



CAD Standards



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General Information

Introduction

The following guidelines/requirements are intended for RETTEW staff for use in preparation of various drawings. To produce achievable drawings, maintain uniformity of work and to facilitate review, these requirements should be met for all drawings. Drawings that do not meet these requirements are unacceptable. If some special condition makes it impractical or impossible to conform to these requirements, the problem should be referred to the CAD Manager. The purpose of this manual is to ensure a consistent quality of printed drawings, and to act as a guide for new staff and outside consultants.

What are “CAD Standards”?

It is easy to put “Drawing Standards”, “Quality Standards” and “CAD Standards” together but they are different.

Drawing Standards - the look of the final product when it goes out the door. Is the product a professional piece with the RETTEW name on it?

Quality Standards - is all the information correct? Can the project be built/constructed from these documents? Are they accurate?

CAD Standards - the method by which the drawings are produced. This will cost time and money if not done correctly the first time.

Quality Standards are the number one priority.

Drawing Standards are the number two priority, as it is a direct reflection on RETTEW and the image it projects to our clients. High quality drawings often bring back more business since accuracy of quality standards is expected.

CAD Standards are the number three priority, as it is an internal function, but still imperative to productivity.

It is important to have consistency not only with the printed drawings, but also within CAD files. Deadlines require a spirit of teamwork and for members of the team to frequently work on several CAD files simultaneously. Many CAD users will have learned different approaches to producing a CAD file; a common discipline therefore is required to enable different members to contribute to the same CAD file.

The key concepts of CAD Standards are as follows:

- Standards make processes consistent
- Consistency allows automation
- Automation saves time
- Time is money
- Therefore, standards save money!

CAD software and hardware will continue to evolve and improve, and CAD users will discover new efficiencies within each software package. Due to these constant changes, this manual will be revised frequently.

Roles & Responsibilities

RETTEW's Standards will be maintained and modified by the CAD Manager. He/She shall be responsible for any follow-up issues, and will head up the CAD Standards & Processes Committee (CSAP) which will oversee and frequently update the RETTEW Standards.

It is the responsibility of the CAD Manager to develop, distribute, update, and maintain any custom tools or templates for use in compliance assistance.

The development and use of CAD Standards and any tools or templates is not seen as an end all in itself. The goal is to enhance productivity and share work among users and projects. To this end the process will never be completed. The CAD Manager shall continue to develop and enhance the use of daily CAD tools.

RETTEW CAD Standards & Processes Committee (CSAP)

Staff	Title	Service Area
Jerry Hesselman	CAD Manager	Information Technology
Edward Nett	Designer	Civil/Municipal
Anthony Naylor	Senior Designer	Land Development
Joel Esh	Senior Designer	Natural Sciences
James Ross	Designer	Survey
Gama Flores	Designer	Survey
Eric McKinney	Designer	Transportation
Michele Slane	Senior Designer	Energy & Environmental Engineering

RETTEW Core Responsibilities Involving CAD Work

Contact	Key Responsibilities
CAD Manager	• Develop RETTEW standard workflow and communicate to CAD Staff • Communicate best practices to CAD Staff through regular meetings/learning sessions with staff and Yammer site. • Maintain and Update Vault and Civil 3D software for optimal best performance • Work with industry experts, Autodesk, and peers to continually improve CAD efficiency in Vault and Civil3D. • Attend Project CAD Kick-off Meeting with CAD Staff and PM. • Communicate staff learning and training gaps to GMs and SA CAD leaders. • Provide support and direction for SA specific templates.
CAD Staff	• Follow RETTEW standard workflows and best practices. • Fine tune existing and develop new workflows as required by SA or Client. • Communicate technical issues and slowdowns to CAD Manager. • Review and participate in CAD Yammer site. • Participate in learning opportunities with manager approval. • Participate in Project CAD Kick-off Meetings with CAD Manager and PM. • Create and maintain SA specific templates (with direction of CAD Manager).
PMs	• Ensure Project CAD Kick-off Meetings with CAD Staff and CAD Manager. • Coordinate production check points (i.e. 25, 50, and 75 to be established at project kick-off meeting) during project to ensure CAD work, involving CAD Manager when necessary.
GMs	• Ensure CAD Kick-off Meetings are being held for projects involving CAD work. • Initiate CAD Audit process to ensure CAD and performance standards are being met for staff, PMs, and CAD support. • Identify and support lead CAD staff in SA responsible for providing technical leadership, coaching staff, maintaining templates in coordination with CAD manager, and monitoring client-focused standards and approved deviations.
IT Staff	• Support CAD Manager in maintenance and updates for Vault Server. • Support CAD Manager and CAD staff in troubleshooting technical issues. • Develop next gen. CAD desktop to normalize CAD performance across offices and projects.

Revision History

Version 1 – Initial release December, 2013

Version 2 – May, 2014

Version 3 – June, 2014

Version 4 – July, 2014

Version 5 – November, 2014

Version 6 – September, 2015

Version 7- January 2016 (added CTB File procedures, update CSAP Team)

Version 8 – April 2016 (added LD work flow)

Version 9 – January 2016 (revised typical workflow section)

Modification Process

This manual is a living document that will change from time to time. The CAD Manager shall continue to develop and modify this document. Comments and suggestions are welcome. Contact the CAD Manager or any member of the CAD Standards & Process Committee (CSAP).

The Modification Process is as follows:

- A proposed change is submitted to the CAD Manager.
- The proposed change is reviewed by the CSAP committee for clarity.
- The CAD Manager shall decide if the proposed change is valid or the CAD Manager/CSAP shall offer clarification on the current standard or work around.
- Upon approval, the proposed change shall be added to the standard and scheduled for full publication.

CAD Standards

General Standards

These general standards are intended to include the fundamental requirements for the efficient generation, archival and retrieval of electronic drawings prepared by RETTEW. Some of these standards will be explained more specifically in other sections of this document.

- All drawings will be drawn at true scale and true coordinates in model space.
- Drawings are to be plotted using paper space at 1:1 scale for full size prints.
- All drawings shall use color dependent plot styles, not named plot styles.
- All colors used in drawing files will comply with the RETTEW Pen/Color configuration.
- All drawings will contain a date stamp that includes the AutoCAD release number, the drawing path name, the file name, and the latest date worked on.
- Layer names will conform to RETTEW standards and all drawing elements will be drawn on the appropriate layer. All layers will be named using the discipline designation the drawing element represents as the first letter.
- All drawing path names shall follow the RETTEW folder structure and file naming conventions.
- Each sub sheet will be created as an individual CAD file. One single drawing file containing multiple sub sheets is not acceptable.
- All site plan drawings shall utilize the same coordinate system used on the original base.
- Any design linework must be in a drawing that is stored in the Models Folder.
- Model drawings shall not contain title blocks and be used to create prints (i.e. they shall not be used as final sheet drawings in and of themselves). A sheet drawing stored within a sheet's service area subfolder shall be used instead.
- All site plan drawings will indicate orientation by using the RETTEW standard North Arrow block.
- All plans that are "to scale" must have a scale bar.
- All sheet drawings shall have a plot stamp referencing when the plot file was created.
- All items in the legend shall be consistent with what is shown on the plan sheets.

Drafting Practices

Keyboard Commands

Keyboard commands are faster than menu or mouse-menu commands, once they are learned. Using these commands will increase drafting speed.

Think about the time it takes to move the mouse to a menu header (e.g. Insert), then down to a command (e.g. External References). Compare that to the time it takes to type "xr" and click the right-mouse button or hit the space bar. The 500 milliseconds gained may seem insignificant, but with repeated use, it makes quite a difference.

Use ALIASEDIT to map favorite, most commonly-used commands to two or three letter commands on the left side of the keyboard. This tip will allow the right hand to stay on the mouse, close a number of toolbars to reclaim screen real estate, and increase system performance.

Keyboard commands come in handy if on a stranger's CAD station where all toolbars are hidden, and menus are heavily modified. It is a good idea to know the basic, full-length AutoCAD most common commands.

There are some times when keyboard commands are not the most efficient practice. The Layer Manager Button and Layer Selection drop-down are faster than typing commands to change a layer. With Civil 3D, the commands are long and convoluted, making them harder to remember. The menus and toolbars may be easier in this case. Basic AutoCAD commands can still be executed using keyboard commands in Civil 3D.

Layer 0

Layer 0, like defpoints, is a special layer deserving careful attention. Layer 0 is a "universal" layer that appears in every drawing and cannot be renamed. It also appears as the same layer in external references. If a drawing is an XRef in a sheet file, the XRef's Layer 0 will not show as XRefname|0. It will not show up in the layer list because there is already a layer 0 in the sheet file.

XRefs are the only objects that should ever be created or inserted on Layer 0 (overlaid, not attached). **Never create entities on Layer 0**, except those which will be turned into blocks. The reason for this may not be obvious. If an XRef is attached to a sheet file, and the appearance of entities on Layer 0 needs to be changed, Layer 0 in the sheet file must be modified. (Layer 0 does not show up as a nested XRef layer). What will happen if a second XRef is added that also has entities on Layer 0? These entities will also take on the properties of the sheet file's Layer 0. There is no way to differentiate between them. The XRef's Layer 0-based entities will not be able to freeze without freezing **ALL** Layer 0-based entities, nor will the color or line type of these entities be able to be changed.

Color BYLAYER

All entities should be colored ByLayer. Color control can then be accomplished by changing the layer color. This is particularly important with base files, as referenced entities are often displayed in different colors in different sheet files. In sheet files, coloring entities ByLayer isn't as important, but it makes changing the color of multiple entities much easier, as each entity does not have to be selected individually.

Layer Naming

RETTEW has adopted the NCS layer naming convention. See article 9 for more information on creating layers.

Layer Separation

Create extra layers for separate parts of a system, so these layers can be frozen or screened back in certain sheet files. For example, make three separate layers for storm drain lines, manholes, and catch basins, rather than just one storm layer for all of these. It is also a best practice to separate the text

labels (such as pipe labels) on a separate layer, as it may be desirable to show the pipes but not their labels on certain sheets.

More layers are better, within reason. Having separate drawing files will keep the layer lists down for each drawing.

Object SNAPS

Object Snaps (OSNAP) is an excellent tool to have. As with ORTHO, this collection of drawing tools allows the drawing to be created with greater accuracy. To draw a line from the end point of another line, DO NOT just pick a spot near the end point of that line and call it good; use endpoint ('END') snap instead. All OSNAP settings are potentially useful and should be familiar to all CAD users.

If multiple OSNAPS are active, the helper symbol of an unwanted OSNAP may be visible. For example, if both the Endpoint and Perpendicular are active, the Endpoint symbol might show up at the end of the line. To use Perpendicular, move the mouse around until AutoCAD determines what is needed, or use the Tab button to cycle through the active OSNAPS.

Each OSNAP setting can be set "on the fly" by typing its three-letter abbreviation or multiple OSNAPS can be set in the OSNAP dialog (toggled on or off with the F3 button).

OSNAPs List

ENDpoint	EXtension (of a line or arc)	TANgent
MIDpoint	NODe (used for points or dims)	NEArest
INTersection	QUAdrant(of a circle or arc)	PARallel
CENter	INSertion(point of block)	PERpendicular

APParent intersection is useful when Z values don't match.

XRef Overlays vs. Attachments

Knowing the difference between an overlaid XRef and an attached XRef is very important when there is a reference to a file that has other files referenced into it. For example, if file A is overlaid into file B, when file B is referenced as an overlay in file C, file A will not appear in file C.

It is a RETTEW standard that ALL XRef's be attached as overlays. This will avoid creating XRefs that load ancillary XRefs upon being referenced into a sheet file.

Blocks

Always define blocks on Layer 0, colored Bylayer. There are exceptions to this rule, but in general, for simple blocks, do not put entities in the block in non-0 layers and do not assign colors to the entities. Put the actual block on the appropriate layer. This should be done in case a user needs to reference the file and change the color of all entities in the drawing. The quickest way to do this is to change the color of the layer that the block is inserted on.

Callouts

Text callouts should generally be in model space. If a callout is placed in paper space, it makes it challenging to adjust the viewport should the need arise. It also makes it hard to tell if there is visual interference with a callout in model space.

Text callouts should be in sheet files, not XRefs. Text callouts are generally specific to each sheet file. Labels that appear in multiple sheets may be placed in XRefs.

Civil 3D Drafting Practices & Tips

Prevent Scaling

If using a 3D drawing, insert the 3D survey drawing into this file. Ensure the units of measure are not accidentally scaled to another unit. For example, if a drawing uses imperial units, it may accidentally be scaled to metric. To prevent scaling, set the INSUNITS value to 0.

Use References to Reduce Drawing Size

Create a surface directly from the point file rather than importing the point as COGO points. This practice avoids the use of system memory to keep the point data labels up to date. Rather than starting a design in the same drawing as the surface, create a data reference to the surface. This practice will dramatically reduce the active drawing size.

Apply Meaningful Names to Objects

Adopt a naming convention that applies useful names to differentiate objects. It is important to use consistent and meaningful names, since multiple people across the company may work with the same drawing.

Use Minimal Object Styles

For most efficient processing, use styles that have very little or no displayed elements. Minimal display styles draw faster, and are especially relevant for large objects, such as surfaces, point groups, and corridors.

Minimal display styles are useful in conceptual designs, the early stages of a project, and whenever there is a need to suppress the display of a surface or other large object. They can also apply to other objects, subject to the nature of the drawings. Minimal styles for objects, such as surfaces and corridors, should be configured in both 2D and 3D display modes for efficient use.

Turn Off Labels

As with object styles, a user can design separate label styles for use at different project stages, and for different audiences. For example, an empty “No Label” style is useful, especially for alignments, profile views, and other objects with label sets. A user can switch off all labels for an object by applying this style. Turn off labels to reduce clutter and drawing time for some design phases.

To turn off all labels for a feature:

1. Right-click the feature node on the Toolspace Settings Tab.
2. Click Edit Label Style Defaults.
3. In the Edit Label Style Defaults dialog box, set label visibility to false.

To create a label design that has just the essential data and can be drawn quickly, simplify all text and graphic elements, including the use of rotation, borders, and plan readability. Another useful tactic is to leave a style in place, but temporarily edit the style with the Label Style Composer to turn off the label visibility.

Use Layers to Manage Display

For faster processing, freeze or turn off the drawing layers that contain objects. By default, design objects and their labels are divided across multiple layers. For example, alignments, profiles, and other road design objects are spread across many layers. Consolidating the road design objects on fewer layers makes it easier to turn them on or off.

Maintaining Clean Drawings

Check for Drawing Errors

The AUDIT command checks for errors in an open, active drawing. To run the command, type AUDIT.

Remove Unused Data

Two PURGE commands are available to remove unused data from drawings

- The main command removes nested, unused features. To run the command, type PURGE
- A secondary command removes unused registered applications (regapps) from a drawing. To run this command, enter –PURGE on the command line, then enter the command option “R” to remove regapps.

Locate Redundant Objects

The AutoCAD command QSELECT is useful for finding redundant objects in a drawing, as long as users have some idea of what to look for. For example, if a user has created alignments and knows that the drawing contains four actual alignments, use QSELECT to select all alignments. If the list includes more than four, the extra ones may be deleted.

Repair Drawings

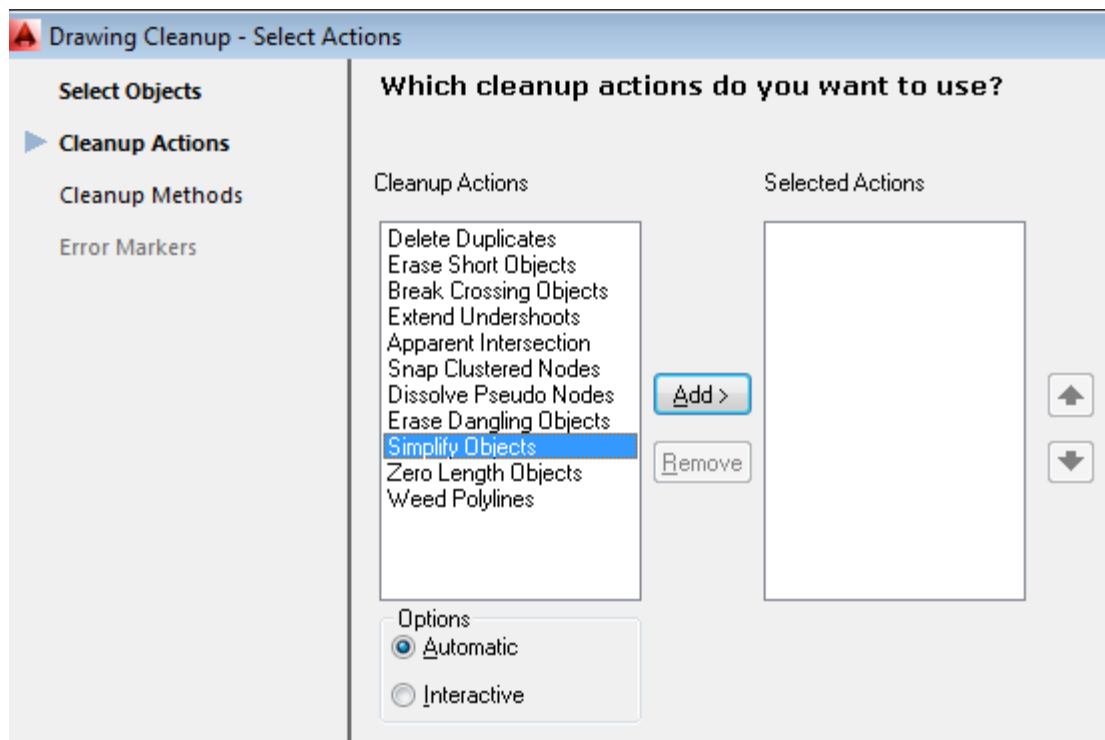
The RECOVER command locates and repairs damaged data in a drawing. The command is intended to be run when a drawing is opened. Click Application Menu > Drawing Utilities > Recover, select the drawing, then click Open.

Map 3D Cleanup

A powerful utility developed included with AutoCAD Civil 3D is Map 3D. It enables users to delete duplicate objects, weed polylines, and perform many other cleanup actions. Several parameters can be set to control each action. Access this cleanup tool in one of two ways:

- At the bottom of the drawing window, click  Workspace Switching and click either Tool-based Geospatial or Task-based Geospatial. On the ribbon, click Tools Tab > Map Edit Panel >  Clean Up
- On the command line, enter MAPCLEAN

The Drawing Cleanup dialog box opens, as shown below:



Note: While it is possible to run several actions together, it is recommended that they be completed one at a time for better monitoring and control.

Delete Corrupt Data

If a drawing is corrupted and cannot be fixed by other means, use the Write Block (WBLOCK) command to write all drawing objects to a new drawing file. This will eliminate the corrupt data and reduce the file size.

Several precautions apply when using WBLOCK with Civil 3D data:

- Do not specify an insertion point, as doing so will change all coordinate positions.
- If the drawing contains many Civil 3D objects or large objects, use one of these alternative methods:

- Export the data to LandXML, then import it into a new drawing.
 - Export to AutoCAD, which explodes the Civil 3D objects. If the objects are exploded and there is a need to recreate them, it may be possible to use the exploded polylines or other simple entities as a starting point.
 - Start from scratch.
- To copy sheet layouts from the drawing, use the DesignCenter tool to drag-and-drop them into the new drawing.

Remove Unneeded Objects

The Zoom Extents command enables users to see whether the drawing contains any unwanted objects outside of the main design area and delete them, reducing the drawing size.

DWG-PURGE Application

This plug-in app helps purge unused DGN Linetypes, text styles, Regapps and annotation scales.

There are two commands for this plug-in, DWG-PURGE and DWG-PURGE-BATCH.

DWG-PURGE

Purges the current drawing.

Type DWG-PURGE at the command line and the plug-in will delete all DGN unreferenced linetypes, Regapps and Annotation Scales. A dialog box will appear, showing a list of any Xref's attached to the drawing that needs to purge. Clicking on 'Yes-Purge Xref also' will begin the purge of the attached xref's.

DWG-PURGE-BATCH

Purges multiple drawings without opening the files.

Type DWG-PURGE-BATCH, and click 'select drawing to purge.' Select the drawings to purge.

If you do not have this plug-in app, please contact Help Desk or the CAD Manager.

File Management

Organizing Data

- Follow the RETTEW Standard project folder structure to allow all team members to readily find needed data files and save all drawings in the correct location.
- Apply meaningful, specific names to all files and objects that will be shared within a project environment. Default names such as “Alignment-(1)” can be especially confusing, because they can appear in multiple drawings, and have no reference to a real-world object.
- For basic design objects such as surfaces and alignments, consider saving one object per drawing for maximum flexibility. This drawing structure enables one team member to open a drawing for edit while other members operate with read-only copies. However, there are exceptions to this structure. On a small project, it may be useful to store several objects in the same drawing if they will always be edited by the same person. It often makes sense to keep a set of related alignments in a single drawing.

