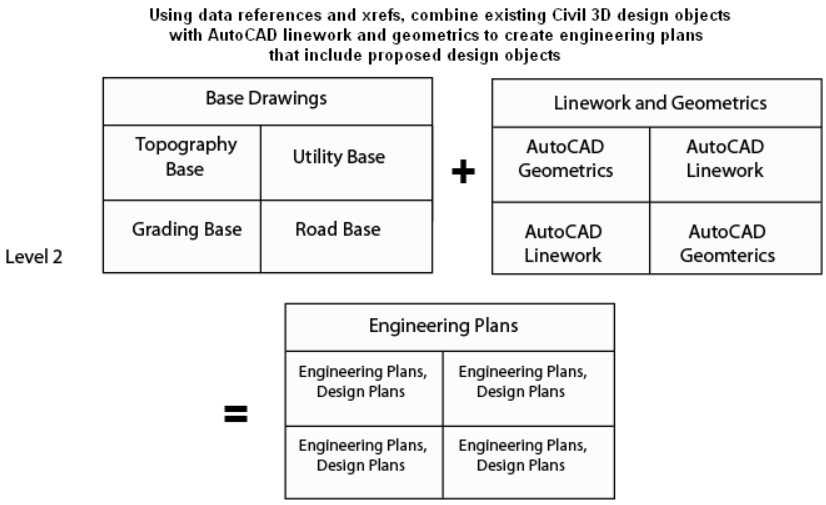
Points

Like survey data, project points are not stored in a source drawing and must be managed differently from other design objects. Master copies of points are stored in a point database and then, as a subset of the project database, project points are checked out or copied directly to a drawing. Because the project

database does not display individual points, you cannot view them using the Vault Administration tool interface. However, you can check out, modify, and check in individual project points rather than the entire project point database. When you modify and check back in a point, the project database updates automatically.

Level 2: Creating Base, Linework, and Engineering Drawings

After you create your design objects and check them in to a vault, there are several types of drawings you can create in Level 2 of the workflow. These include base, linework, and engineering drawings.



Base Drawings

Base drawings are created by combining Level 1 Civil 3D objects by data-referencing them. You can then use base drawings as external reference files for site feature plans or for plan sets (sheet sets), such as an existing condition drawing that includes survey data and a surface model.

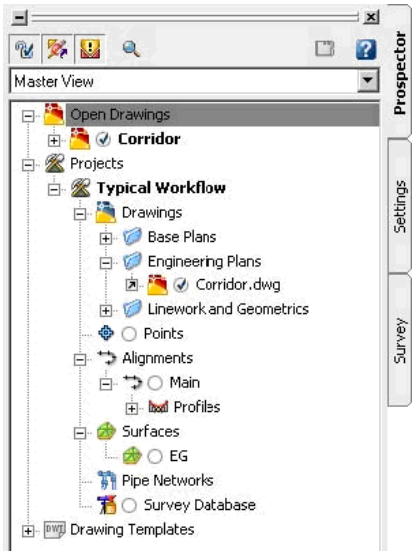
Linework Drawings

Creating linework drawings is sometimes an intermediate step between developing engineering plans and base drawings. Linework drawings contain

the linework and basic AutoCAD objects (such as lines, text, and blocks) that are used to build or represent existing conditions. Although linework drawings do not include Civil 3D objects, you can still add linework drawings to the project so that you can manage and reference them later on in the workflow.

Engineering Plans

Engineering plans—such as corridor designs, grading plans, or site plans—result from combining design objects to create or "engineer" other design objects for your project. For example, if you want to design a corridor model, you can create a drawing that references—from Autodesk Vault—both an alignment with its profile and the existing ground surface. With engineering drawings, you take advantage of the work done on objects in Level 1 while leveraging the powerful Civil 3D design tools. In a multi-user environment, engineers and designers are able to reference core objects from the project, while at the same time, technicians and drafters can create plan sets and conduct drafting as required.



The following steps describe the basic phases you would go through to create an engineering drawing. This example assumes you are creating a corridor design.

