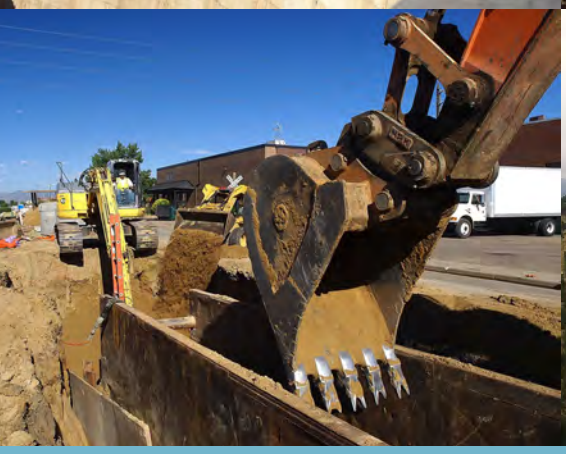
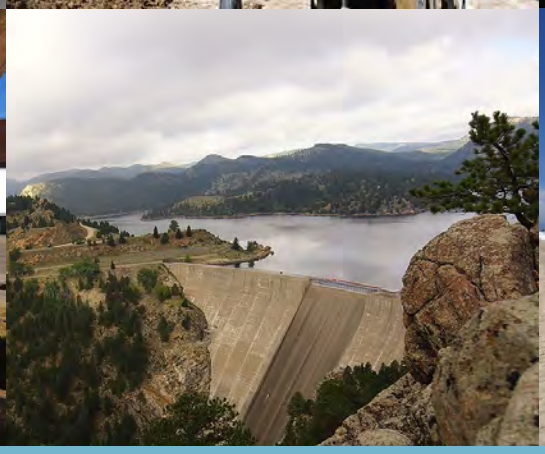
CAD Standards Manual




3rd Edition
2016

PLEASE REFER to denverwater.org for Standards updates.

DENVER WATER

Section 0.0

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Section 18.0 – CAD to GIS: Creating ARG As-Built Drawings

Section 19.0 – Record As-Built Drawings

Section 20.0 – Consultant Needs

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Section 1.0

Introduction & Software Applications

Table of Contents: Section 1.0

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Introduction Overview - Section 1.0

The Denver Water 3rd Edition CAD Standards (DW CAD Standards) were developed for internal and external use. Internally, the CAD Standards are used as an office standard; externally, the CAD Standards shall be issued to consultants for use on Capital Projects submitted to Denver Water. In both instances, the CAD Standards require the end user to follow routine procedures which will increase efficiency and ensure uniformity in plan output. CAD Standards have been based on the current United States National CAD Standard® (NCS).

The DW CAD Standards are in place to support our core values: Integrity, Vision, Passion, Excellence and Respect. The enforcement of the CAD Standards results in clear, accurate drawings that help Denver Water maintain integrity within the system and to continue providing reliable service. Consistent drawings help our field crews identify water features during inspection and construction; increase efficiencies within the office to quickly post work to the Geographic Information System (GIS), at Denver Water otherwise known as Electronic Mapping Access Portal (E-Map); and improve the as-built plans creating a more complete, accurate, and identifiable set.

The DW CAD Standards define best practices for CAD drafters to create and deliver CAD drawing sets. Accurate and error-free CAD drawings support Denver Water's GIS (E-Map), currently used by every division of Denver Water. Having a standard drawing set ensures that less costly mistakes are made in the field - in turn saving time, money and even lives. Denver Water maintains safety, reliability, and consistency within the system by communicating clear, accurate information.

CAD Standards are just one more way Denver Water can accomplish its goal of becoming the best water utility in the nation. We strive to help our customers and consultants by maintaining a very clear and direct standard for drawing creation. We remain open to questions, comments, and concerns regarding the CAD Standards and always take suggestions into consideration.

Other examples of local municipalities that have and enforce CAD standards are CDOT, Metro Wastewater, Greenwood Village and City and County of Denver (CCD).

Software Applications

As of October 2016, Denver Water's Engineering Department is on a Windows 7 - 64 bit platform using AutoCAD Civil 3D 2016; all drawings shall be saved in AutoCAD 2013 .dwg format. This is defined as the "current platform".

While Denver Water is on Subscription with Autodesk software, we may not be using the current version of Autodesk software. If Denver Water implements a new version of Autodesk software the documents posted on the Denver Water's website (www.denverwater.org) and the CAD and Engineering Standards will be changed to reflect any applicable changes.

This document and all screen captures were created using AutoCAD Civil 3D/Map 3D 2016 unless there was no significant change from AutoCAD Civil 3D/Map 3D 2014.