RETTEW Project Naming Convention

Projects shall be created using Civil 3D. New projects shall use the following project naming format:

[Project #]-[project name] as per the RETTEW CAD Manual.

Project name shall be title case only. (i.e. Sams Run, not SAMS RUN)

The project name should be short and **not** include special characters (!@#\$%^&*()+=|.). Keep the project name as short as possible, no long sentences. Descriptions should be placed in the comments of the project.

The project name shall not exceed 20 characters (e.i. the highlighted text should not exceed 20 characters, **123456789-LD-This Project is Done**)

Please note: there is NO space between the Project #, dash, and the Project Name.

The following are NOT acceptable project names:

123456789- BAD BOYS STREET FOR AMERICAN CONTRACTORS

123456789-BAD BOYS @ AMERICA CONTRACTORS

123456789 - BAD BOYS

123456789—REALLY BAD BOYS STREET OF THE AMERICAN CONTRACTORS THAT IS LOCATED SOMEWHERE IN MONTANA

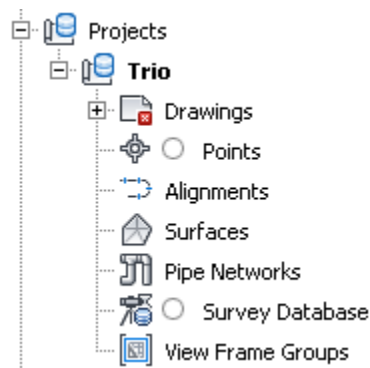
123456789-BAD BOYS ^ AMERICAN@MONTANA

This project name is acceptable: 123456789-Bad Boys Street

Vault Overview

Autodesk Vault is a complete document management system for drawings, project objects, and project-related files. It also provides access control and file version control. Civil 3D provides commands in the Prospector Tree to create and access project drawings and shared project data.

After logging into Vault, each project is displayed as a collection on the Projects node of the Prospector Tree.



Project Drawings

A project contains a collection of project drawings. Use folders to organize the drawings within a project. A master copy of a project drawing is maintained in a specified project within a Vault database, and only one person at a time can edit the master copy. When the edited project drawing is updated in the Vault database, a new version of the drawing is created. The icons displayed next to a drawing in the Prospector Tree indicates the status of the local copy of the drawing in relation to the master copy of the drawing in the Vault Database.

Project Objects and References

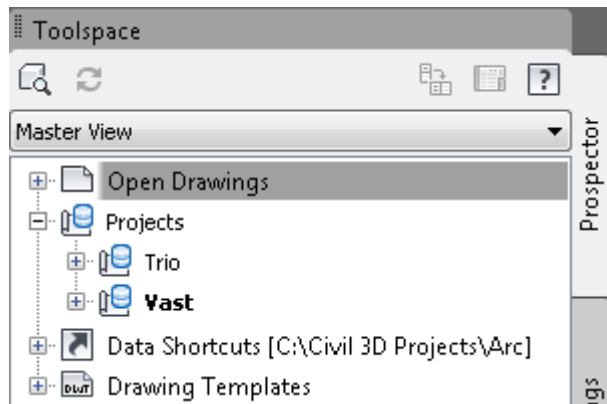
A project contains collections of project objects including surfaces, alignments, profiles, pipe networks, and view frame groups that can be shared with others. All shared project objects are listed in the project object collections in the Prospector Tree. Project members can create a read-only copy of a project object, called a *reference*, in a drawing. This read-only copy of the project object's geometry can be used to perform labeling, design, analysis, or what-if tasks. Multiple project members can create references to the same shared project object.

Project Points

When using Vault, project management of Civil 3D points is handled differently than project management for other objects.

Project and Drawing Items in the Prospector Tree

The Master View of the Prospector Tree contains four collections related to drawings and projects: Open Drawings, Projects, Data Shortcuts, and Drawing Templates.



Note: To view all collections in the Prospector Tree, select Master View from the list at the top of the Prospector Tab.

-  - Updates project data that is shown in Prospector. It is available only when logged into Vault and either the top-level Projects node, an individual project node, or a vaulted drawing is selected.
- **Open Drawings** - Lists open project and non-project drawings.
- **Projects** - Lists the Vault projects available to the user after they have logged into a Vault server and a Vault database.
- **Data Shortcuts** - Lists the data shortcuts projects available.
- **Drawing Templates** - Lists the available drawing templates.

Project Item State Icons

The project item state icons in the Prospector Tree identify the state of a local project drawing in relation to the master copy in the Vault database.

The icons are displayed next to drawings that have been added to the project, indicating the state of the local copy of the drawing on the user's system, in relation to the latest version of the master copy in the Vault database.

An icon that is displayed next to a project object in a project object collection, (such as Surfaces or Alignments) indicates the state of the project object's source drawing.

The project item state icons are shown in this table:

Icon	Meaning
	If no icon is displayed, the drawing has been added to the project, but there is no local copy.
	The drawing is available to be checked out. The version of the master copy in the Vault database matches the user's local copy.
	The drawing is available to be checked out, but the local copy is newer than the latest version in the Vault database. This usually means that the user changed the local copy without checking it out.
	The drawing is available to be checked out. The local copy is older than the latest version in the Vault database.
	The drawing is checked out by the current user. There is no local copy of the object.
	The drawing is checked out by the current user. The version of the drawing in the Vault database matches the local copy.
	The drawing is checked out to the current user. The local copy is newer than the latest version in the Vault database. This usually means that the current user has changed the drawing since they last checked it out.
	The local copy of the file is the released version of the latest revision, but not the latest version of the latest revision. This typically happens when a user has a local copy of the released version but a quick change has been executed by another user.
	The file is not in Vault. The file can be added by using the Check In feature.
	The local copy is a historical revision of the leading revision in Vault.
	The local copy of the file does not match the latest version in Vault. Use the Refresh from Vault feature to obtain the latest version of the file.

	The file is locked and the local copy is up-to-date.
	The file is locked and the local copy is not up-to-date.
	There has been an unexpected result with the file (e.g., the local file has been changed without being checked out). See the tooltip for more information.
	The drawing is checked out to the current user. The local copy is older than the latest version in the Vault database.
	The drawing is checked out to another user. The current user does not have a local copy.
	The drawing is checked out to another user. The local copy matches the latest version in the Vault database.
	The drawing is checked out to another user. The local copy is newer than the latest version in the Vault database.
	The drawing is checked out to another user. The local copy is older than the latest version in the Vault database.
	The file is not in Vault.

When a drawing contains a reference to a shared object, and the local copy of the source drawing becomes out of date,  is displayed next to the drawing name in the Prospector Tree. This generally occurs when a user adds a newer version of the project object's source drawing to the project. Use the Sync to Project Command to update the reference object.

Drawing Item State Icons

The drawing item state icons in the Prospector and Settings Trees identify whether an object is locked, a reference, or is being referenced, as shown in this table:

Icon	Meaning
	Object is locked.
	Object is being referenced by another object.
	Object is a reference to an object in another drawing.

Drawing Item Modifier Icons

The drawing item modifier icons in the Prospector Tree identify an object that is out of date or violates constraints, and also identifies the state of a local copy of a project object.

Note: To display the drawing item modifier icons, click  at the top of the Prospector Tab.

The 3 individual drawing item modifier icons are shown below:

Icon	Meaning
	The object is out of date or violates constraints.
	The project object is more recent than the local copy.
	The local copy of the project object no longer matches the project version, which means that the user has edited it.

All combinations of the drawing item modifier icons are shown below:

Icon Displayed in Drawing	Object is Out of Date or Violates Constraints	Project Object is More Recent than Local Copy	Local Copy Has Been Edited Relative to Project Object
	No	No	No
	Yes	No	No
	No	Yes	No
	Yes	Yes	No
	No	No	Yes
	Yes	No	Yes
	No	Yes	Yes
	Yes	Yes	Yes

Note: Some of the icons above are displayed only in the Points list view.

The Project Collection List Views

Use the list views displayed in the Projects collection to obtain information about the drawings and shared objects in the project.

Project Folders

All projects will use the RETTEW Standard Project Template when created. All new projects will be created by the system administrator.

Do not create a folder for point database files or a survey database. These are automatically stored directly beneath the main project folder.

A project may also include files that are not drawings. Store and access the files under the Support Folder using the Vault tool.

Working Folders

When working on objects, check associated drawings out of Vault and work on them from working folders. The objects in a working folder are physically copied from a Vault file store. Other users can still get read-only copies of the files, but cannot edit them until the drawing is checked back in. This functionality maintains a single master version of each drawing.

When checking a file back into Vault, the revised version from the working folder is copied to the file store on the server. The Vault database marks the file with the appropriate revision data and makes it available to other users.

The working folder location is C:_RettewVaultWIP

Partitioning Project Data

RETTEW's Standard divides project data across multiple drawings using a strategy that both protects data integrity and supports ease of access.

In Civil 3D, there is one master copy of each project object (ex. surface, alignment, profile, or pipe network), and that master copy is stored in a source drawing that is stored in the project's Vault database. There are virtually no restrictions on how many project objects can be stored in the same drawing, but there are some factors to consider.

A key determining factor in partitioning project data is the ability of team members to create and modify project data when they need to. Because only one person can edit a drawing at a time, placing the master copy of every project object into the same drawing is too restrictive for a collaborative environment. In general, spreading project objects across many drawings makes more sense than crowding many objects into fewer drawings.

For each project object, create a separate drawing that contains the geometry of the project object, and if needed, related project objects. Consider placing each surface in a separate drawing. At the very least, consider placing a key surface, such as the finished ground surface, in its own drawing. Avoid placing all project alignments in the same drawing.

The function of a drawing should match its content. If a drawing contains the master copy of a surface object, that drawing should not also be a plan profile sheet. Keep project object geometry in its own drawing and create separate drawings for viewing and annotating read-only copies of the geometry.

A single project must contain all data that is required for that project. A drawing cannot contain references to more than one project.

Adhering to the RETTEW Standards naming convention will make drawings containing master copies of project objects easy to identify. Name a drawing that contains a project surface with the same name as the surface; name a drawing that contains a project alignment with the name of the alignment. Store project drawings in appropriately named folders as outlined in the Standards.

RETTEW standard procedures help minimize the number of shared project objects. **Understand that when adding or checking in a drawing, they should not share an object unless it is needed by others.**

Running Vault from the Prospector Tree

It is possible to access Vault from the Prospector Tree:

1. Log into Vault from the Prospector Tree.
2. In Toolspace, on the Prospector Tab, right-click the Projects collection.
3. Click Autodesk Vault.
4. If the Welcome dialog box is displayed, click Log IN.
5. Set to Windows user.
6. Login name and password will populate.
7. Verify the server is CAPONE
8. Select the RETTEWVault. Click  to list available databases.
9. Click OK.

Viewing Relationships between Project Objects and Drawings

Use the Vault client to find drawings that reference project objects, as well as which objects are consumed in a given drawing.

Using the Vault client, view relationships for either project objects or project drawings.

NOTE: *Do not delete, modify, or move .c3dData files, and do not modify the project structure in Vault. The Vault project may become corrupted if the files are moved.*

Project Objects

1. In the Vault Client Tree, expand the  Project >  Civil 3D Data > [object] collection that contains the desired object.
2. In the Vault client workspace, select the appropriate [object].c3dData file.
3. Use the Uses and Where Used tabs to examine the object's relationship to project drawings.

Project Drawings

1. In the Vault Client Tree, expand the  Project >  folder that contains the drawing.
2. In the Vault client workspace, select the appropriate drawing.
3. Use the Uses and Where Used tabs to examine the drawing's relationship to project objects and drawings.

Working with Vault Projects

A Civil 3D project groups all the drawings and data for a single project in one place and controls access to all project files.

After logging into Vault server and database, the Projects collection in the Prospector Tree lists all projects available to the user.

NOTE: Select Master View from the list at the top of the Prospector Tab to view the Projects collection.

Logging into Vault Server

Before creating or accessing project data, log into Vault server and database from the Prospector Tree.

Before logging in, project management commands are not available on context menus in the Prospector Tree. After logging in, the projects available in the specified server and database are listed in the Prospector Tree, and applicable project management commands are displayed on the menus when a project item in the Prospector Tree is right-clicked.

To Log into Vault from Prospector

1. In Toolspace, on the Prospector Tab, select Master View from the list at the top of the Prospector Tab.
2. Right-click the Projects collection.
3. Click Log In.
4. In the Log In dialog box, select windows user.
5. User name and password will populate the boxes.
6. Select the Vault server CAPONE.
7. Select the RETTEWVault database. Click  to list available databases.
8. Optionally, select Automatically Log In Next Session.
9. Click OK.

Toolspace Context Menu

Prospector Tab (Master View): right-click Projects collection > Log In

Logging Out of Vault

Logging out of Vault terminates connection with the Vault server and database the user is currently logged into.

Viewing or accessing project data in Prospector is not an option after logging out. The user is automatically logged out when they end a civil 3D session.

To Log out of Vault

1. In Toolspace, on the Prospector Tab, right-click the Projects collection.
2. Click Log Out.

Changing the Active Project

The active project is displayed in bold type in the Prospector Tree. It is the default project for the project dialog boxes.

NOTE: *The active project is not displayed in the “Select Projects to Display” dialog box.*

To Change the Active Project

1. In Toolspace, on the Prospector Tab, expand the Projects collection and right-click a project.
2. Click Set Active.

Selecting Projects to Display

The user can limit the number of projects listed in the Prospector Tree. The projects available are determined by the server and the database the user is logged into. By default, all projects available in the database are listed in the Prospector Tree under the Projects collection.

Reducing the number of projects listed in the Prospector Tree will not only reduce the amount of data the user sees, but can also reduce the time required to update the display tree.

The display of the active project cannot be turned off, and the name of the active project is not listed in the dialog box.

To Select Projects to Display

1. In Toolspace, on the Prospector Tab, right-click the Projects collection.
2. Click Select Projects to Display.
3. In the “Select Projects to Display” dialog box, select the check box next to the name of any project listed in the Prospector Projects collection.
4. Click OK.

Toolspace Context Menu

Prospector Tab (Master View): right-click Projects collection > Select Projects to Display.

Working when Disconnected

Working with project files is possible while disconnected from Vault.

If a user is not connected to the network, they can work with local copies of the project. However, they cannot perform project management functions, such as checking files in and out, getting updated versions of any project files, or creating new references to project objects while disconnected.

Before disconnecting, update local copies of project files by getting the latest versions of them, including the source drawings for any project objects the drawing references.

Deleting a Project

Delete a project from the project database using the Vault Client.

A project can be deleted by the CAD Manager or by the user that created it.

To delete a project from the project database, delete the top-level project folder. If a file is checked out, it cannot be deleted.

After a project has been deleted from the Vault database, its name remains in the Projects collection in the Prospector Tree until the display of the tree is refreshed.

After the project has been deleted from the Vault database, use Windows Explorer to delete the local copies of project files and folders from the working folder.

Converting a Project to Data Shortcuts

Change all data references from Vault format to data shortcuts.

To Convert a Vault Project

1. In the Vault Client, right-click the project folder, and click “Get” to download the latest version of the project.
2. On the Windows Start menu, click Programs > Autodesk > AutoCAD Civil 3D 2014 > Data Shortcuts Editor.
3. In the Data Shortcuts Editor, click File menu > Open Data Shortcuts Folder. In the Browse for Folder Dialog box, browse to the folder for the project to convert.
4. In the Data shortcuts Editor, click Edit menu > Find and Replace. Replace each instance of \$ with the path to the local project folder.
5. In the Data Shortcuts Editor, click File menu > Save As, then save the new Shortcuts folder in its current location.
6. In the active project folder, delete the project .xml file.

Labeling Project Milestones

Use the Vault labeling feature to identify the status of a set of project files, such as the project milestone attained.

When a major project milestone is reached, label the files involved so they can be easily identified. When creating a label, the most recent checked in version of every file in the project is assigned that label.

Labeling does more than just tag a set of files. It allows users to archive or retrieve the set of files. Labels do not include folder information; only the project files are labeled.

To create a label in the Vault Client, right-click a project folder and click New Label.

Exporting a Project

Export a project to a ZIP file for storage, or to move the project.

When a project is exported, copies of the latest versions of all drawings and other documents are compressed and saved in a ZIP archive. This archive can be reliably imported to Vault, retaining the data references between drawings. The export operation does not affect the original project documents. They remain in place for ongoing use.

TIP: *Label project files, then export them to archive a copy of the files at a specific milestone.*

To Export a set of Project Files

1. In Toolspace, on the Prospector Tab, In Master View, expand the Projects node to see the list of projects.
2. Right-click the project to export and click Export to ZIP File.
3. In the Browse for Folder dialog box, navigate to and select the folder to save the ZIP file; click OK.
4. The system displays a progress bar while the files are compressed and saved.

Toolspace Context Menu

Prospector Tab (Master View) > right-click Project > Export to ZIP

Importing a Project from a ZIP File

Users can import a Vault project or a project that uses data shortcuts.

Data shortcuts are converted to Vault references during import.

The project to be imported can be in a folder or a ZIP file. If importing a project that was previously exported from Vault, it is in a ZIP file.

Projects with the same name as an existing project in Vault cannot be imported.

To Import a Project from a ZIP file

1. In Toolspace, on the Prospector Tab, in Master View, right-click the Projects node > Import From, and click either ZIP file or Folder.
2. In the dialog box (Import Project Archive or Browse for Folder, depending on project format), navigate to and select the project container; click OK.
3. The system displays a progress bar and status message during the import operation.

Toolspace Context Menu

Prospector Tab (Master View) > right-click Projects > Import From

File Naming & Drawing Organization

Drawing & Object Relationship

For all but the smallest projects, it is a best practice to maintain master drawings of common design objects, such as existing ground surfaces and alignments. These objects can then be referenced into other drawings as lightweight copies of the original, requiring very little space. The practice of referencing also protects the source data from unintentional changes, because the referenced objects are read-only copies. The source data cannot be changed in the host drawing.

The use of references leverages the dynamic relationship between objects. When a source object is edited, these changes automatically flow through all referenced copies in other drawings. Use one of three types of referencing with AutoCAD Civil 3D:

- Autodesk Vault
- Data shortcuts
- AutoCAD external references (XRefs)

The user is constructing a network of drawings as they create data references between project drawings. On a large project with many people, this network can become confusing and difficult to manage. To reap the benefits of data references, it is important to plan the drawing relationships in advance, and create a diagram for the project team to reference.

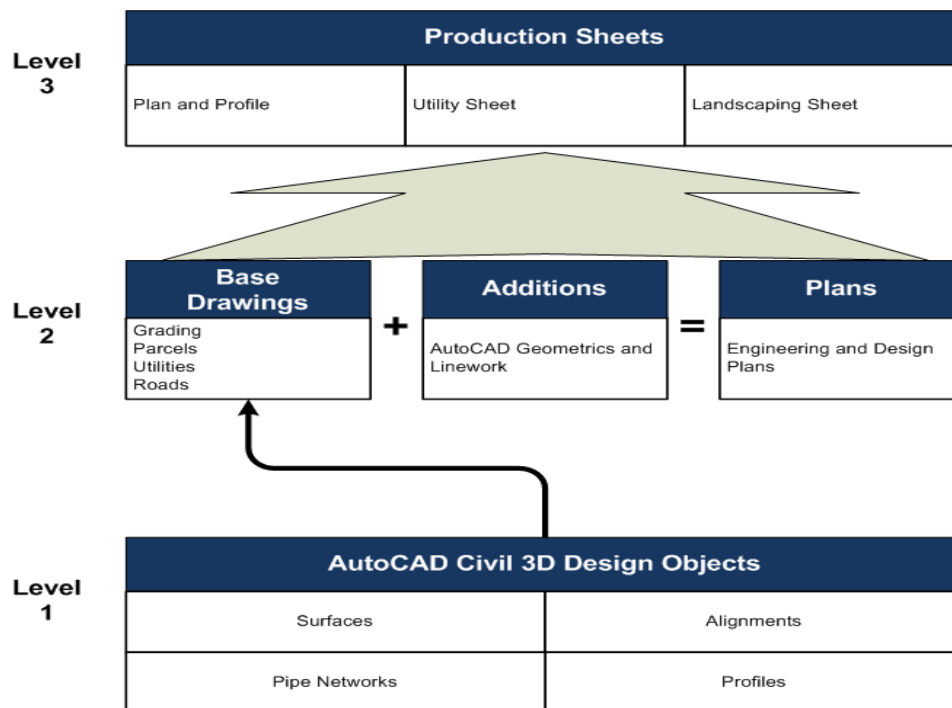


Figure 1: Three-level project drawing structure

Figure 1 shows a sample project structure. RETTEW will be using the three-level structure in our projects. The following sections describe each level.