1. Create a new drawing and add it to the project. Once a drawing has been added to your project, it will appear on the project tree on the Prospector tab in Toolspace. For this example, we will store the corridor drawing in a folder called Engineering Plans. Each project will contain collections

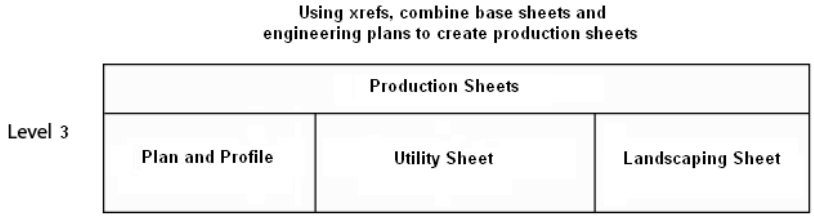
of objects. For example, alignments will be in the alignment collection, surfaces in the surfaces collection, and so on.

2. Data-reference the existing ground surface into the drawing by expanding the surfaces collection and creating a reference. This will import a reference of the surface from the project into your current drawing, allowing you to use the data for design work.
3. Apply styles and annotation to the referenced surface as desired.
4. Repeat the process of data-referencing for the alignment and profile. When you finish, you have the components needed to begin your corridor design.
5. Synchronize with the project, so that if any of the data references have been edited, the updates will be instantly reflected in your design. This allows you to keep your designs in sync across multiple users and multiple drawings.
6. After you create your design—in this case the corridor model and finished road grading—check it in to a vault. You can now share the new surface.

Repeat this process for all other base, linework, and engineering drawings you create to complete Level 2 of the workflow.

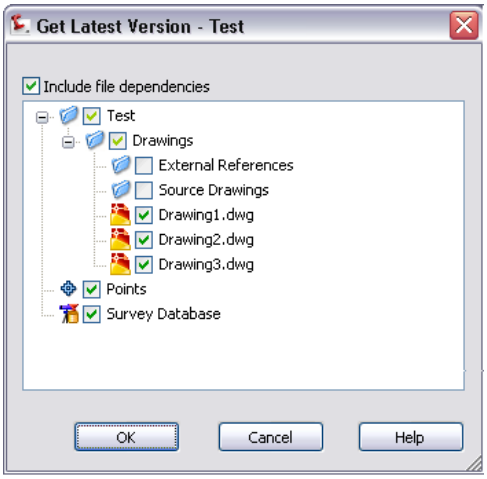
Level 3: Creating Top-Level Production Sheets

After you have developed the base, engineering, and linework drawings, you are ready to create a production sheet or a plan set drawing, such as a plan and profile, utility sheet, or landscaping sheet. When you produce many of these for a single project, they are sometimes referred to as a sheet set.



To generate these top-level (Level 3) sheets, you will need external references of your base, engineering, and linework plans together in to a plan set drawing that can be used for generating layouts with title blocks and final drafting.

Before you create external references for these drawings, you must make sure that you are accessing their latest versions. In Civil 3D, external references are accessed for project drawings (drawings that are part of the Autodesk Vault project) from your working folder. Therefore, you need to make sure that the latest versions of all drawings are in your working folder. To do this, find your project in the project tree on the Prospector tab in Toolspace. Right-click on the project name and choose Get Latest Version. This step pulls the most recent versions of all project drawings and design objects into your working folder. After you have the latest versions of all project drawings and objects, you can create your Level 3 production sheet(s).



Create the Plan Set Drawing

Let's assume you are working on a plan and profile sheet. First, you create a new drawing, name it, and save it to your working folder. Once it's saved, check it in to a vault so that the drawing will be part of the project database. Make sure to choose the Keep Checked Out option so you can keep working on it. Use the XREF command to externally reference the appropriate Level 2 drawings, such as base linework, base utility, and base topology. When you create a top-level drawing in Level 3, the data you created in the Level 2 external references—including object data and label styles—are display-only. However, you can use the Layer Manager to hide and display the external reference layers. When you finish creating your external references, you can check the drawing in to a vault, while making sure to select the Include All File Dependencies option. This ensures that all associated file dependencies will be copied to their working folders when other team members check out the plan set drawing. You will typically use a plan set drawing when using

the AutoCAD Sheet Set Manager. You can also use the Plan Production Tool wizards in Civil 3D to automatically create these sheets.