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Section 2.0

Application Settings

Table of Contents: Section 2.0

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Overview - Section 2.0

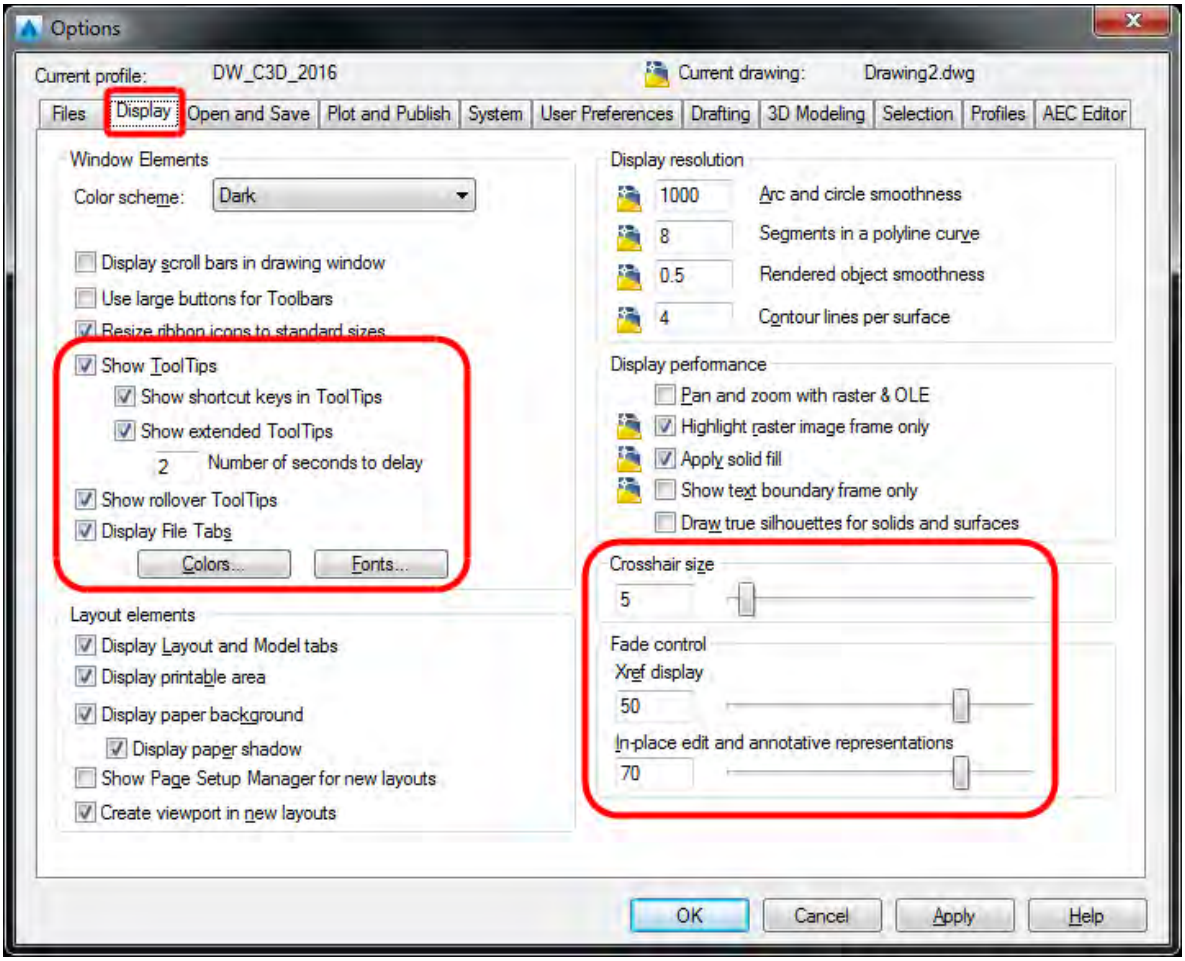
This section outlines the acceptable changes to the AutoCAD Civil 3D 2016 Options menu. The options have been saved in the *DW-2016-C3D* profile, tested on the current Denver Water platform, and run in conjunction with the Enterprise CUI. Only the specified portions are allowed to be changed, **all** other options may be reverted back to their original state at **any** time without notice.

Options Dialog Box (Internal Only)

Do not alter settings outside of areas identified by the rounded rectangles (see below).