Level 1: Individual Design Objects

In the first level of the project structure, set up the source drawings that contain basic design objects, such as existing ground surfaces, alignments, and parcel networks. Store each object in either a separate drawing or include several related objects in a single drawing.

One Object per Drawing

Keeping each object in a separate drawing is recommended for large projects. This structure ensures that users can edit objects while not preventing access to other objects by other users. This isolation of objects also minimizes the possibility of a user editing an object and accidentally affecting other objects in the same drawing.

Multiple Objects per Drawing

Group multiple objects in a single drawing for small projects, or whenever one user is solely responsible for the entire design. For example, manage all related alignments in a subdivision design in a single drawing, and manage the parcel network in another drawing. This project structure reduces the number of drawings to manage, however, there is a risk of accidental changes to objects.

Data Referencing

Use data references between Level 2 drawings to share read-only copies of objects, such as the existing ground surface.

Explicit Naming

For each drawing, create a unique file name and save it to the designated project working folder. It is recommended to name each drawing with a clear reference to the object it contains. As the number of project drawings increases, the wisdom of using explicit references in the file names becomes more apparent.

RETTEW Level 1 Files

<project #>-3D-SURF-EG	Contains the EG surface
<project #>-3D-SURF-FG	Contains the FG surface

Level 2: Base, Linework, and Engineering Drawings

After creating the design objects, create several types of drawings in Level 2 of the workflow, including base, linework, and engineering drawings.

In a multi-user environment, Engineers and Designers can reference core project objects into composite drawings, keeping the drawing size small, and ensuring that core objects are not unintentionally modified. At the same time, Technicians and Drafters can create plan sets and production drawings as required.

Base Drawings

Create base drawings, such as a utility base or grading base, by combining data references from Level 1 drawings. Use base drawings to show the existing conditions on a site, and XRef this drawing into a site features plan or a plan set.

Linework Drawings

Creating linework drawings is sometimes an intermediate step between developing engineering plans and base drawings. Linework drawings contain the linework and AutoCAD objects (such as lines, text, and blocks) that are used to build or represent existing conditions. Although linework drawings do not include AutoCAD Civil 3D objects, add linework drawings to the project to 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 other design objects in the project. For example, in a corridor model drawing, keep the drawing at a manageable size by using data references to bring in the alignment and profile from their source drawing, and the existing ground surface from its source drawing.

RETTEW Level 2 Files

<project #>-SV-BASE	Survey drawing
<project #>-LD-BASE	Proposed features
<project #>-LD-DEMO	Labels & hatching for existing items to be demolished
<project #>-LD-EROS	E&S Design
<project #>-LD-ESMT	Proposed easements
<project #>-LD-GRAD	Proposed grading & spot elevations
<project #>-LD-LAND	Proposed landscaping & lighting
<project #>-LD-PROF	Alignment profiles, pipe networks with alignments & profiles
<project #>-LD-SUBD	Proposed subdivision parcels
<project #>-LD-STRM	Drainage Area lines
<project #>-LD-DETL	Project Details
<project #>-LD-LEGN	Legends
<project #>-LD-KMAP	Sheet Keymaps

Level 3: Production Sheets

After developing the relevant base, engineering, and linework drawings, create a production sheet or a plan set drawing, such as a Plan and Profile, Utility, or Landscaping Sheet.

To generate these top-level sheets, XRef the base, engineering, and linework plans together into a plan set drawing that can be used for generating layouts with title blocks and final drafting. Before using these drawings, ensure that their latest versions are in the working folder from Vault.

This operation pulls the most recent versions of all project drawings and design objects into the working folder. After confirming they are the latest versions, create Level 3 production sheets.

Create the Plan Set Drawing

Assume the task is a plan and profile sheet. Create a new drawing, name it, and save it to the working folder. Externally reference the appropriate Level 2 drawings, such as base linework, base utility, and base topology. When creating a Level 3 drawing, the Level 2 object data and label styles are display-only. However, use Layer Manager to selectively hide and display Level 2 data.

Additional Drafting and Annotation

Data reference individual design objects into a plan set drawing and apply any required annotation or drafting. This process leverages the work done in Level 1 and 2 drawings. In addition, Drafters and Technicians can finalize the annotation for Level 3 sheets as part of a full set of construction documents.

Addressing Interference

When drawings from Level 1 and 2 are externally referenced into Level 3, there may be annotation overlaps, duplications, or other interferences. Use Layer Manager to turn off interfering text, or create a data reference of the design object in the Level 3 drawing and control its annotation there. Using this approach, Level 3 drawings can be synchronized to reflect changes that take place in lower levels. While creating references in Level 3 requires some duplicate work, it is negligible compared to the benefits of synchronizing the Level 3 sheets with the original design.

Working with Images

There may be a need to incorporate an image into a production sheet. For example, a rough grading plan sheet can include aerial photographs. Attach an image using the External References Manager.

Bypassing Level 2

Some projects may be completed without using all three levels of the workflow. In particular, the intermediate drawings in Level 2 may not be needed. Instead, create Level 3 sheets by data referencing individual objects from drawings created in Level 1. A benefit of bypassing Level 2 drawings is the ability to create labels directly in the Level 3 drawings and avoid the possibility of generating interference. However, bypassing Level 2 does have a downside; the user cannot combine objects from Level 1 with design objects such as corridors or utility networks in separate drawings.

RETTEW Level 3 Drawings

<project #>-<sheet #>-COVER

<project #>-<sheet #>--NOTES

<project #>-<sheet #>--EXISTING CONDITIONS

<project #>-<sheet #>--DEMOLITION

<project #>-<sheet #>--SUBDIVISION

<project #>-<sheet #>--LAYOUT

<project #>-<sheet #>--GRADING

<project #>-<sheet #>--UTILITY

<project #>-<sheet #>--UTILITY EASEMENT

<project #>-<sheet #>--LANDSCAPING

<project #>-<sheet #>--EROSION CONTROL

<project #>-<sheet #>--PROFILES

<project #>-<sheet #>--DETAILS

LD Workflow

1. Receive base drawings from survey.
 - A. Check SV-BASE for anything out of the ordinary (i.e. points on wrong layer/style, sheets in paper space, data in drawing).
2. Create LD-BASE using current RETTEW-LD template from Vault.
 - A. Set coordinate zone.
 - B. Draw all proposed features.
 - C. Determine and set the scale of drawings for plan set. Determine sheet size and drawing viewports based on the sheet size in the LD-BASE on the G-VIEW layer.
 - D. Use the “Proposed” multileader style to label anything requiring a leader. All text should be on the correct layer and have the correct annotation scale associated with it.
3. Create 3D-SURF-FG using the RETTEW-LD template. Save this drawing to the 3D folder.
 - A. Set coordinate zone and scale.
 - B. Data reference EG.
 - C. Create any proposed road alignments.
 - Alignments should be named according to the road name in capital letters.
 - Alignment style and label style are automatically set.
 - D. Create profile of the existing grade. Name should be “Road Name-EG”
 - E. Create proposed Profile.
 - Name should be “Road Name-FG”.

- Profile style should be set to “Proposed with marker”.
 - Label style should be “Proposed”.
 - F. Create assembly for each road section needed. Names should represent the section, i.e. “24’ Curbed Crown”.
 - G. Create corridors using finished grade profiles and assemblies.
 - Name corridors by road name.
 - Create surfaces from corridors, name accordingly.
 - H. Finish grading in other areas using whatever method is appropriate, i.e. grading objects, polylines.
 - I. Create FG surface and paste in all components for complete surface. The definition of the FG should be very clean. Most, if not all edits should be done in other surfaces before they are pasted.
 - J. Save and check-in drawing.
 - Only share data that needs to be referenced.
 - This usually includes only the FG surface and all road alignments and profiles.
4. Create LD-GRAD using current RETTEW-LD template from Vault.
- A. Set coordinate zone and scale.
 - B. Data reference FG and label.
 - C. Add any spot elevations needed.
5. Create LD-PROF using current RETTEW-LD template from Vault.
- A. Set coordinate zone and scale.
 - B. Data reference road alignments and profiles.
 - C. Data reference FG and EG and put on no display.
 - D. Create viewports based on sheet size and scale on the G-VIEW layer for the profile views.
 - E. Create profile views.
 - F. Create storm pipe networks.
 - Separate networks by outfalls.
 - Network names should be the last structure in the line.
 - The structures are set to start labeling I-1 and go up from there. When editing the structure labels, put in the description of the structure (i.e. TYPE M, TYPE C).
 - Label the pipes by the structures they are connected to (i.e. I-1 TO I-2).
 - Select structures and pipes per profile view and draw them in corresponding profile view.
 - Label structures and pipes in profile view.
 - Label structures in plan view.
 - Create alignment for any pipe runs not in a road profile. Use “Pipe Network” alignment style with no labels. Cut profile and draw and label structures.
 - G. Create Sanitary Sewer pipe network.
 - H. Run interference check between all networks.
 - I. Draw waterline in plan and profile view.

- J. Add all necessary labels.
6. Create LD-LAND using current RETTEW-LD template from Vault.
 - A. Set coordinate zone and scale.
 - B. Draw and label all landscape and lighting features.
 7. Create LD-EROS using current RETTEW-LD template from Vault.
 - A. Set coordinate zone and scale.
 - B. Draw and label all E&S features.

Create necessary sheets drawings using the *cleanslate* template. The sheets drawings should be in a subfolder under LD, corresponding with the plan type, (i.e. LD/Final or LD/ENS). You can either have all sheets in one drawing or break them out by sheet type.

A. Below are general steps for setting up a traditional land development plan all in one drawing. Each project and plan set will be unique and it is up to the designer to make the plan as clean and presentable as possible, this includes freezing and color screening extra layers that are not listed below.

- i. Insert correct size title block from Vault and fill out.
- ii. Once all common information is filled out, create a block out of the title block. This way if it needs updated, it only needs to be done once.
- iii. Unique information will need to be separate text from the title block, (i.e. sheet name, number and scale).
- iv. Xref in SV-BASE, turn off boundary, boundary labels and text, adjoiners and text, road names, right-of-way and text, zoning boundary and text, township boundary and text, wetlands and text, streams and text, soils boundaries and text and any other features that should not be screened back. Also change the color of all demo line work to red and demo text to cyan, turn all demo layers off. After this is done run the lisp routine "colorscreen". Turn on all layers. Make sure all features and text not needed are frozen, i.e. points, breaklines etc.
- v. Xref in SV-TOPO, send to back
- vi. Xref in SV-USGS, send to back
- vii. Xref in LD-DEMO
- viii. Xref in LD-BASE
- ix. Xref in LD-GRAD
- x. Xref in LD-PROF
- xi. Xref in LD-ESMT
- xii. Xref in LD-LAND
- xiii. Xref in LD-DETL
- xiv. Create cover sheet, bring in required notes and information. Create a viewport for location map using SV-USGS freeze all other xref layers in that viewport. Label with text in paper space of location map.
- xv. Create Existing Conditions & Demolition Plan. Freeze all layers except for SV-BASE, SV-TOPO & LD-DEMO in viewport.

- xvi. Create Layout Plan. Freeze all layers except for SV-BASE & LD-BASE in viewport. In the SV-BASE, freeze all utilities and labels, soils and labels in viewport. You will also need to unfreeze layers in the LD-PROF for any road centerlines and stationing.
- xvii. Create Grading Plan. Freeze all layers in LD-DEMO, LD-LAND, LD-ESMT & LD-DETL in viewport. In the SV-BASE, freeze all layout and utility text, soils and labels in viewport. In the LD-BASE freeze all layout text and screen back proposed line work in viewport. In the LD-PROF, screen back all utilities and freeze labels in viewport.
- xviii. Create Utility Plan. Freeze all layers in LD-DEMO, LD-ESMT, LD-LAND & LD-DETL in viewport. In SV-BASE, freeze all layout text, soils and soil labels in viewport. In the LD-BASE freeze all layout text and screen back proposed line work in viewport. In LD-GRAD, screen back contours and labels and freeze spots in viewport.
- xix. Create Easement Plan. Freeze all layers in LD-DEMO, LD-LAND & LD-DETL in viewport. In the SV-BASE, freeze all utility labels, soils and labels in viewport. In the LD-BASE freeze all layout text and screen back proposed line work in viewport. In LD-GRAD, screen back contours and labels and freeze spots in viewport. In LD-PROF, freeze utility labels and screen back utilities in viewport.
- xx. Create Profiles. Freeze layers in all other xrefs other than LD-PROF in viewport.
- xxi. Create Landscape & Lighting Plan. Freeze all layers in LD-DEMO, LD-ESMT, LD-LAND & LD-DETL in viewport. In SV-BASE, freeze all layout text, soils and soil labels in viewport. In the LD-BASE freeze all layout text and screen back proposed line work in viewport. In LD-GRAD, screen back contours and labels and freeze spots in viewport. In LD-PROF, freeze utility labels and screen back utilities in viewport.
- xxii. Create Details. Freeze layers in all other xrefs other than LD-DETL in viewport
 - B. If breaking out by sheet type:
 - i. Create a title block drawing using the templates from Vault. This will go in the same folder with the plan set.
 - ii. Sheets should be set up in the same manner as laid out for having a one drawing plan except for layer control and screening should be done in model space rather than each individual viewport. Here is the standard list of a sheet set for a typical LD plan set:
 - a. 01-Cover
 - b. 02-06-Exist
 - c. 07-11-Layout
 - d. 12-16-Grading
 - e. 17-21-Utility
 - f. 22-26-Easements
 - g. 27-31-Profiles
 - h. 32-36-Landscape
 - i. 37-40-Details

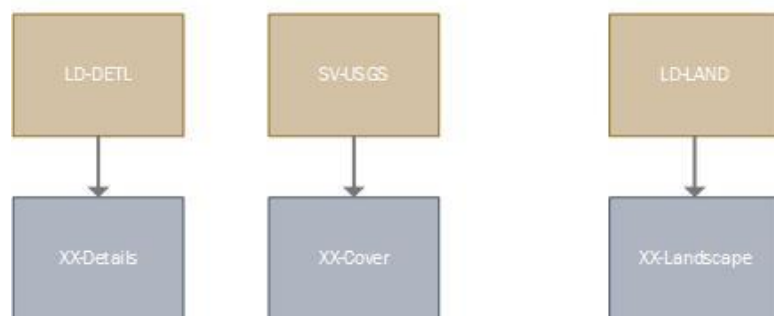
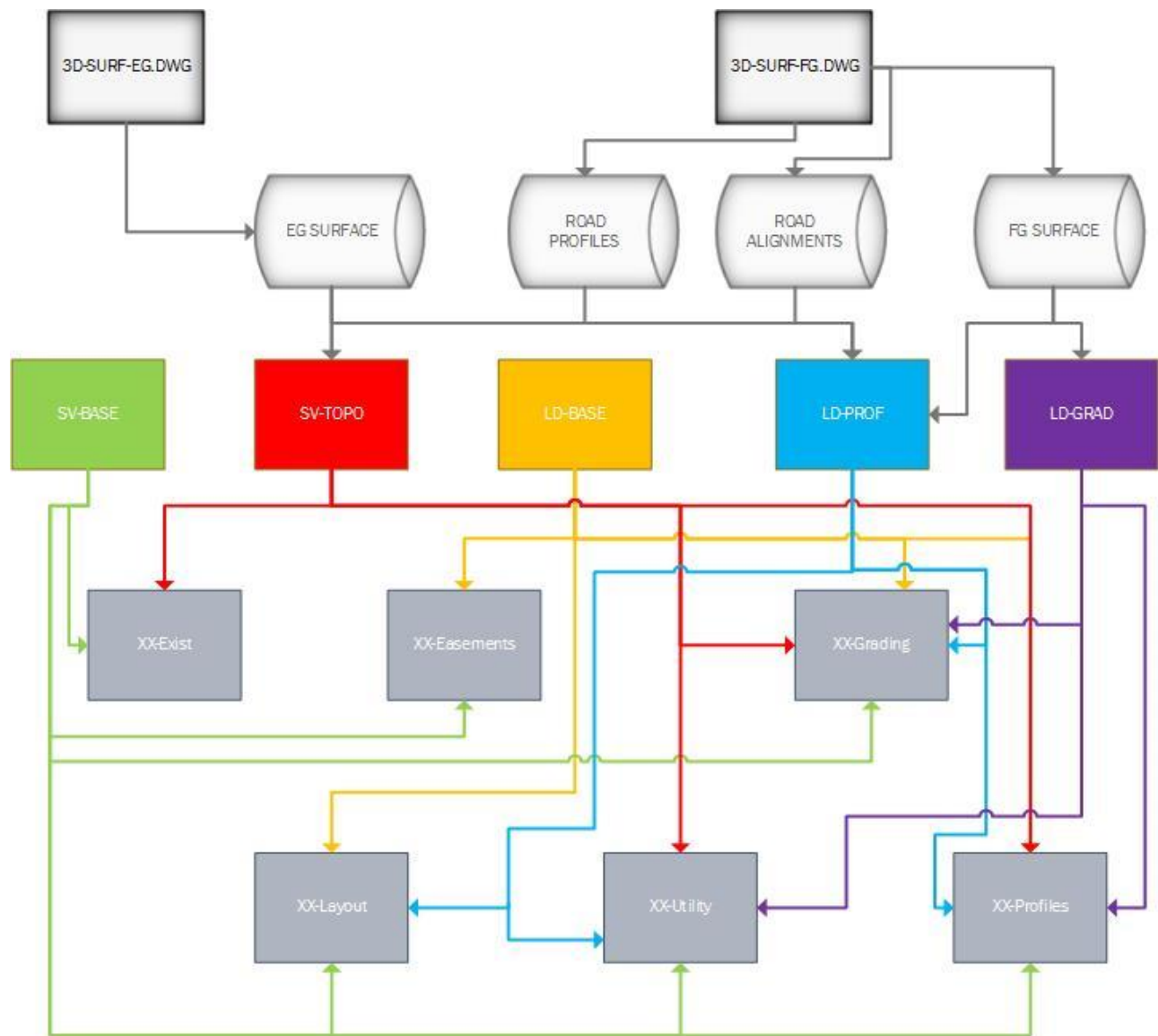
Key things to remember:

- Keep everything as clean as possible to aid the next person.

- Do not reference files outside of the project. If you need a file from an outside source, copy it and place it in the proper folder in the project.
- Plot folders should mimic what is in Vault.
- When given a task to do, make sure you understand if it might affect other aspects of the project.
- If someone asks you to do something that goes against standard, make sure to inform them that it does, and explain the problems that could arise because of it.
- If you see something that goes against standards, call the person that did it and ask if there is a reason for it. If there isn't, have them fix it or inform them that you are going to fix it.
- Use annotative text.
- Use multi-leaders.

Sample Workflow Diagrams

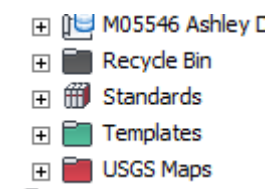
Below is a typical workflow for RETTEW projects completed in Civil 3D:



New & Outside Drawings

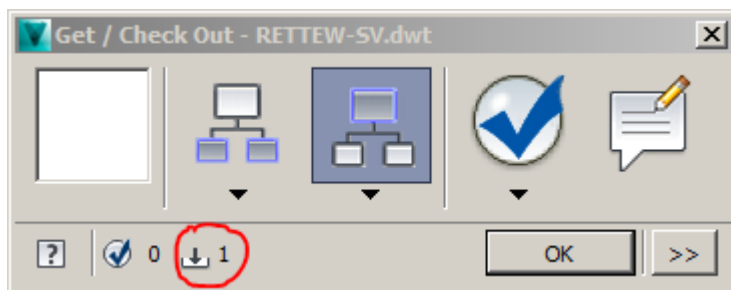
Templates

RETTEW has standard template drawings (.dwt) available for use. Each service area has a designated user in charge of producing and editing that SA specific template. All templates will be stored in Vault. They can be found in the Templates folder.



Under Templates, is a folder for each service area. Select a service area and find the template you wish to use. Select the file, right-click and hit “Get / Check Out”.

The new Get / Check Out dialog box appears.



Verify that you are downloading it and not checking it out (see circle above), and hit the OK button. This will download the template to your _RettewVaultWIP folder under Templates. Open Civil 3D, and create a new file using this path to locate your template.

Typical Level 1 & 2 Drawing Templates

RETTEW-LD-BASE.dwt To create the Land Development base drawing

RETTEW-SV-BASE.dwt To create the Survey drawing

These templates have the standard layering and Civil 3D styles for their respective drawing.

Sending Drawings to Outside Sources

From Vault Explorer, find the project and do a “get latest version” of the needed files. They will now be in the local WIP folder. Send the drawings with an electronic document release form. If there are multiple documents to be sent, best practice is to add them to a ZIP file to condense the size of the project.