Additional Drafting and Annotation

Sometimes you need to edit or add annotation to a design object during Level 3 of the workflow. To add annotation, just reference the appropriate design objects into your plan set drawing from the vault as data references, and apply the needed annotation or drafting. This gives you control over the stylization and annotation of the objects in the plan set drawings. Therefore, you are able to take advantage of the work done in Level 1 and Level 2 of the workflow, while also allowing your drafters and technicians to finalize the annotation and Level 3 sheets needed to produce a full set of construction documents.

Addressing Interference

When drawings from Level 1 and Level 2 are externally referenced into Level 3, you may find that there are annotation interferences. If this happens, you can either use Layer Manager to turn off the interfering text, or you can create data references of the design object in the Level 3 drawings and control its annotation there. Using this approach, the Level 3 drawings can be synchronized to reflect any changes that take place in lower levels. While creating references in Level 3 requires some duplicate work, it is negligible compared to the benefit of having the top-level sheets in sync with the design.

Working with Images

You may need to incorporate an image into your top-level production sheet. For example, a rough grading plan sheet may include aerial photographs. To add an image, create the drawing as recommended (name it and save it to the working folder), attach the image (through the External References Manager or by using AutoCAD Raster Design), and then check the drawing in to a vault, making sure to select the Keep All File Dependencies option. By selecting this option, you include all file dependencies and avoid broken references. After completing this process, the drawing and attached image will be saved in the vault.

Bypassing Level 2

You may be able to complete some projects without going through all levels of the workflow. In particular, you may not need to create any intermediate drawings in Level 2. Instead, you may be able to create top-level sheets by directly data-referencing individual objects created in Level 1. The benefit of bypassing Level 2 drawings is that you can do labeling directly in the Level 3

drawings, avoiding the possibility of generating interferences. The downside of bypassing Level 2 is that you remove the option of combining objects from Level 1 with engineer or design elements—such as corridors or utilities—on design data.

By adopting a workflow like the one just outlined, you make it possible for your teams to work securely and collaboratively—so they can finish civil engineering projects faster. When you use Autodesk Vault to manage project data, you extend the dynamic object updates that occur within a single Civil 3D drawing across multiple drawings. Using the powerful Civil 3D design tools to create your designs along with using Autodesk Vault to facilitate collaboration and to control access to project files, you minimize manual work, reduce errors, and complete plans more quickly and easily.

Assessing Your Workflow

Now that you understand more about how you can use Civil 3D project management capabilities to create an efficient workflow, you need to assess your own organization and workflows to determine what can best suit your needs.

Depending on complexity, an organization's project management needs may range from needing to manage a few drawings in a folder to needing to manage a large database with many shared objects, security controls, and a large number of users. When deciding on which methodology to use for managing your projects, start by analyzing these factors in your organization:

- Your general workflow
- The number of drawings typically managed
- The complexity of drawings typically managed (the number of objects and object types that are typically contained in the drawings)
- The size of the project team (the number of people requiring access to the files) and how many teams you have
- The need to balance the relative ease of use (simplicity of workflow) as opposed to the need to maintain data security

You can always contact an Autodesk representative for assistance in determining which project management solution is right for your organization.

To learn more about how you can use Autodesk Vault with Civil 3D to manage your civil engineering projects, visit *http://www.autodesk.com/VaultForCivil3D*.

The Next Move

6

Now that you have explored the issues involved with moving from Land Desktop to Civil 3D, you may be wondering what your next step should be.

If your organization has already made the commitment to move from Land Desktop to Civil 3D, the next step may already be clear. Teams and individuals may be ready to move on to exploring other training resources, like those listed in Chapter 1. Or perhaps you are ready to contact your Autodesk representative for guidance.

If you still need to convince others in your organization that making the move is the way to go, pointing them to this guide may be the next step.

If you are ready to begin your first Civil 3D pilot project, you will be joining the many other Autodesk customers who are happy they made the switch from Land Desktop to Civil 3D.

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