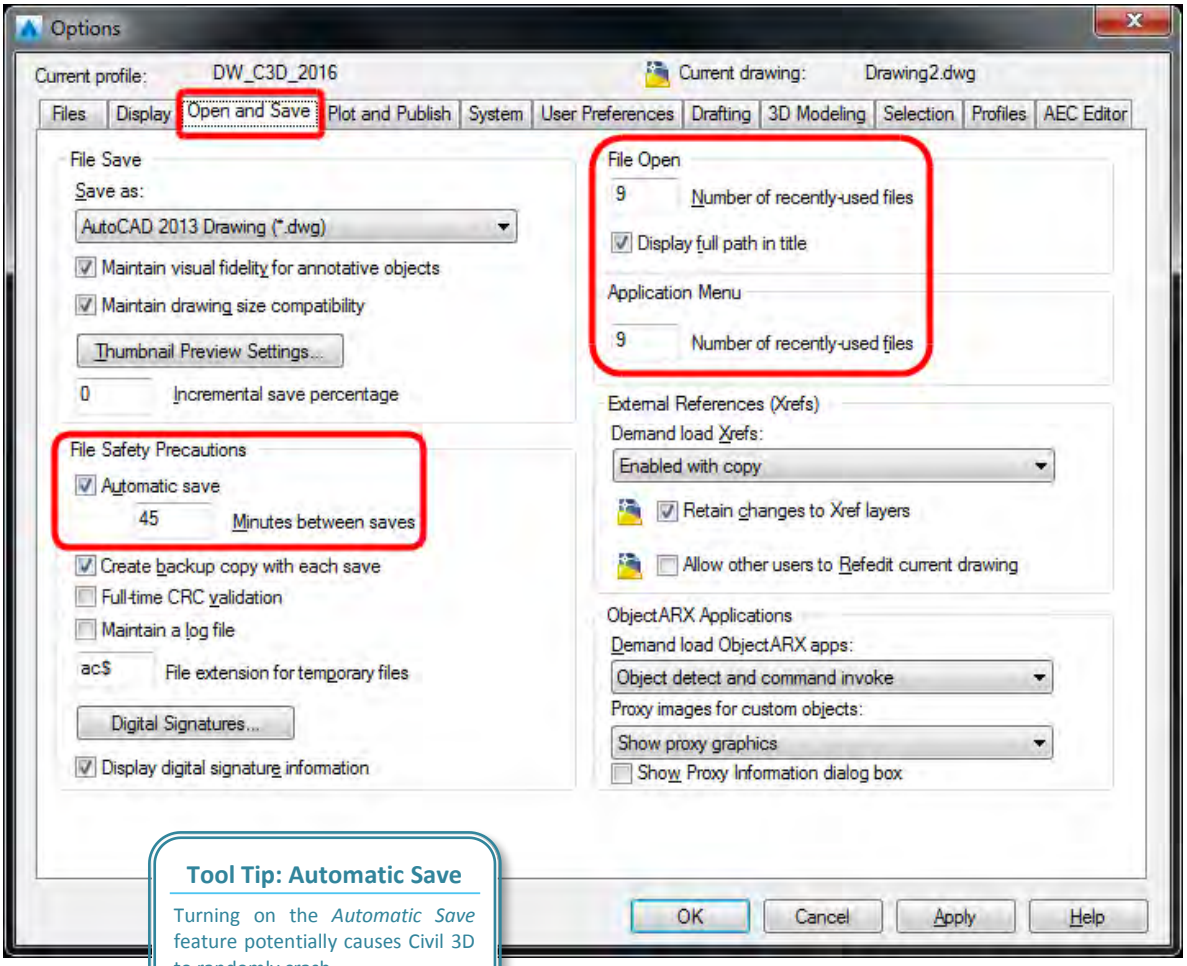
Display Tab

Customizes the screen display:



OPEN AND SAVE TAB

Controls options that relate to opening and saving files:



Tool Tip: Automatic Save

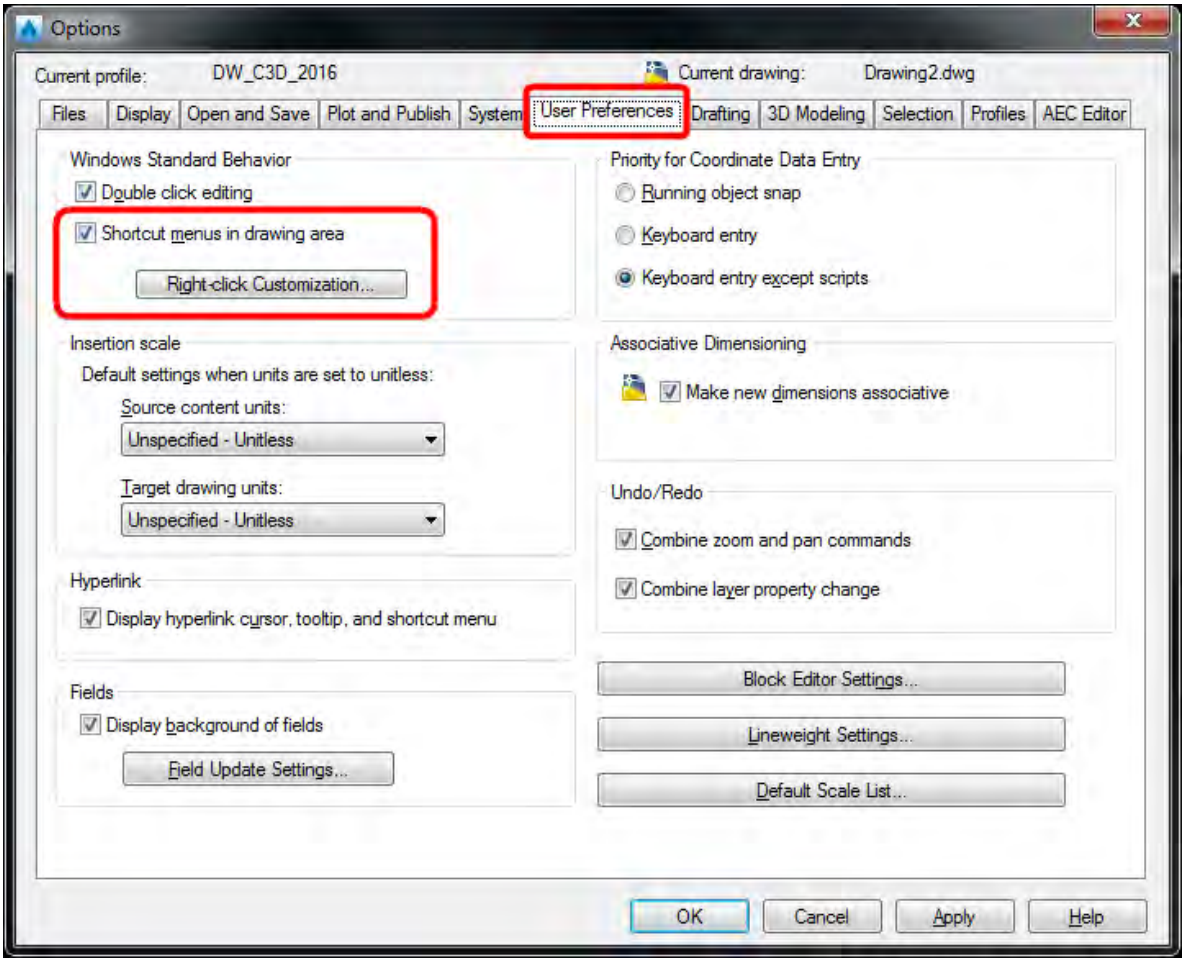
Turning on the *Automatic Save* feature potentially causes Civil 3D to randomly crash.

ATTENTION

Do not change the "Save as" option to an earlier format, this will break intelligent Civil 3D objects.