Project Import and Export

Autodesk Vault provides a convenient mechanism for safely moving projects between vaults. Select a project on the Prospector Tab and export it to a single ZIP archive. This archive can be transferred as required, and imported into another Vault. Access the import operation on the Projects node of the Prospector tab. In addition to importing Vault projects, the import operation can import a data shortcuts project and convert all shortcuts to Vault references.

If there are drawings with data shortcuts, that need to be added to a Vault project, they can be added using regular Vault operations. Broken references will be detected, and after all related drawings have been added, these references will be resolved.

eTransmit

Use this standard AutoCAD function to send AutoCAD Civil 3D drawings and referenced objects to a client or remote team member. eTransmit is also useful for transferring drawings from one project to another. All drawings required to support the data references are automatically included in the package. The receiving computer must have the AutoCAD Civil 3D Object Enabler installed, or a full version of AutoCAD Civil 3D.

Note: *eTransmit is ideal for submitting finished drawings or conducting technical reviews with markups. It can also capture edits to the main drawing and update the central version. Keep in mind, edits to the referenced drawings are less reliable.*

Receiving Drawings

Save the files to the project folder located on the host server. All files should be placed in the designated sub-folder under the project folder.

Sheet Set Manager

Introduction to Sheet Set Manager

The sheet set functionality in AutoCAD enables you to efficiently create, manage, and share your entire set of sheets from one convenient location.

Highlights of Sheet Set Manager (SSM)

- Minimal effort to import current drawing layouts into a sheet set.
- Easy-to-open drawings from SSM while continuing to edit using traditional tools.
- Create new sheets using traditional tools, and import them into current sheet set.
- Easily plot, publish, archive, or create an electronic transmittal of the entire set of drawings.
- Using sheet set properties, users can easily plot to any named page setup, regardless of the setup that is saved in each drawing layout.
- Using a drawing template, users can create new sheets directly from SSM.
- The most powerful functionality is fields, which enables you to automate the sheet data that is stored in your drawings.
- You can create your own fields in the form of custom sheet set properties.

Process Overview

What is the difference between a “sheet” and a “drawing”? Technically, they are the same thing. The drawing file created by SSM is just like any other drawing. The user can draw in model space, create additional layout tabs, etc. The only limitation is that sheets in the SSM sheet list can only point to a layout in a drawing file. If more than one layout is needed in the drawing, the additional layouts will need to be imported into the sheet list. There is no technical reason to not have multiple layouts in your drawing, however, the “best practice” is to have one sheet drawing for each sheet in your set. The main benefit of this is to enable multiple users to work on different sheets at the same time.

Below is a quick overview of how sheet sets are intended to work:

1. Create model geometry in its own drawing file. Continue to create model geometry in modelspace. Continue to create XREF's.
2. Create a new sheet. Create a sheet drawing from SSM.
3. Open the sheet. (This opens the drawing that has that particular layout).
4. Add resource drawing views to the sheet layout. This is where the user creates layout viewports and attaches the model drawing XREF's. XREFs are attached in model space, and assembled into a sheet layout using titleblock, viewports, notes, etc in paper space. Only objects that should exist in model space are attachments to external references.

5. Add sheet information to the sheet layout. The user might add sheet notes or other information specific to the sheet. It is possible to draw in model space, but the intention is for the file to be a single sheet with external references to model drawings.

Adding Vault to the basic workflow for SSM, will allow the user to take full advantage of Sheet Set functionality.

Vault Integration

Vault incorporates SSM, however, it severely limits its functionality. Fortunately, it is still possible to take advantage of SSM while using Vault. To do this effectively, there are certain rules and procedures that must be followed.

1. SSM will use the local copy of all drawings. Make sure to have the latest versions.
2. The .DST file, (which will be explained later), will be stored with plots on the project local server.
3. Files must be checked out, prior to editing. There is no need to check out a file if it is only being plotted.
4. Again, SSM will be using the local copy.....MAKE SURE TO HAVE THE LATEST VERSIONS OF THE FILE before making plots!!

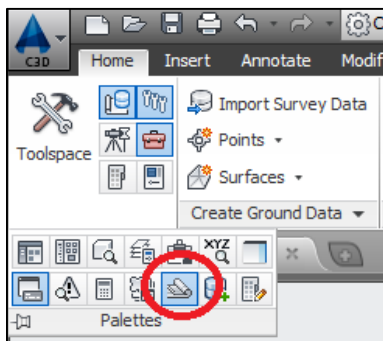
Implementing Sheet Sets with Minimal Effort

Creating a New Sheet Set

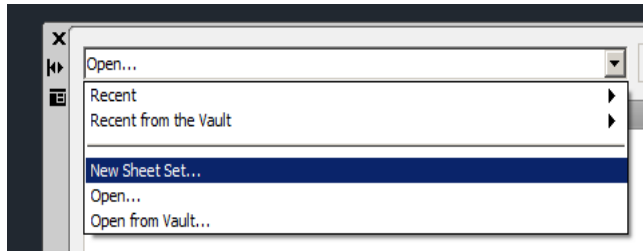
Create a sheet set using an example sheet set, or by importing existing drawing layouts as sheets. There is a sheet set template for your use called RETTEW PROJECT.dst. It can be found under the Templates folder in Vault. You can do a Get/Checkout to copy it to your local _RETTEWVAULTWIP folder.

In order to create a new sheet set based on existing drawings, those drawings must use layouts. Creating a sheet set will not edit the drawings. A sheet set is just an XML-based file with a DST extension that points to the drawing files.

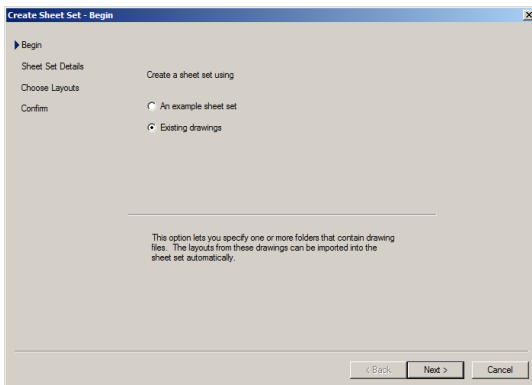
1. Make sure you have the latest versions of files locally before creating a project sheet set.



2. Start the Create Sheet Set Wizard. From the File menu, choose New Sheet Set.

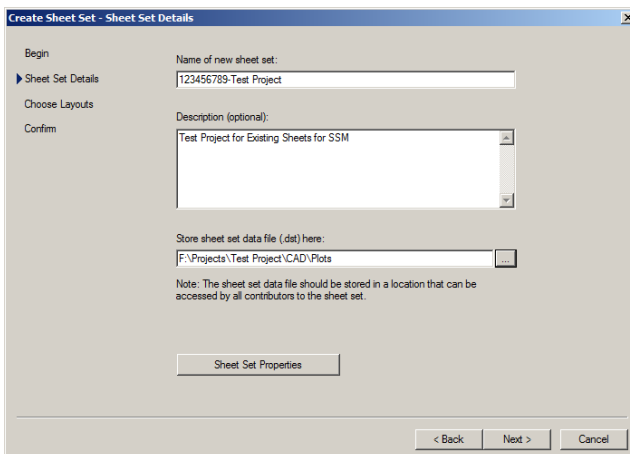


3. In the Create Sheet Set Wizard, select Existing drawings.



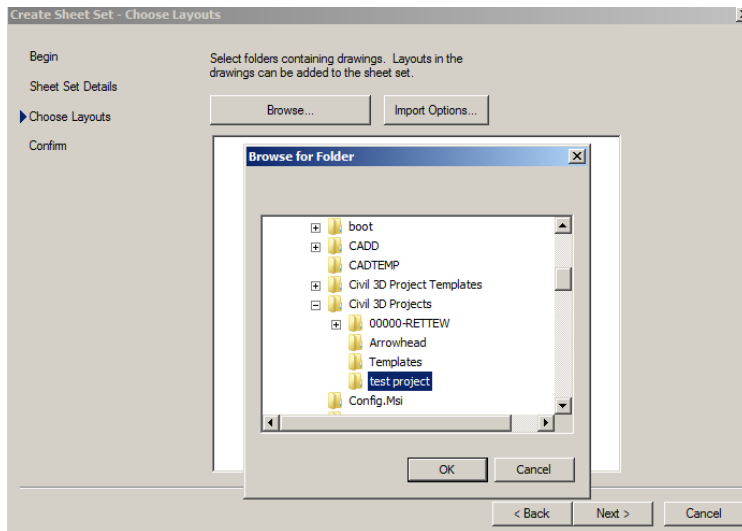
4. Specify the name and location for the sheet set file. The sheet set file is an XML-based file with a DST extension.

- a. Name the sheet set. Using project#-project name (ex. 123456789-Maple Street Project) is recommended.
- b. Provide a description for the sheet set (optional).
- c. Specify the location to store the sheet set data file. Store it with the plot files on the project host server (ex. H:\projects\12345\123456789\CAD\PLOTS).

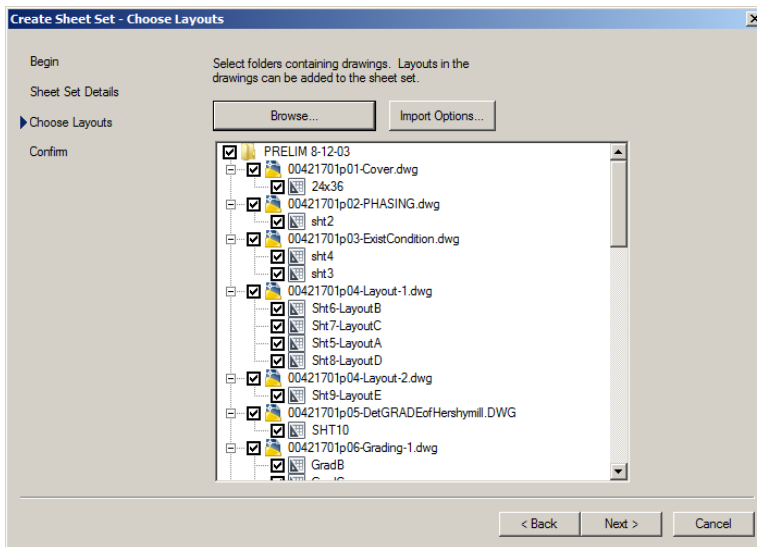


3. Select the appropriate layouts to import.

- a. Choose Browse... and navigate to the folder where the project drawings are located.



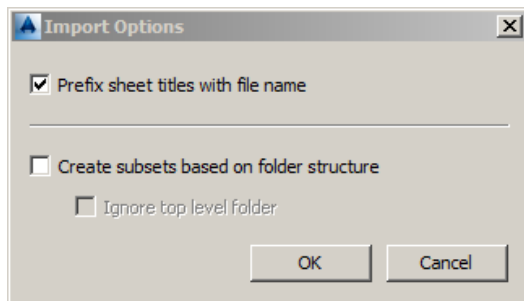
- b. Expand the folders and drawings to show all the layouts to include as sheets in the sheet set. If the drawings include multiple layouts, they will be displayed in the list.



- c. Select the layouts to be included as sheets in the sheet set. Remember to select only the drawings/layouts that will be represented as sheets. Don't select the model drawings (Level 1's and 2's).

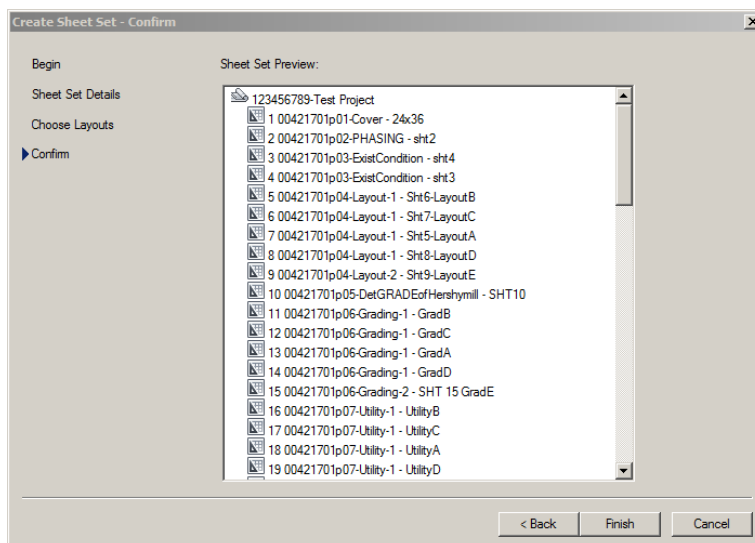
4. Specify the appropriate Import Options.

- a. Choose Import Options.
- b. If the drawing file name is to be included as part of the sheet name, choose the option to prefix sheet titles with file name. If it is preferred to create subsets in the sheet set file that match the user's folders, choose the option to create subsets based on folder structure. Subsets are like visual folders that enable organization of the sheets in the sheet list. If there is no need to create a subset of the main folder from which the drawings are imported, choose Ignore top level folder. The sheet set can always be reorganized later, if options need to change.



5. Finalize the sheet set.

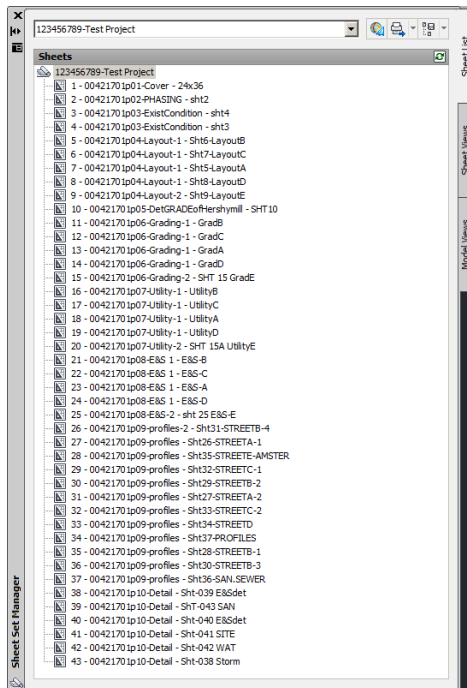
- a. Review the sheet set structure. Preview the sheet set before completing the process. If the sheet set preview is missing sheets or has extra sheets, use the back button to select different folders, drawings, layouts, or import options.
- b. Choose Finish to complete the sheet set process, when you are satisfied with the preview.



After exiting the Create Sheet Set Wizard, the sheet set data file will automatically open on the Sheet List tab of the Sheet Set Manager (SSM). The sheet names in the list are shortcuts to the layouts in your

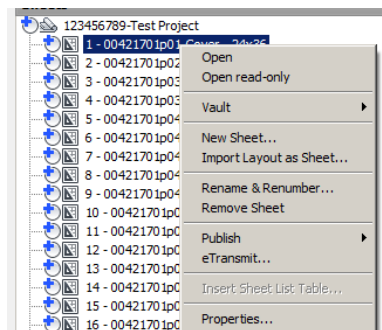
DWG files. The drawings have not changed, and CAD did not create new drawings or folders. All it did was create a sheet set data file with a list of sheets that link to the existing drawings. Use the SSM to organize and open the drawing sheets. Right-click on a sheet name and choose Rename and Renumber to enter a sheet number to change the sheet title. Reminder, SSM is pointing to local copies of the files, ALWAYS make sure to have the LATEST VERSION of all FILES! Drag and drop sheets to reorganize them in the sheet list.

Absolutely nothing in the drawings has changed. However, if the sheet set is open in the SSM, and the drawings that are being pointed to by the sheet set are opened and saved, a small piece of data will be saved with the drawings.

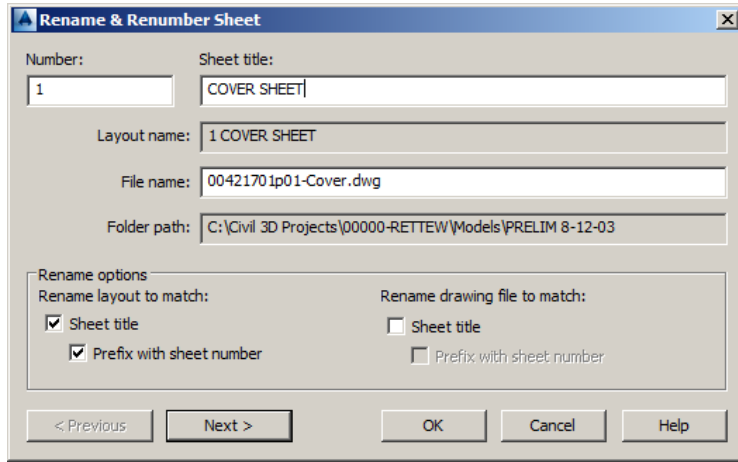


Organizing Sheets

1. Edit sheet names and numbers.
 - a. Right-click on a sheet name and choose Rename & Renumber.



- b. Enter the appropriate name and number. Use the Next and Previous buttons in the dialog box to move up and down the sheet list. DO NOT use the option to rename the associated drawing file to match the new sheet title.



The dialog box is titled "Rename & Renumber Sheet". It contains the following fields and options:

- Number:** A text box containing the value "1".
- Sheet title:** A text box containing the text "COVER SHEET".
- Layout name:** A text box containing the text "1 COVER SHEET".
- File name:** A text box containing the text "00421701p01-Cover.dwg".
- Folder path:** A text box containing the text "C:\Civil 3D Projects\00000-RETTEW\Models\PRELIM 8-12-03".
- Rename options:**
 - Rename layout to match:**
 - ☒ Sheet title
 - ☒ Prefix with sheet number
 - Rename drawing file to match:**
 - ☐ Sheet title
 - ☐ Prefix with sheet number

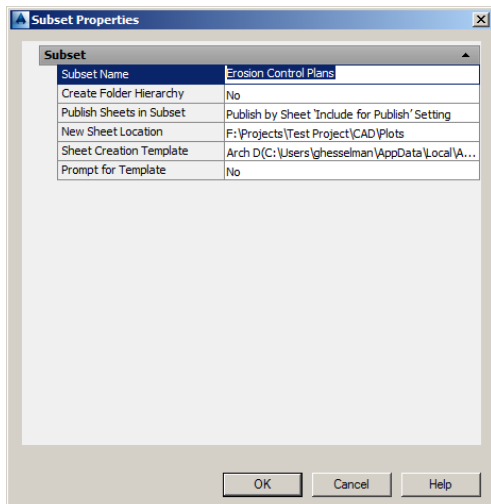
At the bottom, there are five buttons: "< Previous", "Next >", "OK", "Cancel", and "Help".

2. Remove a sheet from the sheet set.

Right-click on a sheet and choose Remove Sheet to remove it from the sheet set. When removing a sheet from the sheet set, it is not deleting the drawing from the folder. It is removing the shortcut that points to the drawing.

3. Add subsets.

- a. Right-click in the sheet set name or a subset and choose New Subset. Create subsets and nested subsets to help organize the sheets on the sheet list.
- b. Enter a name for the subset. A subset is like a visual folder on the sheet list. Adding a subset does not create a folder on the local drive.
- c. Choose OK.



The dialog box is titled "Subset Properties". It contains a table with the following data:

Subset	
Subset Name	Erosion Control Plans
Create Folder Hierarchy	No
Publish Sheets in Subset	Publish by Sheet 'Include for Publish' Setting
New Sheet Location	F:\Projects\Test Project\CAD\Plots
Sheet Creation Template	Arch D(C:\Users\ghesselman\AppData\Local\A...
Prompt for Template	No

At the bottom, there are three buttons: "OK", "Cancel", and "Help".

4. Remove subsets.

Right-click on a subset and choose Remove Subset. It is only possible to remove subsets that do not contain sheets.

5. Rearrange sheets and subsets.

Drag and drop sheets and subsets to rearrange the sheet list.

As sheets are moved, notice the sheet numbers do not automatically update to reflect their position in the sheet list. To make the sheet numbers correspond to their order in the sheet list, manually change the sheet number as described in the step one. At this point, the sheet name and number are nothing more than a way to view and access the drawing sheets by knowing their sheet numbers and/or names rather than their file names and locations. The value of the sheet names and numbers will become more obvious with each new sheet (layouts) created, using sheet set functionality.

Accessing Sheets

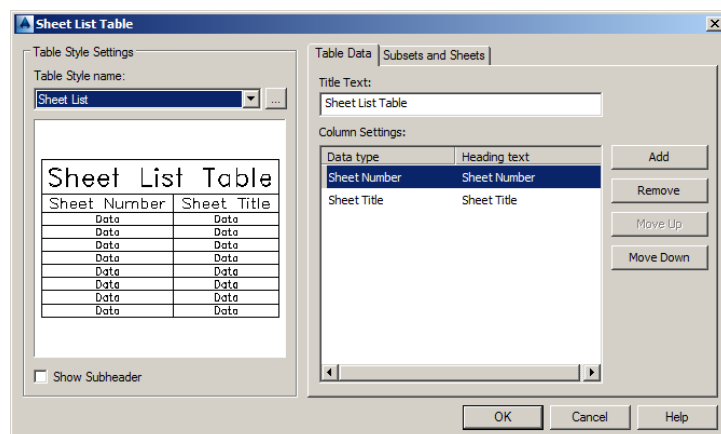
The SSM is a great way to organize sheets and access them from a central location. This sheet list can also be included as a table in a drawing. Using the SSM, a user can easily add a sheet list table to one of the sheets in the sheet set. The sheet list table can even be used to quickly open any of the sheets in the list. **Remember, SSM uses the LOCAL copy of the files, make sure to get the LATEST versions of all files!**

1. Open a sheet in the AutoCAD window.

Double-click the desired sheet to add a sheet list table. If the file is already in Vault, it will need to be checked out first. (Typically this would be the cover sheet).

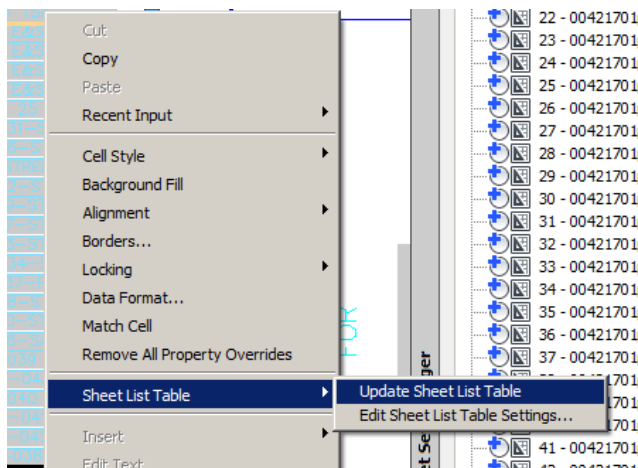
2. Insert a sheet list table.

- In the SSM, right-click the sheet set title and choose Insert Sheet List Table.
- In the Insert Sheet List Table dialog box, select a table style. If the RETTEW-TITLELOCKS.dwt template was not used, one will need to be created. Using this table style will save time and ensure consistency from project to project.



- c. Choose OK.
 - d. Place the table on the sheet. The sheet list table is an AutoCAD table object that contains fields for the sheet set data such as sheet number and sheet name. Since this is a table object, the table editing commands can be used to change its appearance. However, any edits made, will be lost the next time you update the sheet list. For this reason, do not make any edits directly to the sheet list table. To change its appearance, edit its table and/or the sheet list table settings.
3. Edit settings after inserting the Sheet List Table.
 - a. Select the sheet list table in the drawing.
 - b. Right-click and choose Edit Sheet List Table Settings.
 - c. Change the table style, title, or column settings as necessary. Any changes made using this method, will remain when the table data is refreshed.
4. Change the contents of the sheet list in the SSM.

Add, remove, rename, or renumber the sheets in the SSM. Notice the data in the drawing's sheet list table does not change automatically. The user must force the table to update.
5. Update the Sheet List Table.
 - a. Select the sheet list table in the drawing.
 - b. Right-click and choose Update Sheet List Table. The sheet list table updates to reflect any changes to the sheet list in the SSM.



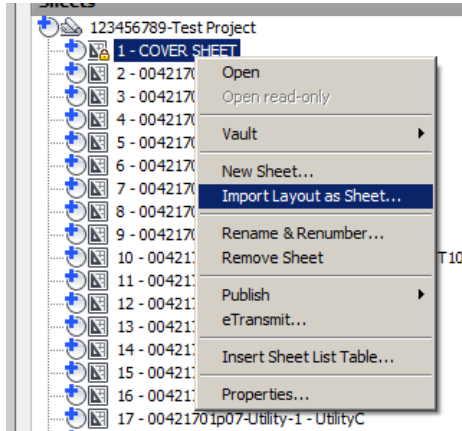
6. Access sheets from the sheet list table. Easily open any drawing sheet from the sheet list table by pressing the CTRL key and choosing the sheet name or number.

By using sheet list tables, users can appreciate how the sheet names, numbers and other data in the SSM can be used to create meaningful and automated textual data in drawings.

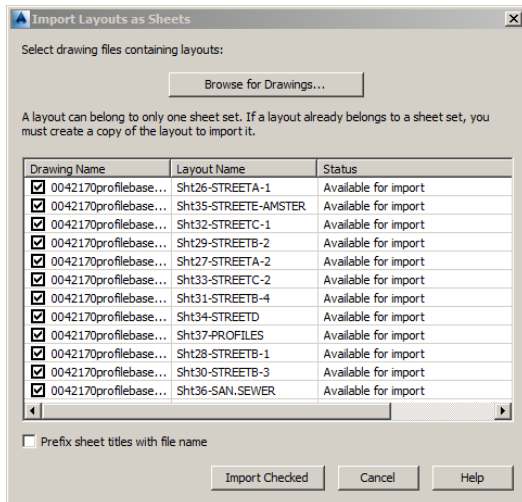
Importing Existing Layouts

This method enables users to quickly create a new sheet with pointers to an existing drawing.

1. Right-click the sheet list and choose Import Layout as Sheet. The location of the right-click determines where the new sheet will be added in the sheet list. A right-click on the sheet set name, adds the new sheet to the end of the sheet list. A right-click on a subset, adds the new sheet to the end of the subset. A right-click on a sheet, adds the new sheet below that sheet. Regardless of the location of the right-click, the user can always drag and drop the new sheet to a proper location.



2. Choose Browse for Drawings and select the drawing that contains the layout to add. After selecting a drawing, all of that drawing's layouts are listed in the Import Layouts as Sheets dialog box. Select the layouts to import. Users have the option to prefix the sheet title with the file name.



3. Choose Import Checked. The newly added sheet is like any other sheet in the sheet list. Rename, renumber and reorganize sheets as necessary.

Plotting Using Default Page Setups

Plotting sheets using their default page setups, can save a significant amount of time over the life of a project.

Using the SSM for plotting can significantly reduce the amount of time spent plotting drawings. Even being unfamiliar with a project, quickly plot the entire sheet set without having to check out, open and view each drawing file. Others can continue editing drawings while the SSM is used to send the entire set of sheets to their default plot device. Keep in mind, this method assumes each sheet has been saved with the proper plot information. Using this method is the same as opening the drawing, selecting the layout and choosing PLOT, without making any changes to the page setup.

1. In the SSM, select the sheets to plot. Use the Shift and CTRL keys to specify a range or specific sheets. The user can also select subsets or the entire sheet set.
2. Right-click and choose Publish>Publish to PDF.

Publishing to DWF

DWF (Design Web Format) enables sharing of design data in a secure and lightweight format. It's like plotting to PDF but better. Unlike PDF, DWF files are vector based to give better quality with smaller file sizes. DWFs may be posted to a project site or sent via email. The recipient can view and plot it to scale using the free DWF viewer.

Creating Archive/Transmittal Sets

Use eTransmit with a sheet set to package multiple drawings and all associated files with minimal effort.

1. Close or save drawings.

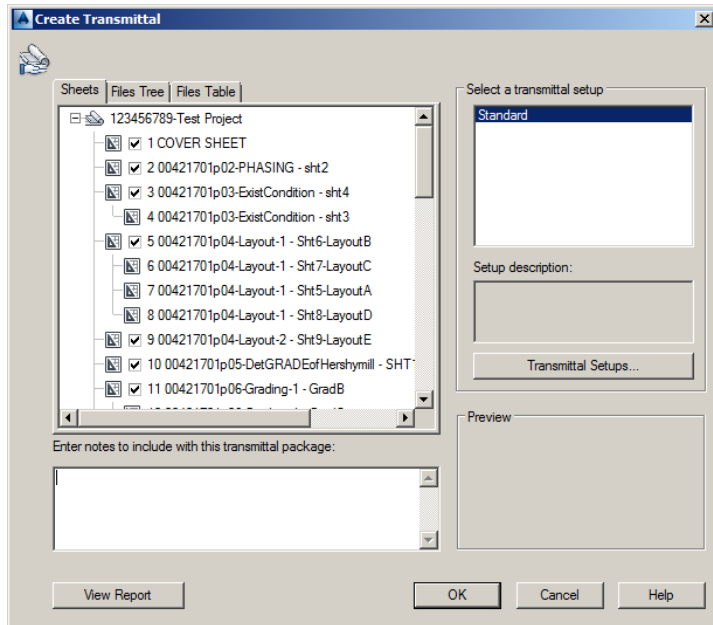
Close or save any open sheet set drawings that have been edited.

2. Select sheets to include in the transmittal set.

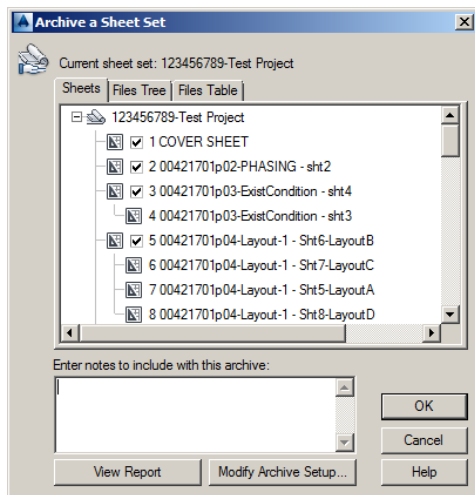
In the SSM, use Shift and CTRL keys to select a range of specific sheets, subsets, or the entire set of sheets.

3. Create a transmittal set.
 - a. Right-click and choose eTransmit.
 - b. In the Create Transmittal dialog box, select Transmittal Setups.

- c. In the Transmittal Setups dialog box, create or modify a transmittal setup. By default, AutoCAD includes a Standard transmittal setup. Modify the Standard transmittal setup or create any number of new ones.
- d. In the Create Transmittal dialog box, use the Sheets, File Tree, or Files Table tabs to add and remove files from the transmittal set. When using eTransmit in a drawing without a sheet set, the Sheets tab is not displayed.



- e. Choose View Report to see a comprehensive list of all files and sheet set information included with the transmittal set.
 - f. Choose OK to close the Create Transmittal dialog box and create the transmittal set.
4. Create an Archive Set.
 - a. Creating an archive set is very similar to creating a transmittal set. They use the same underlying technology, however Archive has been simplified for the single purpose of archiving the sheet set.
 - b. On the Sheet List tab of the SSM, right-click on the sheet set name and choose Archive. Unlike eTransmit, Archive is only available for a sheet set. Similar to eTransmit, any open drawings that have been edited, must be closed or saved.
 - c. Choose Modify Archive setup to modify Archive Setup options similar to eTransmit. Like eTransmit, the Archive setup is saved with the sheet set data file. Unlike eTransmit, there is only one Archive Setup, and it cannot be imported from another sheet set.
 - d. Use sheets, File Tree, or Files Table tabs to add and remove files from the archive set.

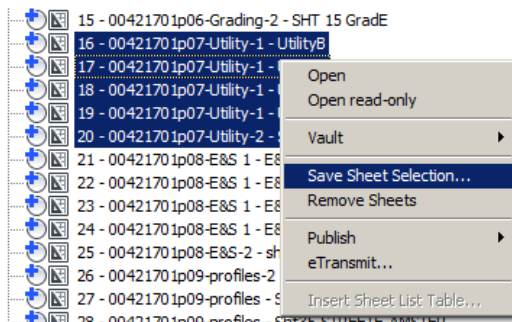


The original files are not modified using either eTransmit or Archive. AutoCAD makes a copy of the files using the specified criteria in the transmittal or archive setups.

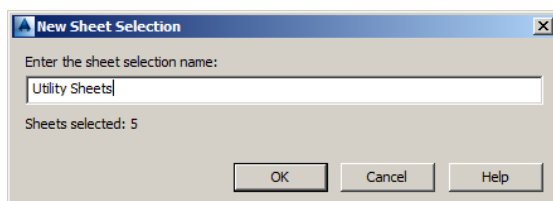
Using Named Sheet Selections

This function is very handy for plotting various selections of sheets, many times throughout the project. Rather than having to scroll through and select the appropriate sheets each time, create named sheet selections.

1. Create named sheet selections. You will repeat this process for each named sheet selection created.
 - a. Select several sheets and/or subsets using the Shift or CTRL keys to include in the named sheet selection.
 - b. From the Sheet Selections drop-down list, choose Create. If multiple sheets are selected, right-click and choose Save Sheet Selection.



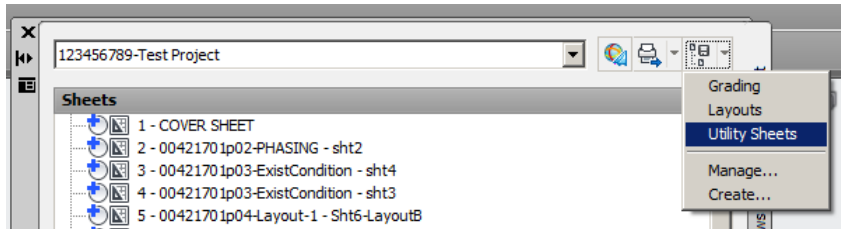
- c. Enter a name for the sheet selection. Suggestions are Client set, Design review, Grading sheets, etc.



- d. Choose OK.

2. Restore different named sheet selections.

From the Sheet Selections drop-down list, choose a named sheet selection. The sheets that were selected when the named sheet was created, are highlighted and ready for to plot, publish to DWF, or eTransmit.

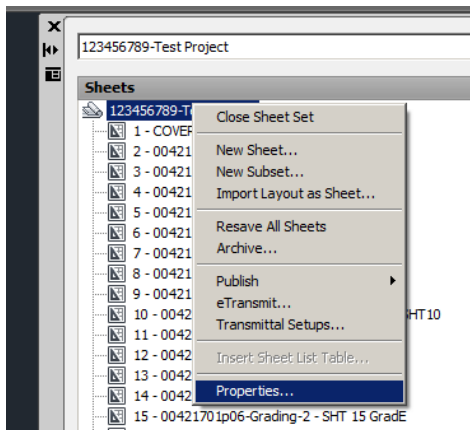


3. Manage named sheet selections.

- a. From the Sheet Selections drop-down list, select Manage.
- b. Choose Rename or Delete.

Assigning Sheet Set Properties

Sheet set properties can be found by right-clicking the sheet set title in the Sheet List tab of the Sheet Set Manager and selecting Properties.



Note that you will also find Properties option in the right-click menu for subsets and sheets. Depending on which item is right-clicked, selecting Properties will display different dialog boxes (Sheet Set Properties, Subset Properties, Sheet Properties) enabling the user to view and change the relevant properties for that particular item.

The Sheet Set Properties dialog box includes three sections: Sheet Set, Project Control, and Sheet Creation. The Sheet Set section name property references the name of the sheet set. It uses the name provided when the sheet set was created with the Create Sheet Set Wizard. That name was also used for the name of the sheet set data file (DST). Name changes can be made here, however the name of the

sheet set data file will not change. To change the name of the DST file, close the sheet set in SSM and use Windows Explorer to rename the DST file.

Sheet Set Properties - 123456789-Test Project

Sheet Set	
Name	123456789-Test Project
Sheet set data file	F:\Projects\Test Project\CAD\Plots\123456789...
Description	Test Project for Existing Sheets for SSM
Model view	C:\Civil 3D Projects\00000-RETTEW\Models
Label block for views	
Callout blocks	
Page setup overrides file	C:\Users\ghesselman\AppData\Local\Autodesk...
Project Control	
Project number	
Project name	
Project phase	
Project milestone	
Sheet Creation	
Sheet storage location	F:\Projects\Test Project\CAD\Plots
Sheet creation template	Arch D(C:\Users\ghesselman\AppData\Local\A...
Prompt for template	No

Edit Custom Properties... OK Cancel Help

Subset Properties

Subset	
Subset Name	Erosion Control Plans
Publish Sheets in Subset	Publish by Sheet 'Include for Publish' Setting
New Sheet Location	F:\Projects\Test Project\CAD\Plots
Sheet Creation Template	Arch D(C:\Users\ghesselman\AppData\Local\A...
Prompt for Template	Yes

OK Cancel Help

Sheet Properties

Sheet	
Sheet title	COVER SHEET
Sheet number	1
Description	
Include for Publish	Yes
Expected layout	1 COVER SHEET(C:\Civil 3D Projects\00000-RE...
Found layout	1 COVER SHEET(C:\Civil 3D Projects\00000-RE...
Sheet set	123456789-Test Project
Revision number	
Revision date	
Purpose	
Category	

Rename options

Rename layout to match:

☒ Sheet title

☒ Prefix with sheet number

Rename drawing file to match:

☐ Sheet title

☐ Prefix with sheet number

OK Cancel Help

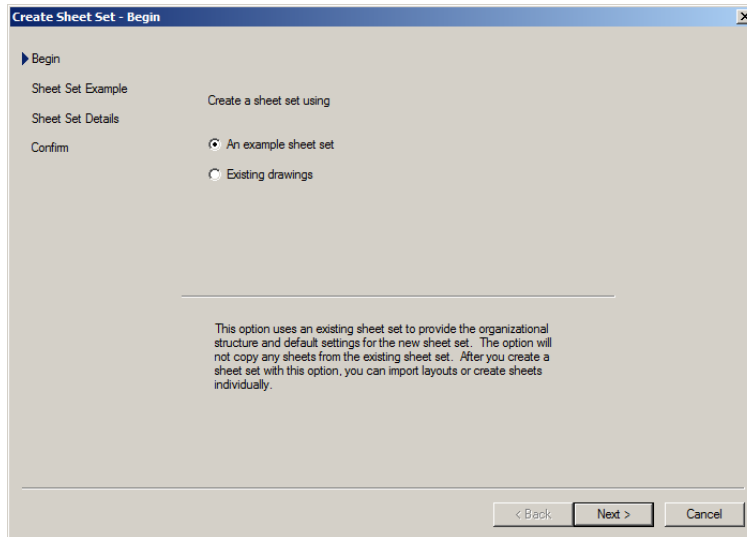
Creating New Sheets

To create a new drawing (sheet) more efficiently, use the RETTEW default sheet template along with the RETTEW default DST file.

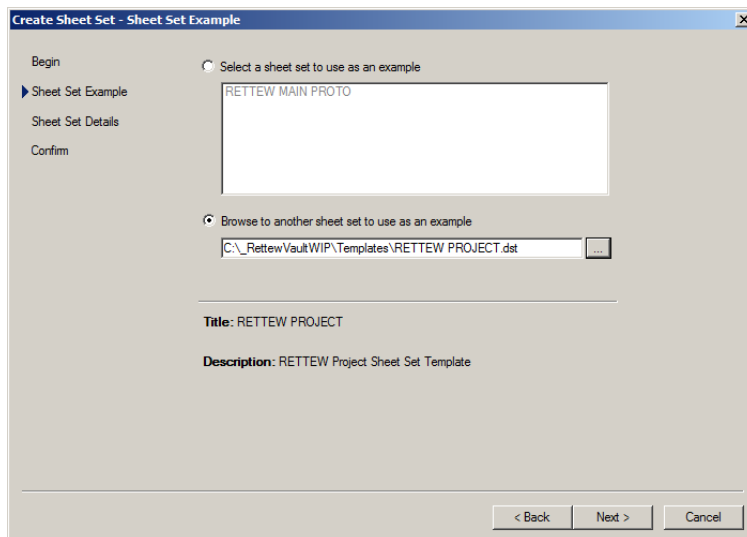
1. Download the required templates from Vault locally. (The RETTEW-PROJECT.dst and RETTEW-TITLEBLOCKS.dwt from the Templates folder).



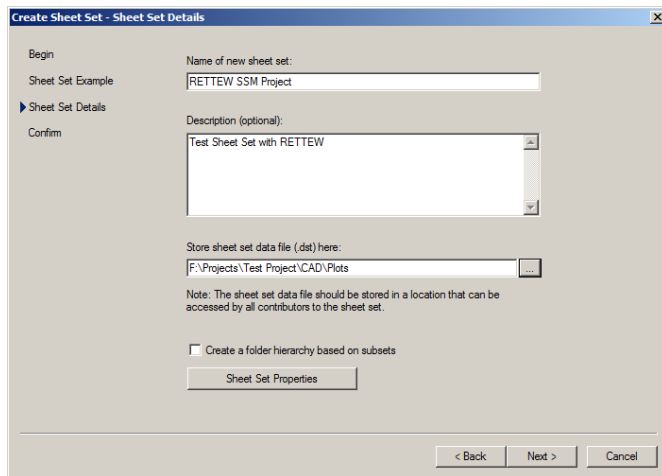
2. Create a new sheet set using “An example sheet set”



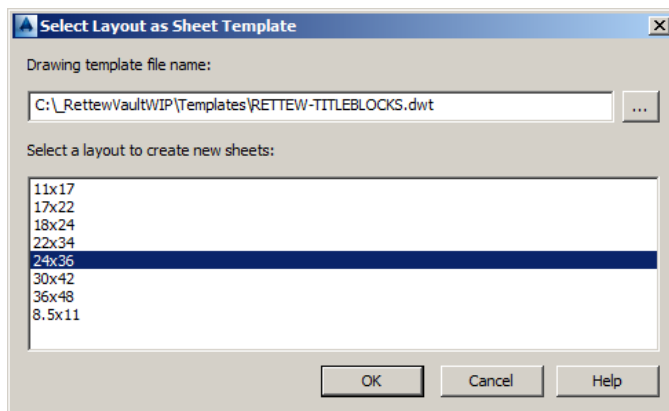
3. Browse to the DST template downloaded from Vault.