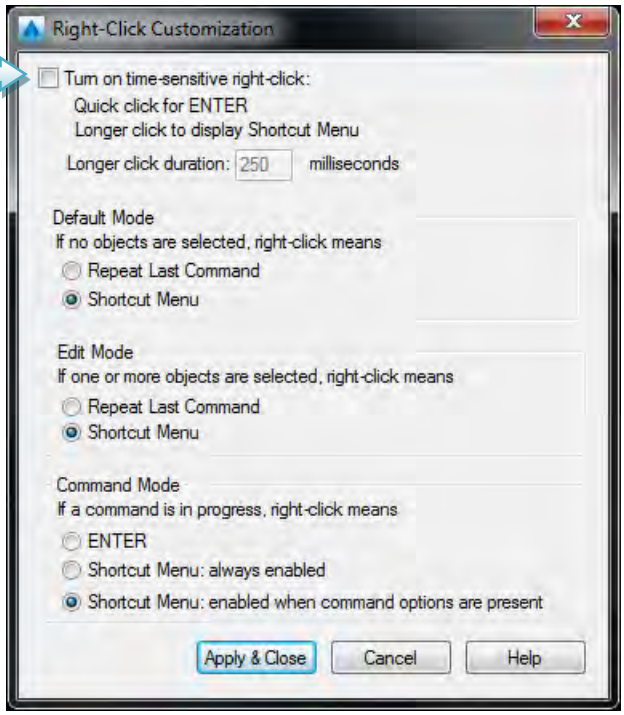
User Preferences Tab

Controls options that optimize the work environment for End-Users:



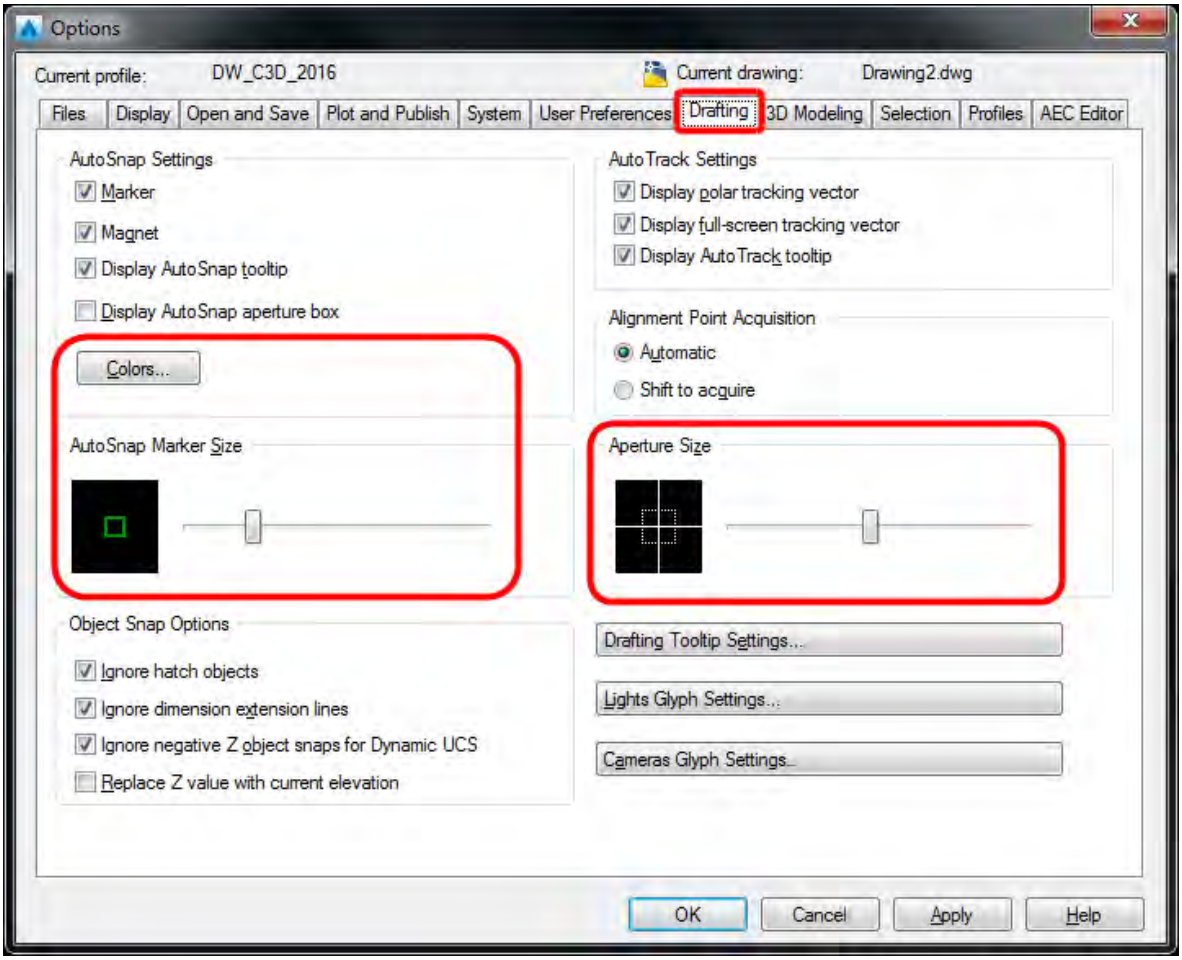
Tool Tip: Right-click

Check this box to enable the Right-Click to function as an ENTER and display menus needed for Civil 3D.