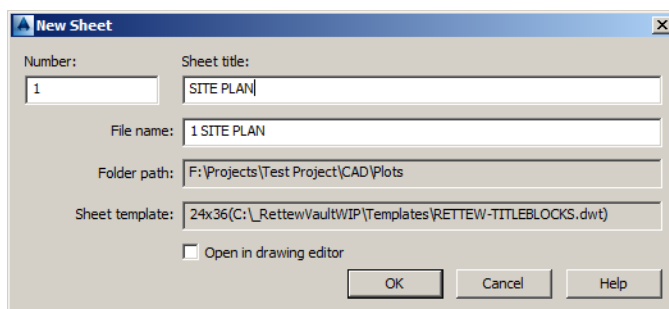
4. Type the name of the new Sheet Set project, add a description, and browse to the desired path location for the DST file (where the plot drawings are located on a server).



5. Confirm your information and select Finish. The RETTEW-PROJECT DST file has custom properties to fill out which will populate the sheet template titleblock.
6. Under Properties, Sheet Creation, change the sheet storage location to the correct path for the sheet to be used in Vault.
7. Right-click the Sheet Set name and select New Sheet.
8. Path to the RETTEW-TITLEBLOCK.dwt file loaded from Vault and select the desired sheet size.



9. Give the new sheet a number and title.



10. Right-click the sheet set title, and select Properties. Complete all the titleblock information. There is information under Project Control as well as Sheet Set Custom Properties.

The screenshot shows the 'Sheet Set Properties - RETTEW SSM Project' dialog box. It contains several sections with form fields:

- Model view**: Label block for views (C:_RettewVault\WIP\Templates\RETTEW-TIT...), Callout blocks, Page setup overrides file (C:\Users\ghesselman\AppData\Local\Autodesk...).
- Project Control**: Project number (0123456789), Project name (RETTEW SSM PROJECT), Project phase (FINAL PLANS), Project milestone (6/2/14).
- Sheet Custom Properties**: Design By (DSN), Drawn By (CAD).
- Sheet Creation**: Sheet storage location (F:\Projects\Test Project\CAD\Plots), Sheet creation template (24x36(C:_RettewVault\WIP\Templates\RETTE...), Prompt for template (Yes).
- Sheet Set Custom Properties**: Checked By (MAN), Client (RETTEW), Client Address 1 (23 MAIN STREET), Client Address 2 (LANCASTER, PA 17603), Client Address 3 ((717)-222-8888), Fieldbook No (#), Project County And State (LANCASTER COUNTY, PA), Project Manager (MANAGER), Project Township (LANCASTER TOWNSHIP).

At the bottom, there are buttons for 'Edit Custom Properties...', 'OK', 'Cancel', and 'Help'.

11. Right-click the individual sheet, select Properties, and complete the titleblock information.

The screenshot shows the 'Sheet Properties' dialog box. It contains the following sections:

- Sheet**: Sheet title (SITE PLAN), Sheet number (1), Description, Include for Publish (Yes), Expected layout (1 SITE PLAN(F:\Projects\Test Project\CAD\Plot...), Found layout (1 SITE PLAN(F:\Projects\Test Project\CAD\Plot...), Sheet set (RETTEW SSM Project), Revision number, Revision date, Purpose, Category.
- Sheet Custom Properties**: Design By (DWG), Drawn By (BAT).
- Rename options**: Rename layout to match: ☒ Sheet title, ☒ Prefix with sheet number; Rename drawing file to match: ☐ Sheet title, ☐ Prefix with sheet number.

At the bottom, there are buttons for 'OK', 'Cancel', and 'Help'.

12. Open the sheet to confirm all titleblock information is visible and correct.

####	
SITE PLAN FOR RETTEW SSM PROJECT	
FINAL PLANS	
LANCASTER TOWNSHIP	LANCASTER COUNTY, PA
DATE: 6/2/14	
SHEET NO. 1 OF 10	
DWG. NO. 0123456789	

13. Add in the desired XREF's and notes.

14. Check the files into Vault when completed.

Text Height, Styles & Dimensioning

Text

Annotation must be placed in model space (of XREF drawing files) with the linework it is associated with. There are cases however, in which annotation (notes, legends, etc.) may appear in paper space. All proposed annotation must be UPPERCASE and all existing annotation must be lower case.

Civil 3D Labels vs. Annotative Text

You may use both Civil 3D Labels and Annotative MTEXT and MLEADERS. Both have different properties, and for any given task, one may be more appropriate than the other. The following table contains a brief synopsis of the differences between Civil 3D Labels and Annotative MTEXT and MLEADERS. Most items in the table apply to either, but some are specific to MLEADERS. The majority of these items also apply to Annotative Dimensions.

Civil 3D Labels	Annotative MTEXT & MLEADERS
Cannot use Fields.	Can use Fields.
Can display dynamic data associated with Civil 3D elements, such as bearings, northing/easting, lat/long, etc.	Cannot see custom properties of Civil 3D elements.
Can orient to Object, View, or WCS, depending on the setting in the Style.	Orients to USC current when object is created, unless “Match Viewport Orientation” is selected in the Style.
Loses Text Overrides when copied between drawings or when Style is changed.	Retains text contents when copied between drawings or when Style is changed.
Rotation is controlled via the Style settings, and cannot be overridden.	Can be freely rotated, and will retain new rotation angle (unless “Match Viewport Orientation” is set in the Style).
Has option to “Flip Plan Readable” with “Readability Bias.”	Cannot “Flip Plan Readable.”
Scales by Viewport Scale in paper space, and by the Drawing Scale in model space.	Scales by Annotation Scale.
Must use Layers+VPFREEZE to control visibility in viewports.	Can use either Layers+VPFREEZE or Annotation Scales to control visibility in viewports.
Cannot override settings in Styles, and must create a new style to alter any display settings.	Styles settings can be overridden for each individual entity.
Label can be placed with accompanying Marker.	Does not include a Marker.
Each Style can be composed of multiple components, including Block and Line Components, for flexible appearance.	Contents limited to a single Text or Block Component for MLEADERS, with no options for Block or Text Components in MTEXT.
Leader segments cannot be constrained.	Leader segments can be constrained to specific angles.
Can only have a single Leader.	Can have multiple Leaders.

No advanced layout options.	Has advanced layout options, such as MLEADERALIGN & MLEADERCOLLECT.
-----------------------------	---

Scaling occurs differently for Civil 3D Labels than for Annotative Text. Two types of labels can get “out of sync” unless both the Annotation Scale and the Viewport scale (in paper space) or the Drawing Scale (model space) is changed. The Scale combo box in the Status Bar at the bottom of the screen will change both settings simultaneously. It is a best practice to always change your scales by using the setting in the Status Bar.

Text Styles

Style	Font Name	Annotative	Paper Text Height	Oblique Angle
EXISTING	Simplex	No	0.00	22.00
FANCY	Italic	Yes	0.10	0.00
L100	Simplex	Yes	0.10	0.00
L120	Simplex	Yes	0.12	0.00
L125	Simplex	Yes	0.125	0.00
L140	Simplex	Yes	0.14	0.00
L175	Romand	Yes	0.175	0.00
L200	Romand	Yes	0.20	0.00
L240	Romand	Yes	0.24	0.00
L290	Romant	Yes	0.29	0.00
L350	Romant	Yes	0.35	0.00
L40	Simplex	Yes	0.04	0.00
L425	Romant	Yes	0.425	0.00
L50	Simplex	Yes	0.05	0.00
L500	Romant	Yes	0.50	0.00
L60	Simplex	Yes	0.06	0.00
L70	Simplex	Yes	0.07	0.00
L80	Simplex	Yes	0.08	0.00
Legend	Calibri (TT)	No	0.00	0.00
LS100	Simplex	Yes	0.10	22.00
LS120	Simplex	Yes	0.12	22.00
LS60	Simplex	Yes	0.06	22.00
LS70	Simplex	Yes	0.07	22.00
LS80	Simplex	Yes	0.08	22.00
PROPOSED	Simplex	No	0.00	0.00
SOLID	Solid	No	0.00	0.00
TITLE	Romand	No	0.00	0.00

Notes

Use MTEXT to create numbered notes. The title shall be <color>, underlined and 0.20; sub-titles shall be <color>, not underlined and 0.14; and text shall be <bylayer> and 0.10.

Dimension Styles

PROPOSED Dimension Style:

- Arrowheads: Closed Filled
- Arrow Size: 0.14
- Text Style: Proposed
- Text Height: 0.10
- Scale for Dimension Features: Annotative

EXISTING Dimension Style:

- Arrowheads: Open 30
- Arrow Size: 0.10
- Text Style: Existing
- Text Height: 0.80
- Scale for Dimension Features: Annotative

Annotative Text

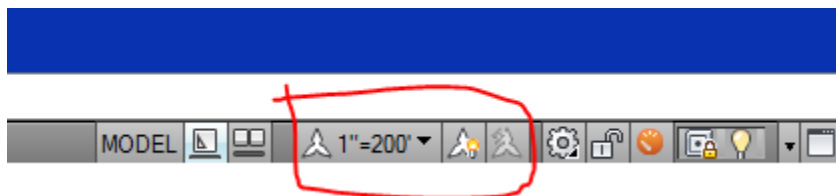
Annotative Scale texts are a great way to speed the annotation process when a drawing needs to be shown in different scales.

There is a property for several entities called Annotative Scale. This property allows the user to show objects differently according to the Active Annotation Scale. This is useful for Text Notes.

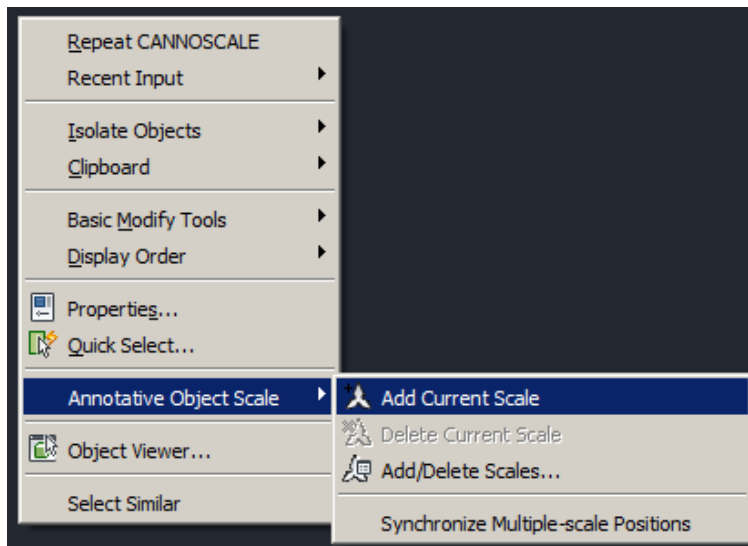
Example, if a project shown at 1"=200' scale has many descriptive notes, the notes will be the appropriate size and printed at 1"=200'. However, if the same drawing is used to show an enlarged portion of the project by zooming into it, the notes will be twice the size when printed. Annotation Scale will help you solve this.

Select the text and click on the Properties Tab. The property called "Annotative" should be set to "YES." The system variable ANNOAUTOSCALE, controls if new annotation scales are added automatically or not. It has values ranging from -4 to 4, see below for the differences in each value.

Setting the ANNOAUTOSCALE to automatically add annotation scales to all objects is not recommended; that would increase the file size. Instead, set the Annotation Scale of the drawing by selecting it on the lower right side of the screen.



Select the objects to add new annotative scales too, right click -> Add Current Scale.



A different orientation can be set for each annotative scale. Using the ROTATE command on text, will rotate all of its Annotative instances. Alternatively, selecting the text, choosing the Properties tab, and entering a new rotation, will ONLY apply to the current Annotative Scale.



The 1"=200' text is aligned in one direction, while the 1"=100' text (the smaller text) is aligned according to the enlarged plan orientation.

ANNOAUTOSCALE

Update annotative objects to support the annotation scale when the annotation scale is changed.

When the value is negative, the autoscale functionality is turned off, but the settings are maintained:

1	Adds the newly set annotation scale to annotative objects that support the current scale, except for those on layers that are turned off, frozen, locked, or set to Viewport > Freeze.
-1	ANNOAUTOSCALE is turned off, but when turned back on, is set to 1.

2	Adds the newly set annotation scale to annotative objects that support the current scale except for those on layers that are turned off, frozen, or set to Viewport > Freeze.
-2	ANNOAUTOSCALE is turned off, but when turned back on, is set to 2.
3	Adds the newly set annotation scale to annotative objects that support the current scale except for those on layers that are locked.
-3	ANNOAUTOSCALE is turned off, but when turned back on, is set to 3.
4	Adds the newly set annotation scale to all annotative objects that support the current scale.
-4	ANNOAUTOSCALE is turned off, but when turned back on, is set to 4.

Layers

Layer Name Format

Hierarchy of Data Fields

The layer format is organized as a hierarchy. This arrangement allows users to select from a number of options for naming layers according to the level of detailed information desired. Layer names consist of distinct data fields separated from one another by dashes. A detailed list of abbreviations, or field codes, is prescribed to define the content of layers.

There are four defined layer name data fields: **Discipline Designator**, **Major Group**, **Minor Group**, and **Status**. The Discipline Designator and Major Group fields are mandatory. The Minor Group and Status fields are optional. Each data field is separated from adjacent fields by a dash ("-") for clarity.

Ex. The complete U.S. National CAD Standard layer name format showing the Discipline Designator, the Major Group, two Minor Groups, and the Status fields.

V	I	-	S	I	T	E	-	F	E	N	C	-	T	E	X	T	-	D
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Discipline Designator, Level 1

The Discipline Designator denotes the category of subject matter contained on the specified layer. The Discipline Designator is a two character field. The first character is the discipline character, and the second is an optional modifier.

V	-	S	I	T	E	-	F	E	N	C	-	T	E	X	T	-	D
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

LEVEL 1 DISCIPLINE DESIGNATORS	
A	Architectural
B	Geotechnical
C	Civil
D	Process
E	Electrical
F	Fire Protection
G	General
H	Hazardous Materials
I	Interiors
L	Landscape
M	Mechanical
O	Operations
P	Plumbing
Q	Equipment

R	Resource
S	Structural
T	Telecommunications
V	Survey/Mapping
X	Other Disciplines
Z	Contractor/Shop Drawings

Discipline Designator, Level 2

The optional second character is used to further define the discipline character.

V	I	-	S	I	T	E	-	F	E	N	C	-	T	E	X	T	-	D
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

**For a complete list of Discipline Designators, see the layer lists for RETTEW Associates on the following pages.*

Major Group

The major group is a four character field that identifies a major building system. The Major Group field codes (four character abbreviations) shown on the Layer List are logically grouped with specific discipline designators.

V	I	-	S	I	T	E	-	F	E	N	C	-	T	E	X	T	-	D
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Minor Group

This is an optional, four character field to further define the Major Group. A second minor group may be used to modify any Major Group, provided that the definition of the Minor Group remains unchanged.

V	I	-	S	I	T	E	-	F	E	N	C	-	T	E	X	T	-	D
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Status (Phase)

The status field is an optional single character field that distinguishes the data contained on the layer, according to the status of the work or the construction phase. The prescribed field codes for this field are as follows:

STATUS FIELD CODES	
D	Existing to demolish
E	Existing to remain
F	Future work
M	Items to be moved
N	New work
T	Temporary work
X	Not in contract
1-9	Phase numbers

Annotation Layer List

Annotation Field Codes

Annotation consists of text, dimensions, notes, sheet borders, detail references and other elements on CAD drawings that do not represent physical aspects of an object. Use of the Major Group ANNO allows all annotation to be placed in a defined group of layers.

The Layer names shown below provide examples for the use of Minor Group field codes for annotation. **These Minor Groups may be used to modify any Major or Minor Groups in the Layer List.**

Annotation Layer Names

Layer Name	Description
#-ANNO	Annotation
#-####-BRNG	Bearings and distance labels
#-####-DIMS	Dimensions
#-####-IDEN	Identification tags
#-####-KEYN	Keynotes
#-####-LABL	Labels
#-####-LEGN	Legends, symbol keys
#-####-LOGO	Company logo
#-####-MARK	Markers, break marks, leaders
#-####-MATC	Match lines
#-####-NOTE	Notes
#-####-NPLT	Non-plotting graphic information
#-####-PROS	Date/Time/File name stamp
#-####-RDME	Read-me layer (not plotted)
#-####-REDL	Redlines
#-####-REFR	Reference, external files
#-####-REVC	Revision clouds
#-####-REVS	Revisions
#-####-SCHD	Schedules
#-####-STMP	Professional stamps
#-####-SYMB	Reference symbols
#-####-TABL	Data tables
#-####-TEXT	Text
#-####-TITL	Drawing or detail titles
#-####-TTLB	Border and title block

General Layer List

General Layer Name	Description	Linetype	Color
G-ANNO-LOGO	Title block: company logos	Continuous	161
G-ANNO-MATC	Match lines	Continuous	161
G-ANNO-NPLT	Non-plotting graphic information	Continuous	7
G-ANNO-SYMB	North arrow	Continuous	1
G-ANNO-TEXT	Text	Continuous	141
G-ANNO-TTLB	Title block	Continuous	5
G-ANNO-TTLB-MEDM	Title block: medium	Continuous	114
G-ANNO-TTLB-TEXT	Title block: text	Continuous	161
G-ANNO-TTLB-TITL	Title block: title	Continuous	4
G-DETL-LINE	Details: line	Continuous	191
G-DETL-LINE-HEVY	Details: line: heavy	Continuous	242
G-DETL-LINE-MEDM	Details: line: medium	Continuous	114
G-DETL-LINE-THIN	Details: line: thin	Continuous	97
G-DETL-PATT	Details: patterns, hatching	Continuous	144
G-DETL-TEXT	Details: text	Continuous	141
G-DETL-TITL	Details: titles	Continuous	114
G-REFR	Reference object / drawing	Continuous	7
G-REFR-IMAG	Reference image	Continuous	7

Survey/Mapping Layer List

Survey/Mapping Discipline Designators

Designator	Description
V	Survey / Mapping
VA	Aerial Survey
VF	Field Survey
VI	Digital Survey
VO	Survey by Others

Survey/Mapping Layer Names

Survey Layer Name	Description	Linetype	Color
V-BLDG	Buildings & primary structures	Continuous	1
V-BLDG-DECK	Building: deck (attached, no roof overhead)		
V-BLDG-DIMS	building: dimensions	Continuous	32
V-BLDG-LABL	Building: labels (FFE)	Continuous	32
V-BLDG-OTLN	Building: outline		
V-BLDG-OVHD	Building: overhead		
V-BLDG-PATT	Building: patterns, hatching	Continuous	3
V-BLDG-PRCH	Building: porch (attached, roof overhead)		
V-BLDG-TEXT	Building: text	Continuous	3

Survey Layer Name	Description	Linetype	Color
V-BNDY	Political boundaries		
V-BNDY-BORO	Political boundaries: borough		
V-BNDY-CITY	Political boundaries: city		
V-BNDY-CNTY	Political boundaries: county	Continuous	30
V-BNDY-CNTY-TEXT	Political boundaries: county: text	Continuous	32
V-BNDY-CORP	Political boundaries: corporation		
V-BNDY-STAT	Political boundaries: state		
V-BNDY-TSHP	Political boundaries: township	TWP	30
V-BNDY-TSHP-TEXT	Political boundaries: township: text	Continuous	32
V-BNDY-ZONE	Political boundaries: zone	Continuous	9
V-BNDY-ZONE-TEXT	Political boundaries: zone: text	Continuous	4
V-BORE	Borings		
V-BRDG	Bridge		
V-BRDG-BENT	Bridge: top of bent		
V-BRDG-CNTR	Bridge: center		
V-BRDG-CTLJ	Bridge: control joint		
V-BRDG-DECK	Bridge: deck		
V-BRDG-GRAL	Bridge: guide rail		
V-BRKL	Break / fault lines		
V-BRKL-BOTB	Break / fault lines: bottom of bank		
V-BRKL-FLOW	Break / fault lines: flowline (lowest point of ditch)		
V-BRKL-TOPB	Break / fault lines: top of bank		
V-BRLN	Building restriction line		
V-BZNA	Buffer zone area		
V-CHAN	Navigable channels		
V-CHAN-BWTR	Navigable channels: breakwater		
V-CHAN-CNTR	Navigable channels: center		
V-CHAN-DACL	Navigable channels: de-authorized channel limits		
V-CHAN-DOCK	Navigable channels: dock, decks, floats, piers		
V-CHAN-NAID	Navigable channels: navigation aids		
V-COMM	Telephone communications		
V-COMM-MHOL	Telephone communications: manhole		
V-COMM-OVHD	Telephone communications: overhead		
V-COMM-POLE	Telephone communications: pole		
V-COMM-UGND	Telephone communications: underground		
V-CTRL	Control points		
V-CTRL-BMRK	Control points: benchmarks		
V-CTRL-FLYS	Control points: fly stations		
V-CTRL-GRID	Control points: grid	Continuous	34
V-CTRL-HORZ	Control points: horizontal		
V-CTRL-HVPT	Control points: horizontal / vertical		
V-CTRL-PNPT	Control points: panel points		
V-CTRL-TRAV	Control points: traverse	Continuous	21
V-CTRL-TRAV-LINE	Control points: traverse: line	Continuous	30
V-CTRL-TRAV-TEXT	Control points: traverse: text	Continuous	3
V-DRIV	Driveways		

Survey Layer Name	Description	Linetype	Color
V-DRIV-ASPH	Driveways: asphalt		
V-DRIV-CNTR	Driveways: center		
V-DRIV-CONC	Driveways: concrete		
V-DRIV-CURB	Driveways: curb		
V-DRIV-FLNE	Driveways: fire lane		
V-DRIV-GRVL	Driveways: gravel		
V-DRIV-MRKG	Driveways: pavement markings		
V-DRIV-UPVD	Driveways: unpaved surface		
V-DTCH	Ditches		
V-DTCH-BOTM	Ditches: bottom		
V-DTCH-CNTR	Ditches: center		
V-DTCH-EWAT	Ditches: edge of water		
V-DTCH-TOPD	Ditches: top		
V-ESMT	Easements	EXEASMT	7
V-ESMT-ACCS	Easements: access (pedestrian only)		
V-ESMT-CATV	Easements: television systems		
V-ESMT-CONS	Easements: conservation		
V-ESMT-CSTG	Easements: construction / grading		
V-ESMT-ELEC	Easements: electrical		
V-ESMT-FDPL	Easements: flood plain		
V-ESMT-INEG	Easements: ingress / egress (vehicles)		
V-ESMT-LSCP	Easements: landscape		
V-ESMT-NGAS	Easements: natural gas line		
V-ESMT-PHON	Easements: telephone line		
V-ESMT-ROAD	Easements: roadway		
V-ESMT-ROAD-PERM	Easements: roadway: permanent		
V-ESMT-ROAD-TEMP	Easements: roadway: temporary		
V-ESMT-RWAY	Easements: right-of-way (public access)		
V-ESMT-SGHT	Easements: sight distance		
V-ESMT-SSWR	Easements: sanitary sewer		
V-ESMT-STRM	Easements: storm sewer		
V-ESMT-SWMT	Easements: storm water management		
V-ESMT-TEXT	Easements: text	Continuous	3
V-ESMT-TRAL	Easements: trail or path		
V-ESMT-UTIL	Easements: utility lines		
V-ESMT-WATR	Easements: water supply		
V-FLHA	Flood hazard area	Continuous	5
V-FLHA-TEXT	Flood hazard area: text	Continuous	7
V-FUEL	Fuel systems		
V-FUEL-MHOL	Fuel systems: manhole		
V-FUEL-PIPE	Fuel systems: piping		
V-FUEL-TANK	Fuel systems: storage tanks		
V-FUEL-UGND	Fuel systems: underground		
V-NGAS	Natural gas	V-G	144
V-NGAS-MHOL	Natural gas: manhole		
V-NGAS-PIPE	Natural gas: piping		

Survey Layer Name	Description	Linetype	Color
V-NGAS-TANK	Natural gas: storage tanks		
V-NGAS-TEXT	Natural gas: text	Continuous	144
V-NGAS-UGND	Natural gas: underground		
V-NODE	Node	Continuous	3
V-NODE-ABUT	Node: abutment		
V-NODE-ACTL	Node: aerial horz. & vert. control points		
V-NODE-BLDG	Node: building		
V-NODE-BLIN	Node: baseline		
V-NODE-BRDG	Node: bridge		
V-NODE-BRKL	Node: breaklines		
V-NODE-BROW	Node: brush row points		
V-NODE-BRSH	Node: brush points		
V-NODE-CABL	Node: underground cable system		
V-NODE-CURB	Node: curb		
V-NODE-DECK	Node: deck		
V-NODE-DRIV	Node: driveway		
V-NODE-EXPJ	Node: expansion joints		
V-NODE-GPS~	Node: GPS points		
V-NODE-GRND	Node: ground		
V-NODE-MHOL	Node: manhole		
V-NODE-MRKG	Node: pavement markings		
V-NODE-NGAS	Node: natural gas line		
V-NODE-PIPE	Node: piping (driveway / culverts)		
V-NODE-POLE	Node: pole (power, telephone, etc.)		
V-NODE-PROP	Node: boundary evidence points		
V-NODE-PVMT	Node: pavement		
V-NODE-RTK~	Node: RTK points		
V-NODE-SIGN	Node: signage		
V-NODE-SSWR	Node: sanitary sewer		
V-NODE-STAK	Node: stakeout points		
V-NODE-STRM	Node: storm sewer		
V-NODE-SWLK	Node: sidewalks		
V-NODE-TOPO	Node: topographical features		
V-NODE-TREE	Node: tree		
V-NODE-TROW	Node: tree row		
V-NODE-WATR	Node: water supply		
V-NODE-WETL	Node: wetlands	Continuous	2
V-POWR	Power		
V-POWR-FENC	Power: fences		
V-POWR-INST	Power: instrumentation (meters, transformers)		
V-POWR-MHOL	Power: manholes		
V-POWR-OVHD	Power: overhead		
V-POWR-POLE	Power: pole		
V-POWR-STRC	Power: structures		
V-POWR-UGND	Power: underground		
V-PRKG	Parking lots		

Survey Layer Name	Description	Linetype	Color
V-PRKG-ASP	Parking lots: asphalt		
V-PRKG-CNTR	Parking lots: center		
V-PRKG-CONC	Parking lots: concrete		
V-PRKG-CURB	Parking lots: curb		
V-PRKG-DRAN	Parking lots: drainage slope indications		
V-PRKG-FLNE	Parking lots: fire lane		
V-PRKG-GRVL	Parking lots: gravel		
V-PRKG-MRKG	Parking lots: pavement markings		
V-PRKG-STRP	Parking lots: striping		
V-PRKG-UPVD	Parking lots: unpaved surface		
V-PROP	Property boundary		
V-PROP-ADJN	Property boundary: adjoining	ADJOIN	161
V-PROP-ADJN-TEXT	Property boundary: adjoining: text	Continuous	3
V-PROP-BRNG	Property boundary: bearings and distance labels	Continuous	32
V-PROP-DEED	Property boundary: deed tract	Continuous	160
V-PROP-DEED-ADJN	Property boundary: deed tract: adjoining	Continuous	2
V-PROP-DEED-BRNG	Property boundary: deed tract: bearings & distance	Continuous	3
V-PROP-LABL	Property boundary: label area	Continuous	32
V-PROP-LINE	Property boundary: lines	Bound	230
V-PROP-MRKR	Property boundary: marker	Continuous	32
V-PROP-MRKR-TEXT	Property boundary: marker: text	Continuous	3
V-PROP-QTRS	Property boundary: quarter section		
V-PROP-RSRV	Property boundary: reservation		
V-PROP-SBCK	Property boundary: setback lines	Setback	161
V-PROP-SBCK-TEXT	Property boundary: setback lines: text	Continuous	161
V-PROP-SECT	Property boundary: section		
V-PROP-SUBD	Property boundary: Subdivision (interiors) lines		
V-PROP-SXTS	Property boundary: sixteenth sections		
V-PVMT	Pavement	Cartway	32
V-PVMT-ASPH	Pavement: asphalt		
V-PVMT-CONC	Pavement: concrete	Continuous	2
V-PVMT-GRVL	Pavement: gravel		
V-PVMT-TEXT	Pavement: text	Continuous	3
V-RAIL	Railroad	Continuous	2
V-RAIL-CNTR	Railroad: center		
V-RAIL-EQPM	Railroad: equipment		
V-RAIL-TEXT	Railroad: text	Continuous	3
V-RAIL-TRAK	Railroad: track		
V-RIVR	River	River	162
V-RIVR-BOTM	River: bottom		
V-RIVR-CNTR	River: center		
V-RIVR-EDGE	River: edge		
V-RIVR-TEXT	River: text	Continuous	3
V-RIVR-TOPB	River: top of bank		
V-ROAD	Roadways	Cartway	2

Survey Layer Name	Description	Linetype	Color
V-ROAD-ASPH	Roadways: asphalt		
V-ROAD-CNTR	Roadways: center	CL	7
V-ROAD-CNTR-TEXT	Roadways: center: text	Continuous	3
V-ROAD-CONC	Roadways: concrete		
V-ROAD-CURB	Roadways: curb	Continuous	3
V-ROAD-CURB-TEXT	Roadways: curb: text	Continuous	3
V-ROAD-FLNE	Roadways: fire lane		
V-ROAD-GRVL	Roadways: gravel	Cartway	2
V-ROAD-IDEN	Roadways: identification, names	Continuous	114
V-ROAD-MRKG	Roadways: pavement marking	Continuous	3
V-ROAD-MRKG-TEXT	Roadways: pavement marking: text	Continuous	3
V-ROAD-TEXT	Roadways: text	Continuous	3
V-ROAD-UPVD	Roadways: unpaved surface		
V-RRAP	Riprap	Continuous	204
V-RRAP-TEXT	Riprap: text	Continuous	3
V-RWAY	Right-of-way	LRW	1
V-RWAY-CNTR	Right-of-way: center		
V-RWAY-CTLA	Right-of-way: controlled access		
V-RWAY-LINE	Right-of-way: lines		
V-RWAY-LMTA	Right-of-way: limited access		
V-RWAY-MRKR	Right-of-way: marker		
V-RWAY-STAN	Right-of-way: stationing		
V-RWAY-TEXT	Right-of-way: text	Continuous	32
V-SITE	Site features	Continuous	204
V-SITE-EWAT	Site features: edge of water		
V-SITE-FENC	Site features: fences	V-X	2
V-SITE-FENC-TEXT	Site features: fences: text	Continuous	3
V-SITE-GRAL	Site features: guide rail	Guiderail	2
V-SITE-GRAL-TEXT	Site features: guide rail: text	Continuous	3
V-SITE-ROCK	Site features: large rocks	Cartway	2
V-SITE-ROCK-TEXT	Site features: large rocks: text	Continuous	3
V-SITE-RTWL	Site features: retaining wall	Continuous	2
V-SITE-RTWL-TEXT	Site features: retaining wall: text	Continuous	3
V-SITE-SIGN	Site features: signage	Continuous	2
V-SITE-SIGN-TEXT	Site features: signage: text	Continuous	3
V-SITE-VEGE	Site features: trees, shrubs, and other vegetation	Continuous	34
V-SITE-VEGE-TEXT	Site features: trees, shrubs, & others: text	Continuous	3
V-SOIL	Soils	Soils	30
V-SOIL-TEXT	Soils: text	Continuous	161
V-SSWR	Sanitary sewer	Continuous	161
V-SSWR-MHOL	Sanitary sewer: manhole		
V-SSWR-PIPE	Sanitary sewer: piping	V-S	144
V-SSWR-STRC	Sanitary sewer: structures		
V-SSWR-TEXT	Sanitary sewer: text	Continuous	144
V-SSWR-UGND	Sanitary sewer: underground		
V-STEM	Steam system		

Survey Layer Name	Description	Linetype	Color
V-STEM-INST	Steam system: instrumentation		
V-STEM-MHOL	Steam system: manhole		
V-STEM-PIPE	Steam system: piping		
V-STEM-STRC	Steam system: structures		
V-STEM-UGND	Steam system: underground		
V-STRM	Storm sewer		
V-STRM-DTCH	Storm sewer: ditches		
V-STRM-MHOL	Storm sewer: manhole		
V-STRM-PIPE	Storm sewer: piping	Exist	144
V-STRM-PIPE-TEXT	Storm sewer: piping: text	Continuous	144
V-STRM-POND	Storm sewer: retention pond		
V-STRM-STRC	Storm sewer: structures	Continuous	144
V-STRM-TEXT	Storm sewer: text	Continuous	144
V-STRM-UGND	Storm sewer: underground		
V-SURV	Survey		
V-SURV-DATA	Survey: data		
V-SWLK	Sidewalks	Continuous	2
V-SWLK-ASPH	Sidewalks: asphalt		
V-SWLK-CONC	Sidewalks: concrete		
V-SWLK-TEXT	Sidewalks: text	Continuous	3
V-TOPO	Topographic feature		
V-TOPO-EWAT	Topographic feature: edge of water		
V-TOPO-LABL	Topographic feature: labels	Continuous	214
V-TOPO-GRID	Topographic feature: grid		
V-TOPO-MAJR	Topographic feature: major (contours)	Contour2	214
V-TOPO-MINR	Topographic feature: minor (contours)	Contour	204
V-TOPO-SOUN	Topographic feature: soundings		
V-TOPO-SPOT	Topographic feature: spot elevations	Continuous	3
V-UNID	Unidentified feature	Continuous	2
V-UNID-CABL	Unidentified feature: cable systems		
V-UNID-PIPE	Unidentified feature: piping		
V-UNID-TANK	Unidentified feature: storage tanks		
V-UNID-TEXT	Unidentified feature: text	Continuous	3
V-UNID-UTIL	Unidentified feature: utility lines	Continuous	144
V-UNID-UTIL-OVHD	Unidentified feature: utility lines: overhead		
V-UNID-UTIL-TEXT	Unidentified feature: utility lines: text	Continuous	144
V-UNID-UTIL-UGND	Unidentified feature: utility lines: underground		
V-WATR	Water supply	Continuous	144
V-WATR-INST	Water supply: instrumentation		
V-WATR-MHOL	Water supply: manhole		
V-WATR-PIPE	Water supply: piping	V-W	144
V-WATR-STRC	Water supply: structures		
V-WATR-TEXT	Water supply: text	Continuous	144
V-WATR-UGND	Water supply: underground		
V-WETL	Wetlands	Continuous	86
V-WETL-SYMB	Wetlands: symbols, photo locations	Continuous	7

Survey Layer Name	Description	Linetype	Color
V-WETL-TEXT	Wetlands: text	Continuous	3

Civil Layers

Civil Layer Names	Description	Linetype	Color
C-AIRS	Air Supply	Continuous	4
C-AIRS-TEXT	Air Supply: text	Continuous	7
C-BLDG	Buildings & Structures	Continuous	230
C-BLDG-ANNO	Buildings & Structures: finished floor elevation	Continuous	191
C-BLDG-DECK	Buildings & Structures: deck (attached, no roof overhead)		
C-BLDG-DOOR	Buildings & Structures: doors	Continuous	3
C-BLDG-OVHD	Buildings & Structures: overhead	SMDASH	161
C-BLDG-PATT	Buildings & Structures: patterns, hatch	Continuous	144
C-BLDG-TEXT	Buildings & Structures: text	Continuous	161
C-BLIN	Baseline	CL	255
C-BLIN-STAN	Baseline: stationing	Continuous	2
C-BLIN-ZONE	Boundary: zoning line	ZONING	9
C-BLIN-ZONE-TEXT	Boundary: zoning line: text	Continuous	7
C-BORE	Borings		
C-BORE-TEXT	Borings: text		
C-BRDG	Bridge		
C-BRDG-CTNJ	Bridge: construction joint		
C-BRDG-CNTR	Bridge: center		
C-BRDG-DECK	Bridge: deck		
C-BRDG-EXPJ	Bridge: expansion joint		
C-BRDG-FALT	Bridge: fault/break line		
C-BRDG-HIDD	Bridge: objects or lines hidden from view		
C-BRDG-OBJT	Bridge: objects		
C-BRDG-OBJT-PRIM	Bridge: objects: primary		
C-BRDG-OBJT-SECD	Bridge: object: secondary		
C-BRDG-RBAR	Bridge: reinforcing bar		
C-BRDG-TEXT	Bridge: text		
C-CATV	Cable television system	Continuous	161
C-CATV-OVHD	Cable television system: overhead	OC	161
C-CATV-POLE	Cable television system: pole		
C-CHAN	Navigable channels		
C-CHAN-DOCK	Navigable channels: decks, docks, floats, piers		
C-CHAN-BWTR	Navigable channels: breakwater		
C-CHAN-CNTR	Navigable channels: center		
C-CHAN-DACL	Navigable channels: de-authorized channel limits		
C-CHAN-NAID	Navigable channels: navigation aids		

C-CHAN-TEXT	Navigable channels: text		
C-COMM	Telephone communications	Continuous	7
C-COMM-OVHD	Telephone communications: overhead	OT	7
C-COMM-POLE	Telephone communications: pole		
C-COMM-TEXT	Telephone communications: text	Continuous	7
C-COMM-UGND	Telephone communications: underground	UT	7
C-CTRL-VERT	Control points: vertical		
C-DFLD	Drain fields		
C-DFLD-OTLN	Drain fields: outline		
C-DFLD-PROF	Drain fields: profile		
C-DFLD-TEXT	Drain fields: text		
C-DRIV	Driveways	Continuous	161
C-DRIV-ASPH	Driveways: asphalt		
C-DRIV-CNTR	Driveways: center		
C-DRIV-CONC	Driveways: concrete		
C-DRIV-GRVL	Driveways: gravel		
C-DRIV-TEXT	Driveways: text		
C-DTCH	Ditches	Flow	191
C-DTCH-BOTM	Ditches: bottom		
C-DTCH-CNTR	Ditches: center		
C-DTCH-EWAT	Ditches: edge of water		
C-DTCH-TEXT	Ditches: text	Continuous	161
C-DTCH-TOPD	Ditches: top		
C-EROS	Erosion & sediment control	Continuous	6
C-EROS-BALE	Erosion & sediment control: straw bale barrier	SB	242
C-EROS-CIPR	Erosion & sediment control: culvert inlet protection	Continuous	6
C-EROS-CNTE	Erosion & sediment control: construction entrance	Continuous	6
C-EROS-DDIV	Erosion & sediment control: drainage divides		
C-EROS-DVDK	Erosion & sediment control: diversion dike		
C-EROS-FENC-CNST	Erosion & sediment control: fence: construction	CF	242
C-EROS-FS12	Erosion & sediment control: 12" filter sock	FS-12	242
C-EROS-FS18	Erosion & sediment control: 18" filter sock	FS-18	242
C-EROS-FS24	Erosion & sediment control: 24" filter sock	FS-24	242
C-EROS-FS32	Erosion & sediment control: 32" filter sock	FS-32	242
C-EROS-INPR	Erosion & sediment control: inlet protection	Continuous	6
C-EROS-NPDS	Erosion & sediment control: NPDES boundary	Longdash	22
C-EROS-PATT	Erosion & sediment control: pattern, hatching	Continuous	144
C-EROS-SILT	Erosion & sediment control: silt fence	SF	242
C-EROS-SSLT	Erosion & sediment control: super silt fence	SSF	242
C-EROS-TEXT	Erosion & sediment control: text	Continuous	91
C-EROS-TOPO-LABL	Erosion & sediment control: topo: label	Continuous	191
C-EROS-TOPO-MAJR	Erosion & sediment control: topo: major (contour)	Continuous	91
C-EROS-TOPO-MINR	Erosion & sediment control: topo: minor (contour)	Continuous	32
C-ESMT	Easements	EXEASMT	241

C-ESMT-ACCS	Easements: access (pedestrian only)		
C-ESMT-CATV	Easements: cable television system		
C-ESMT-CONS	Easements: conservation		
C-ESMT-CSTG	Easements: construction / grading		
C-ESMT-ELEC	Easements: electrical		
C-ESMT-FDPL	Easements: flood plain		
C-ESMT-INEG	Easements: ingress / egress (vehicles)		
C-ESMT-LSCP	Easements: landscape		
C-ESMT-NGAS	Easements: natural gas line		
C-ESMT-PHON	Easements: telephone line		
C-ESMT-ROAD	Easements: roadway		
C-ESMT-ROAD- PERM	Easements: roadway: permanent		
C-ESMT-ROAD- TEMP	Easements: roadway: temporary		
C-ESMT-RWAY	Easements: right-of-way (public access)		
C-ESMT-SGHT	Easements: sight distance		
C-ESMT-SSWR	Easements: sanitary sewer		
C-ESMT-STRM	Easements: storm sewer		
C-ESMT-SWMT	Easements: storm water management		
C-ESMT-TEXT	Easements: text	Continuous	191
C-ESMT-TRAL	Easements: trail or path (public access)		
C-ESMT-UTIL	Easements: utility lines		
C-ESMT-WATR	Easements: water supply		
C-FENC	Fences	Fence	7
C-FENC-GRAL	Fences: guard rail		
C-FENC-POST	Fences: posts		
C-FENC-STEL	Fences: steel (barbed wire & / or chain)		
C-FENC-TEXT	Fences: text		
C-FENC-WOOD	Fences: wood		
C-FIRE	Fire protection		
C-FIRE-HYDT	Fire protection: hydrants & connections		
C-FIRE-PIPE	Fire protection: piping		
C-FIRE-TEXT	Fire protection: text		
C-FIRE-UGND	Fire protection: underground		
C-FLHA	Flood hazard area	Flow	5
C-FLHA-025Y	Flood hazard area: 25 year mark	Flow	5
C-FLHA-050Y	Flood hazard area: 50 year mark	Flow	5
C-FLHA-100Y	Flood hazard area: 100 year mark	Flow	5
C-FLHA-200Y	Flood hazard area: 200 year mark	Flow	5
C-FLHA-TEXT	Flood hazard area: text	Continuous	191
C-FUEL	Fuel systems		
C-FUEL-EQPM	Fuel systems: equipment (pumps, motors)		
C-FUEL-INST	Fuel systems: instrumentation (meters, valves, etc.)		