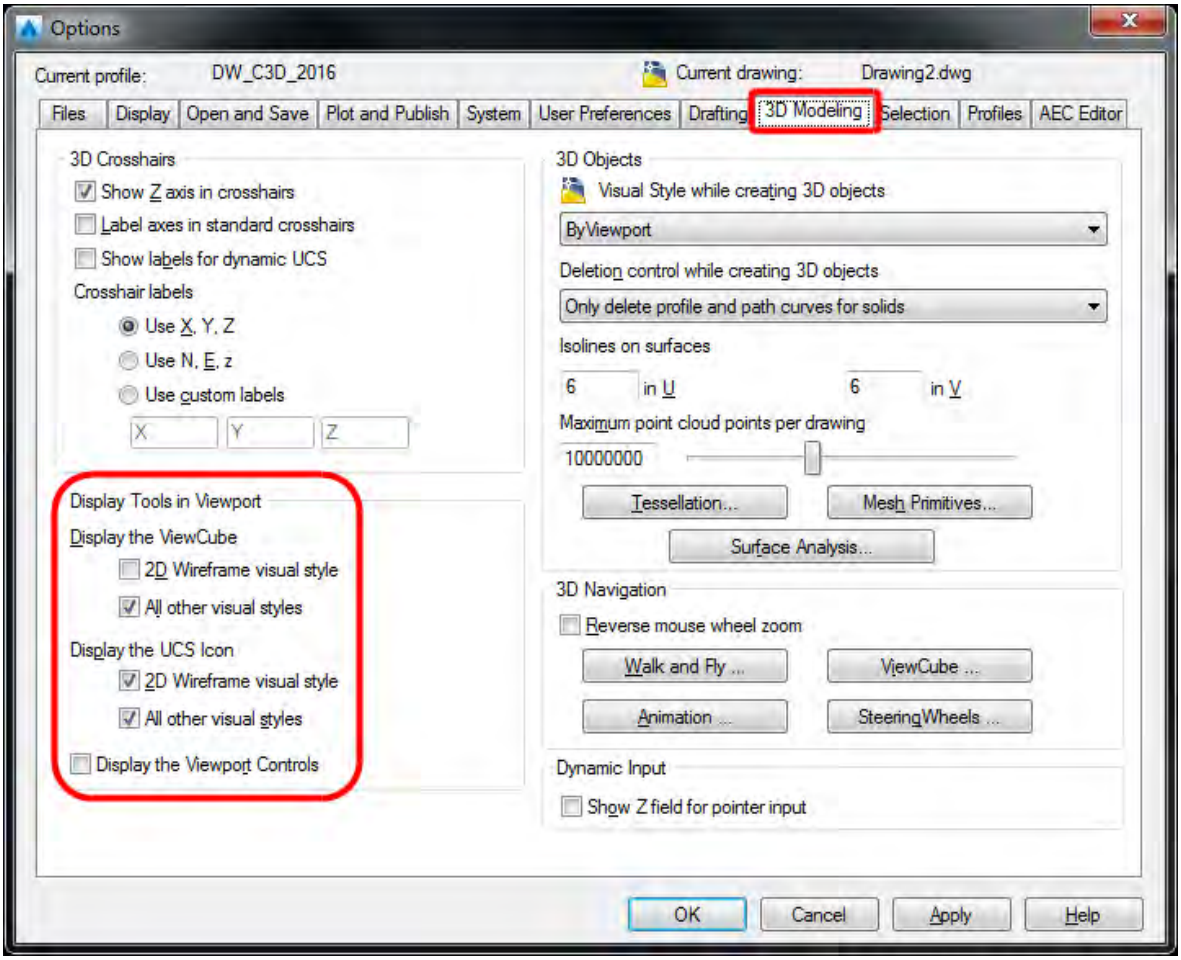
DRAFTING TAB

Sets options for various editing features, including AutoSnap and AutoTrack:



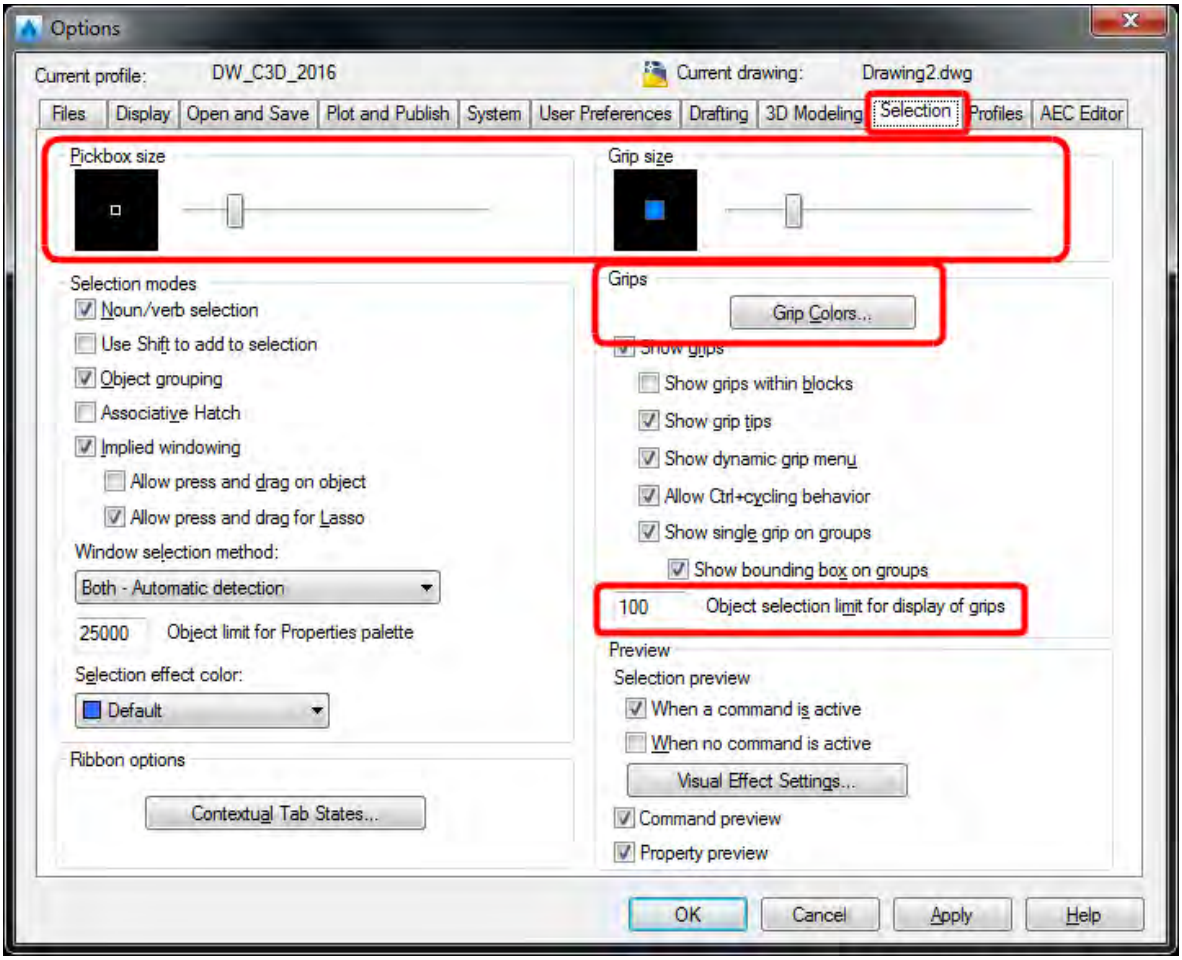
3D Modeling Tab

Sets options for working with solids and surfaces in 3D:



SELECTION TAB

Sets options for selecting objects:



ATTENTION

INTERNAL USERS ONLY: Changing any of the "Selection modes" settings from their current selections can, and will, cause unexpected drafting results.
Profiles Tab: **DO NOT** create new profiles, rename, or import and/or export current profiles. Use Workspaces to save User interface settings.

Users will require an Autodesk 360 account to access certain tools (such as GEOMAP). Autodesk 360 accounts are free through Autodesk, but most services are not. **Your work account must be linked to Denver Water's Autodesk maintenance plan.**

NO options will be edited on any tabs not shown above (Files, Plot and Publish, System, Profiles or AEC Editor).

Section 3.0

CAD Community & Related Workflows

Table of Contents: Section 3.0

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Overview - Section 3.0

The DW CAD Community refers to Denver Water (DW) employees (contract & permanent) who use AutoCAD applications to perform their job duties. Members (End-Users) are required to have a basic understanding of DW's CAD Standards and have attended some form of software training scheduled by DW's CAD Management team. CAD Community members include employees who work in various Divisions and/or Sections of DW; however the majority of members work within the Engineering Division.

The Engineering Division is organized into Sections, groups of employees who perform similar engineering tasks. This document places focus on the CAD procedures and processes used by members of the CAD Community who belong to various Sections within the Engineering Division.

Engineering Sections referenced in this manual are defined below:

a. Survey
b. Design Drafting = Capital Projects
c. Distribution = Distribution Engineering
d. Property Management
e. Asset Recording Group

Related, up-to-date Engineering Workflows can be found on DW's SharePoint sites.

Engineering Division Sections

- **Survey** is responsible for providing land surveying, aerial photography control, and mapping services related to new and existing Denver Water facilities, properties, right-of-ways, and easements.
- **Programs and Projects / Design Drafting** is responsible for providing Engineering services related to new and existing Denver Water facilities. These services include Capital Projects, scheduling, budgeting, the control of assigned projects, and coordination with other divisions, sections and outside agencies as well.
- **Construction Management** is responsible for providing contract administration support related to construction projects involving new or existing Denver Water facilities and the inspection of construction contracts awarded by the Engineering Division. This group ensures that projects are constructed in compliance with Denver Water's Capital Projects Construction Standards (CPCS) and project-specific contract documents.
- **Distribution Engineering** is responsible for the design of proposed projects, plan review, and the as-built drawings for all main installations 20-inch and smaller in the Denver Water contract area.
- **Distribution Inspection** is responsible for the inspection and testing of 20-inch and smaller mains, firelines, and domestic services 3-inch and larger in the Denver Water contract area. The inspection services extends to Denver Total Service, Read & Bill and Master Meter contract areas. This group ensures projects are constructed in accordance with the DW Engineering Standards.
- **Property Management** is responsible for easement acquisitions, plan reviews, land sales and exchanges and license agreements on Denver Water's operating and non-operating properties. They also oversee recreation activities for operating and non-operating properties including leases, agreements and studies.
- **Asset Recording** is responsible for activities related to the GIS database, the creation and maintenance of Maximo records related to each facility, and providing assistance to other sections regarding the use of spatial data.

Engineering Workflows

For the most up-to-date project workflows visit OMS Connect for Denver Water's Capital Projects Procedure Manual (CPPM). The Engineering Dashboard can also be utilized to find workflows for smaller Distribution piping.