C-FUEL-MHOL	Fuel systems: manhole		
C-FUEL-PIPE	Fuel systems: piping		
C-FUEL-TANK	Fuel systems: storage tanks	Continuous	1
C-FUEL-TEXT	Fuel systems: text	Continuous	32
C-FUEL-UGND	Fuel systems: underground		
C-HYDR	Hydraulic structure		
C-HYDR-BAFL	Hydraulic structure: baffle block & splash pad		
C-HYDR-BASN	Hydraulic structure: stilling & settling basins		
C-HYDR-CNDT	Hydraulic structure: diversion / bypass conduits / culverts		
C-HYDR-DAM~	Hydraulic structure: dam		
C-HYDR-FISH	Hydraulic structure: fish ladder / passage		
C-HYDR-FLUM	Hydraulic structure: flume		
C-HYDR-INTK	Hydraulic structure: intake		
C-HYDR-NOVR	Hydraulic structure: non-overflow structure		
C-HYDR-PENS	Hydraulic structure: penstock		
C-HYDR-TEXT	Hydraulic structure: text		
C-LOCN	Limits of construction	LOD	134
C-LOCN-PHSE	Limits of construction: phase line	Phase	6
C-LOCN-PHSE-TEXT	Limits of construction: phase line: text	Continuous	7
C-LOCN-TEXT	Limits of construction: text		
C-NGAS	Natural gas	Gas_line	114
C-NGAS-EQPM	Natural gas: equipment (pumps, motors)	Continuous	114
C-NGAS-INST	Natural gas: instrumentation (meters, valves, etc.)	Continuous	114
C-NGAS-MHOL	Natural gas: manhole	Continuous	114
C-NGAS-PIPE	Natural gas: piping	Gas_line	114
C-NGAS-TANK	Natural gas: storage tank	Continuous	114
C-NGAS-TEXT	Natural gas: text	Continuous	191
C-NGAS-UGND	Natural gas: underground	Continuous	114
C-PERC	Perc testing		
C-PERC-HOLE	Perc testing: holes		
C-PERC-TEXT	Perc testing: text		
C-POND	Ponds		
C-POND-EDGE	Ponds: edge		
C-POND-SWAY	Ponds: spillway		
C-POND-TEXT	Ponds: text		
C-POND-TOPB	Ponds: top of bank		
C-POWR	Power	Continuous	8
C-POWR-FENC	Power: fences		
C-POWR-INST	Power: instrumentation (meters, transformers)		
C-POWR-LGHT	Power: lights	Continuous	4
C-POWR-LGHT-TEXT	Power: lights: text	Continuous	191
C-POWR-MHOL	Power: manhole		
C-POWR-OVHD	Power: overhead	OE	8

C-POWR-POLE	Power: pole		
C-POWR-STRC	Power: structures	Continuous	4
C-POWR-TEXT	Power: text	Continuous	191
C-POWR-UGND	Power: underground	UE	8
C-PRKG	Parking lots		
C-PRKG-ASPH	Parking lots: asphalt		
C-PRKG-CARS	Parking lots: cars & other vehicles		
C-PRKG-CONC	Parking lots: concrete		
C-PRKG-CURB	Parking lots: curb		
C-PRKG-CURB-BACK	Parking lots: curb: back		
C-PRKG-CURB-FACE	Parking lots: curb: face		
C-PRKG-DRAIN	Parking lots: drainage slope indications		
C-PRKG-FIXT	Parking lots: fixtures (wheel stops, parking meters, etc.)		
C-PRKG-FLNE	Parking lots: fire lane		
C-PRKG-FLNE-MRKG	Parking lots: fire lane: pavement markings		
C-PRKG-FLNE-SIGN	Parking lots: fire lane: signage		
C-PRKG-GRVL	Parking lots: gravel		
C-PRKG-MRKG	Parking lots: pavement markings		
C-PRKG-SIGN	Parking lots: signage		
C-PRKG-STRP	Parking lots: striping		
C-PRKG-TEXT	Parking lots: text		
C-PRKG-UPVD	Parking lots: unpaved surface		
C-PRKG-WHIT	Parking lots: white paint		
C-PRKG-WHIT-TICK	Parking lots: white paint: tick marks		
C-PRKG-YELO	Parking lots: yellow paint		
C-PRKG-YELO-TICK	Parking lots: yellow paint tick marks		
C-PROF-AXIS	Profile: axis	Continuous	1
C-PROF-AXIS-TEXT	Profile: axis: text	Continuous	191
C-PROP-AXIS-TITL	Profile: axis: title	Continuous	7
C-PROF-E	Profile: existing	Exist	34
C-PROF-GRID	Profile: grid	GRD	204
C-PROF-N	Profile: new	Continuous	8
C-PROF-TITL	Profile: title	Continuous	7
C-PROP	Property boundary		
C-PROP-BRNG	Property boundary: bearings & distance labels	Continuous	141
C-PROP-IDEN	Property boundary: identification	Continuous	7
C-PROP-LABL-AREA	Property boundary: label: area	Continuous	141
C-PROP-LINE	Property boundary: line	Lotline	4
C-PROP-MRKR	Property boundary: marker	Continuous	161
C-PROP-MRKR-TEXT	Property boundary: marker: text	Continuous	7
C-PROP-SBCK	Property boundary: setback lines	Setback	141
C-PROP-SBCK-TEXT	Property boundary: setback lines: text	Continuous	241
C-PVMT	Pavement	Continuous	8

C-PVMT-ASPH	Pavement: asphalt		
C-PVMT-CONC	Pavement: concrete	Continuous	8
C-PVMT-GRVL	Pavement: gravel		
C-PVMT-PATT	Pavement: pattern, hatching	Continuous	97
C-ROAD	Roadways	Continuous	4
C-ROAD-ASPH	Roadways: asphalt		
C-ROAD-CNTR	Roadways: center	CL	255
C-ROAD-CNTR-TEXT	Roadways: center: text	Continuous	7
C-ROAD-CONC	Roadways: concrete		
C-ROAD-CURB	Roadways: curb	Continuous	2
C-ROAD-CURB-BACK	Roadways: curb: back		
C-ROAD-CURB-FACE	Roadways: curb: face		
C-ROAD-CURB-TEXT	Roadways: curb: text	Continuous	7
C-ROAD-FLNE	Roadways: fire lane		
C-ROAD-FLNE-MRKG	Roadways: fire lane: pavement markings		
C-ROAD-FLNE-SIGN	Roadways: fire lane: signage		
C-ROAD-GRVL	Roadways: gravel		
C-ROAD-MRKG	Roadways: pavement markings	Continuous	97
C-ROAD-MRKG-TEXT	Roadways: pavement markings: text	Continuous	121
C-ROAD-PATT	Roadways: pattern, hatching	Continuous	254
C-ROAD-PROF	Roadways: profile		
C-ROAD-SHLD	Roadways: shoulder	Continuous	8
C-ROAD-SHLD-PATT	Roadways: shoulder: pattern, hatching	Continuous	1
C-ROAD-SIGN	Roadways: signage	Continuous	7
C-ROAD-SIGN-TEXT	Roadways: signage: text	Continuous	7
C-ROAD-STAN	Roadways: stationing	Continuous	2
C-ROAD-TEXT	Roadways: text	Continuous	191
C-ROAD-UPVD	Roadways: unpaved surface		
C-ROAD-WHIT	Roadways: white paint		
C-ROAD-WHIT-TICK	Roadways: white paint: tick marks		
C-ROAD-YELO	Roadways: yellow paint		
C-ROAD-YELO-TICK	Roadways: yellow paint: tick marks		
C-RRAP	Riprap	Continuous	3
C-RWAY	Right-of-way line	RRW	242
C-RWAY-TEXT	Right-of-way line: text	Continuous	121
C-SGHT	Sight distance	SMDASH	34
C-SGHT-PROF	Sight distance: profile		
C-SITE-SIGN	Site features: signage	Continuous	7
C-SITE-SIGN-TEXT	Site features: signage: text	Continuous	7
C-SITE-VEGE	Site features: vegetation	Continuous	114
C-SITE-VEGE-TEXT	Site features: vegetation: text	Continuous	191
C-SITE-VEGE-TRLN	Site features: vegetation: treeline	Continuous	5

C-SITE-VEGE-TEXT	Site features: vegetation: text	Continuous	121
C-SOIL	Soils		
C-SSWR	Sanitary sewer	Continuous	5
C-SSWR-DIAG	Sanitary sewer: diagrams		
C-SSWR-FORC	Sanitary sewer: force main		
C-SSWR-INST	Sanitary sewer: instrumentation (equipment, plant)	Continuous	8
C-SSWR-INST-TEXT	Sanitary sewer: instrumentation: text	Continuous	32
C-SSWR-LATL	Sanitary sewer: lateral line	Lateral	114
C-SSWR-MHOL	Sanitary sewer: manhole		
C-SSWR-PIPE	Sanitary sewer: piping	San	114
C-SSWR-PIPE-RCON	Sanitary sewer: piping: reinforced concrete		
C-SSWR-PIPE-STEL	Sanitary sewer: piping: steel		
C-SSWR-PIPE-TEXT	Sanitary sewer: piping: text	Continuous	191
C-SSWR-PROF	Sanitary sewer: profile		
C-SSWR-STAN	Sanitary sewer: stationing		
C-SSWR-STRC	Sanitary sewer: structures		
C-SSWR-TEXT	Sanitary sewer: text	Continuous	191
C-STEM	Steam system		
C-STEM-INST	Steam system: instrumentation (meters, valves, etc.)		
C-STEM-MHOL	Steam system: manhole		
C-STEM-PIPE	Steam system: piping		
C-STEM-STRC	Steam system: structures		
C-STEM-UGND	Steam system: underground		
C-STRM	Storm sewer	Continuous	6
C-STRM-CNTR	Storm sewer: center		
C-STRM-DDIV-POST	Storm sewer: drainage divide: post divide	Hidden	7
C-STRM-DDIV-PRE~	Storm sewer: drainage divide: pre divide	Longdash	4
C-STRM-DDIV-PREP	Storm sewer: drainage divide: pre post	Longdash	4
C-STRM-DDIV-PRES	Storm sewer: drainage divide: pre subdivide	Hidden	1
C-STRM-DDIV-PSTS	Storm sewer: drainage divide: post subdivide	Long_dashed	7
C-STRM-DDIV-TEXT	Storm sewer: drainage divide: text	Continuous	161
C-STRM-DIAG	Storm sewer: diagrams		
C-STRM-FLOW-TRAL	Storm sewer: flow: TC path	Continuous	1
C-STRM-HWAL	Storm sewer: headwall		
C-STRM-MHOL	Storm sewer: manhole		
C-STRM-PIPE	Storm sewer: piping	SMDASH	61
C-STRM-PIPE-CMTL	Storm sewer: piping: corrugated metal		
C-STRM-PIPE-RCON	Storm sewer: piping: reinforced concrete		
C-STRM-PIPE-TEXT	Storm sewer: piping: text	Continuous	141
C-STRM-PROF	Storm sewer: profile		
C-STRM-STAN	Storm sewer: stationing		
C-STRM-STRC	Storm sewer: structures		
C-STRM-TEXT	Storm sewer: text	Continuous	141
C-STRM-UGND	Storm sewer: underground		

C-SWLK	Sidewalks	Continuous	21
C-SWLK-ASPH	Sidewalks: asphalt		
C-SWLK-CONC	Sidewalks: concrete		
C-SWLK-PATT	Sidewalks: pattern, hatching	Continuous	97
C-SWLK-SCOR	Sidewalks: scoring	Continuous	144
C-SWLK-TEXT	Sidewalks: text	Continuous	121
C-TINN	Triangulated irregular network		
C-TINN-BNDY	Triangulated irregular network: boundary	Continuous	7
C-TINN-BRKL	Triangulated irregular network: breaklines	Continuous	4
C-TINN-FALT	Triangulated irregular network: fault / break lines	Continuous	4
C-TINN-VIEW	Triangulated irregular network: triangle views	Continuous	7
C-TINN-VOID	Triangulated irregular network: void regions	Continuous	7
C-TOPO	Topographic feature		
C-TOPO-DEPR	Topographic feature: depression		
C-TOPO-LABL	Topographic feature: labels	Continuous	121
C-TOPO-MAJR	Topographic feature: major (contours)	Continuous	242
C-TOPO-MINR	Topographic feature: minor (contours)	Continuous	141
C-TOPO-SPOT	Topographic feature: spot elevations	Continuous	3
C-TOPO-TEXT	Topographic feature: text	Continuous	121
C-TOPO-TPIT	Topographic feature: test pits		
C-TRAL	Trails or paths		
C-TRAL-ASPH	Trails or paths: asphalt		
C-TRAL-CONC	Trails or paths: concrete		
C-TRAL-GRVL	Trails or paths: gravel		
C-TRAL-MRKG	Trails or paths: pavement markings		
C-TRAL-SIGN	Trails or paths: signage		
C-TRAL-UPVD	Trails or paths: unpaved surface		
C-WALL	Walls	Continuous	161
C-WALL-CTLJ	Walls: control joint		
C-WALL-NSBR	Walls: noise barrier		
C-WALL-RTWL	Walls: retaining wall		
C-WALL-SHEA	Walls: structural bearing or shear wall		
C-WATR	Water supply	Continuous	1
C-WATR-DIAG	Water supply: diagrams		
C-WATR-INST	Water supply: instrumentation (meters, valves, etc.)		
C-WATR-PIPE	Water supply: piping	WL	1
C-WATR-PROF	Water supply: profile		
C-WATR-STAN	Water supply: stationing		
C-WATR-STRC	Water supply: structures		
C-WATR-TEXT	Water supply: text	Continuous	121
C-WATR-UGND	Water supply: underground		
C-WATR-WELL	Water supply: well		
C-WETL	Wetlands		

Plotting

CTB Files

When plotting AutoCAD drawings, the software controls the final output through the use of CTB (color plot style tables) files. The CTB files identify pen assignments related to color.

Drawings created for RETTEW shall be plotted using one of the RETTEW standard .ctb or custom client based .ctb files.

Only one .ctb pen settings file is required for both half and full size prints. (Use “scale lineweight” feature).

Submitting a new CTB file

If a new CTB file needs to be created due to client standards, create the new CTB file and pass it on to the CAD Manager. The CAD Manager will then make sure the CTB not only will be distributed to all staff but it will be also part of the support files and therefore will have a backup.

Under no circumstances there should be a non-compliant CTB file used for ANY RETTEW CAD file. Please report to the CAD Manager if you come across a CAD drawing with a non-compliant CTB file.

Plotting Standards

- Plot to a PDF file, and send the PDF to the plotter. Do not plot directly to the plotter.
- Always use the “DWG to PDF” setting. This will create a PDF file.
- Plot drawings using paper space.
- The RETTEW border sheet will always be inserted at full size – in paper space.
- Only use RETTEW supplied .ctb files.
- Do not rename the .ctb files.
- No objects should be drawn outside of the border lines.
- PDF files should be stored on the file server, under the project folder, in the PLOTS folder.

RETTEW Standard Pen Table

Color	Pen #	Width (mm)	Width (in)	Shade
1 (red)	3	0.508	0.020	100%
2 (yellow)	1	0.180	0.007	100%
3 (green)	1	0.180	0.007	100%
4 (cyan)	3	0.508	0.020	100%
5 (blue)	4	0.700	0.028	100%
6 (magenta)	4	0.700	0.028	100%
7 (white)	2	0.330	0.013	100%
8 (gray)	3	0.508	0.020	100%
9 (lt. gray)	4	0.700	0.028	100%

10	4	0.700	0.028	100%
12	5	1.000	0.039	100%
20	3.5	0.609	.024	100%
21 (sand)	2	0.330	0.013	100%
22	3	0.508	0.020	100%
30 (orange)	4	0.700	0.028	100%
32 (brown)	2	0.330	0.013	100%
34 (rust)	1	0.180	0.007	100%
40 (mustard)	2	0.330	0.013	100%
41	1 (shade)	0.180	0.007	50%
50	3.5	0.609	0.024	100%
51	4	0.700	0.028	100%
52	1 (shade)	0.180	0.007	50%
60	5	1.000	0.039	100%
61 (lime)	3	0.508	0.020	100%
62	1 (shade)	0.180	0.007	75%
70	3	0.508	0.020	100%
73	2 (shade)	0.330	0.013	70%
80	3.5	0.609	0.024	100%
83	3 (shade)	0.508	0.020	70%
86	2	0.330	0.013	100%
90 (green)	4 (shade)	0.700	0.028	70%
91	3	0.508	0.020	100%
92	4	0.700	0.028	100%
94	1 (shade)	0.180	0.007	50%
96	4	0.700	0.028	100%
97 (dk. Green)	1	0.180	0.007	100%
100	5	1.000	0.039	100%
103 (mint)	5	1.000	0.039	100%
106	5	1.000	0.039	100%
113	1 (shade)	0.180	0.007	50%
114 (dk. Green)	3	0.508	0.020	100%
116	3.5	0.609	0.024	100%
120	2	0.330	0.013	100%
121	1.5	0.254	0.010	100%
130	3.5	0.609	0.024	100%
131	5	1.000	0.039	100%
132	1	0.180	0.007	100%
133	1 (shade)	0.180	0.007	50%
134 (blue/green)	4	0.700	0.028	100%
141	1.5	0.254	0.010	100%
144 (blue/gray)	0	0.102	0.004	100%
160	1	0.180	0.007	100%
161 (lt. blue)	2	0.330	0.013	100%
162	2	0.330	0.013	100%
163	1 (shade)	0.180	0.007	50%

170	3	0.508	0.020	100%
172	3.5	0.609	0.024	100%
180	5	1.000	0.039	100%
191	1.5	0.254	0.010	100%
200	2	0.330	0.013	100%
201 (lavender)	4	0.700	0.028	100%
202 (purple)	1 (shade)	0.180	0.007	70%
204 (purple)	1 (shade)	0.180	0.007	50%
205	3	0.508	0.020	100%
210	3.5	0.609	0.024	100%
211	3	0.508	0.020	100%
212	5	1.000	0.039	100%
213	2	0.330	0.013	100%
214 (grape)	2 (shade)	0.330	0.013	50%
215	1.5 (shade)	0.254	0.010	50%
221	3.5	0.609	0.024	100%
222 (wine)	3 (shade)	0.508	0.020	50%
223	1 (shade)	0.609	0.024	50%
224	3.5 (shade)	0.180	0.007	50%
230 (strawberry)	5	1.000	0.039	100%
231	5	1.000	0.039	100%
240	2	0.330	0.013	100%
241	1.5	0.254	0.010	100%
242	3.5	0.609	0.024	100%
250 (gray)	250 (fill)	0.330	0.013	70%
251 (gray)	251 (fill)	0.330	0.013	50%
252 (gray)	252 (fill)	0.330	0.013	35%
253 (gray)	253 (fill)	0.330	0.013	20%
254 (gray)	254 (fill)	0.330	0.013	10%
255	1	0.180	0.007	100%