Section 4.0

Basic Drawing Guidelines & Checklists

Table of Contents: Section 4.0

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Overview - Section 4.0

In order for projects to be shared easily it is important that the method of drafting and structure of the drawing set be standardized. These standards are applicable to projects prepared by and for Denver Water; however, there may be instances where a variance from these standards is necessary. Variances to the CAD Standards shall be submitted in writing to the Denver Water Engineering Technical Support Supervisor (CAD Manager).

Projects and CAD drawings shall be set up using the Sheet Set Manager. Drawings shall maintain a defined coordinate system in order to allow existing conditions and design information to translate accurately into the GIS system.

See *Section 5.0 – Example Sheets* for a representation of each of the following lists.

General Startup Checklist

- ☐ Start or create drawings using the Sheet Set Manager
  - o [see *Section 7.0 – Sheet Set Manager*]
- ☐ Fill out Drawing Properties (as-built plans only)
  - o [see *Section 15.0 – DW's Tool Palettes*]
- ☐ Set Coordinate System
  - o [see *Section 11.0 – Coordinate Systems*]
- ☐ Set drawing scales – Model Space and Paper Space viewports
  - o [see *Section 13.1 – Model/Paper Space and Annotation Scales*]
- ☐ Attach XREF's as overlays with relative pathing
  - o [see *Section 9.2 – External References (XREF's)*]
- ☐ Use DW standard layers*, colors, and linetypes
  - o [see *Section 12.0 – Layers and Linetypes*]
- ☐ Use DW standard text and dimension styles
  - o [see *Section 13.0 – Labeling and Annotation Tools*]
- ☐ Maintain the use of DW standard symbols and blocks
  - o [see *Section 14.0 – DW Standard Symbols and Blocks*]
- ☐ Use a separate layout for each sheet, multiple layouts are permitted in a single drawing
- ☐ Where abbreviations are used, refer to the Denver Water Engineering Standards (ES) and/or Capital Projects Construction Standards (CPCS)
- ☐ Spell check all sheets
- ☐ Plot using *DW Engineering.ctb*
  - o [see *Section 16.1 – DW's Plot Styles (CTBs)*]

*NOTE: Do not draw on layer 0 or Defpoints

Title Blocks

Drawings should be started using a predefined Sheet Set Manager (SSM), which automatically references the Denver Water title blocks in the 2016 templates. Use the SSM to edit title block and cover sheet information [see *Section 7.0 – Sheet Set Manager*].

Always check the subsections located under *Section 5.0 – Example Sheets* for specifics.

All Denver Water title blocks shall contain the following items (from top to bottom):

- ☐ Denver Water Logo – imbedded, not editable
- ☐ Consultant Logo (if applicable)
- ☐ Professional Engineer's Stamp, if applicable
- ☐ Project Title – edit using SSM
- ☐ Project Description – edit using SSM
- ☐ Service Address – edit using SSM
- ☐ Reference to DW Standards (ES and/or CPCS depending on scope of work) – imbedded, not editable
- ☐ Sign off block for Milestone Review/Revision Block/Change Orders/Addendums – edit using SSM
- ☐ Scale – imbedded, not editable
- ☐ Appropriate coordinate system
- ☐ Project Tracker Number (PT NO) – edit using SSM
- ☐ Drafter, Checker, Approver, and As-Built Drafter's last name – edit using SSM
- ☐ Date – see example sheets for editing
- ☐ As-Built Date – edit using SSM
- ☐ Drawing Title (Sheet Title) – edit using SSM
- ☐ Sheet Numbers (Sheet # of # Sheets – the cover shall be Sheet 1) – edit using SSM

ATTENTION

DO NOT explode title blocks or overwrite attribute fields with text. See *Section 7.0 – Sheet Set Manager* for editing Sheet Set Properties; to add company logos insert them as a block on the G-ANNO-LOGO layer, and situate them in the designated area of the title blocks.

Cover Sheet & General Drawing Guidelines

Most plan sheets should contain the following information. Check the subsections located under *Section 5.0 – Example Sheets* for specifics:

- ☐ Cover Sheet Information
  - o Sheet 1 – edit using SSM
  - o Denver Water – Denver, Colorado – imbedded, not editable
  - o Project Title– edit using SSM
  - o Project Description – edit using SSM
  - o Contract Number or Project Tracker Number (based on scope of work) – edit using SSM
  - o Location Map
  - o Vicinity Map
  - o North Arrow
  - o Project contact info
- ☐ Index of Sheets / Drawing Index (Cover Sheet preferred if possible)
- ☐ General Notes
- ☐ Plan Legend (Symbols and Abbreviations)
- ☐ Datum information, including:
  - o Vertical Datum:
    - ▪ Benchmark: reference number, description, location, and elevation
    - ▪ Coordinate System name/Datum name
  - o Horizontal Datum:
    - ▪ Basis of Bearing description
    - ▪ Description of the monuments used for basis of bearing
    - ▪ Coordinates of each monument used for basis of bearing
    - ▪ Bearing and Distance between the two monuments
    - ▪ Source of coordinates (Published, GPS, etc.)
- ☐ Materials List (if applicable)
- ☐ Fire Flow Data (if applicable)
- ☐ Fire Hydrant Note (if applicable)
- ☐ Professional Land Surveyor (PLS) and/or Professional Engineer (PE) seal (if applicable)
- ☐ Contract/Project Numbers (City Pipe and Capital Projects)

General Plan Set Guidelines

Most plan sheets should contain the following information. Check the subsections located under *Section 5.0 – Example Sheets* for specifics:

- ☐ Define Coordinate System
- ☐ Adjoining sheets/views must use match lines at an even station with the sheet number referenced
- ☐ Dimensioning, within profiles, between features shown on separate sheets should be shown with double arrowheads
- ☐ Location, dimensions and labels of dedicated streets, easements, DW Property Boundary, and right-of-ways (ROW)
- ☐ Plan views should have a North arrow with the scale noted with Plan Title Standard Block (include contour internal (CI) when contours are shown in Plan View)(if applicable)
- ☐ Utility Notification Center of Colorado “Call Before You Dig” note (Cover Sheet only)
- ☐ North should be shown at a 90 degrees increment or “building” North, as a general rule
- ☐ Lots to be served
- ☐ Existing and proposed curb and gutter
- ☐ Existing and proposed utilities
- ☐ Existing and proposed utility appurtenances such as vaults, catch basins, traffic islands, retaining walls, detention ponds, footers, etc.
- ☐ Proposed alignment, with stationing, of water mains and/or conduits and the location of proposed facilities such as valves, fire hydrants, fittings, etc.
- ☐ Location and size of taps, services, stub-ins, curb stops or property line valves, and meters for fire service lines and domestic connections. A typical blow-up detail may be used, provided exceptions to the typical detail are clearly identified on the plan
- ☐ References to applicable Denver Water Standard ES Drawing number or CPCS detail number
- ☐ Proposed elevations, upstream and downstream hydraulic grade line, and pressure on Pressure Regulating Valves (PRV)
- ☐ Profile views on plans for water mains 16-inch or larger
- ☐ Where applicable, profile views are shown below plan views; the plan and profile views should be aligned so that the improvement is in direct relationship between the two views
- ☐ Add standard plan & profile notes

Survey Control Guidelines

Survey control information shall be included in every plan set. Utilize Data Shortcuts and x-referencing (XREF or XR) [see *Section 9.0 – Sharing Project Data*].

All External Surveys

- ☐ Defined Coordinate System
- ☐ Street names must be shown
- ☐ Description of every monument (size, type, construction, markings, cased, buried, surface brass cap, etc.)
- ☐ Range lines for survey's within Denver City limits
- ☐ Coordinates for each monument, which must include Northing and Easting
- ☐ Bearing and distance between two monuments, and distance from offset monument (if any) to the intersection
- ☐ Curve data: radius, delta angle, and arc length on any curving monument lines or baselines
- ☐ Bearing and distance and/or dimension from monument line to construction baselines
- ☐ Station at each intersection and PCs and PTs of curving monument lines (no stationing that starts at the property line, end of existing paving, or other indeterminate point)
- ☐ Description and elevation of any site Benchmarks or Control Points with elevation
- ☐ Dimension from the monument line to right-of-way line on each street; if variable, show dimension at each end of block
- ☐ Professional Land Surveyor (PLS) stamp (the stamp must be signed if plans are complete)
- ☐ Current contact information for PLS

City Pipe Survey Maps (internal use only)

Property Requirements

- ☐ Public ROW limits
- ☐ Denver Water property lines
- ☐ Easements, existing and proposed lines
- ☐ Flowline with distance from property line or edge of asphalt
- ☐ Type of curb and gutter (Hollywood, 6-inch vertical with concrete pan, etc.)
- ☐ Street names
- ☐ Range Points and Range Lines (tied out for post construction replacement also, if needed)
- ☐ Aliquot Section Corners and Aliquot Lines (only if range points are missing)
- ☐ Pertinent information pertaining to surveyor, and horizontal and vertical datum
  - o GPS Coordinate System used
- ☐ Additional City or County requirements

Drafting/Interference Requirements

- ☐ Horizontal distance (dimension) to all utilities from property line or ROW
- ☐ Roadway centerline and flowline, include lane marking for traffic plan
- ☐ Size of vaults and manholes (inside dimensions or circumference)
- ☐ Vertical and horizontal alignment of utilities, including, but not limited to, gas, fiber optic, electrical (overhead and underground), water, sanitary sewer, sanitary sewer forcemain, and storm sewer extending upstream and downstream of the proposed limits of work
- ☐ Type and size of storm and sanitary sewer mains
- ☐ Rim and invert elevation on all storm and sanitary manholes extending upstream and downstream of the proposed limits of work
- ☐ Upstream and downstream utility appurtenances
- ☐ One-foot contours with centerline, flowline, and property lines defined (depending on project site)
- ☐ Scale and North arrow
- ☐ Note any abandoned utilities in the area, and existing water mains including valves, hydrants, and the size and type of pipe
- ☐ Water main crossings with utilities including high pressure gas, underground electric lines
- ☐ **Verify and document any discrepancies between field investigation and GIS data (import GIS into drawings for comparison)**
- ☐ Determine if conduits are connected to mains, if they are not connected, it should be clearly shown
- ☐ Surface material limits including, but not limited to: concrete, asphalt, or gravel, etc. Also note if it is new asphalt or chip seal
- ☐ Notate trees, fences, retaining walls, railroad tracks, light rail tracks, drainageway, detention ponds, ditches, tunnels, footers, wing walls, approach slabs, medians, signs, encroachments, and overhead interference
- ☐ Note of current for construction at the time of the field survey

Erosion Control Plans

Erosion Control is project and jurisdiction dependent. Plans shall be developed in accordance with the permitting Jurisdiction's Grading, Erosion, and Sediment Control (GESC) requirements. Best Management Practices (BMPs) shall be in conformance with the current, applicable drainage criteria within the project county/counties.

References include but are not limited to:

- Urban Drainage and Flood Control District (http://www.udfcd.org/)
- Southeast Metro Stormwater Authority (http://semswa.org)
- Jefferson County (http://jeffco.us/)
- Douglas County (http://www.douglas.co.us/)

Section 5.0

Example Sheets

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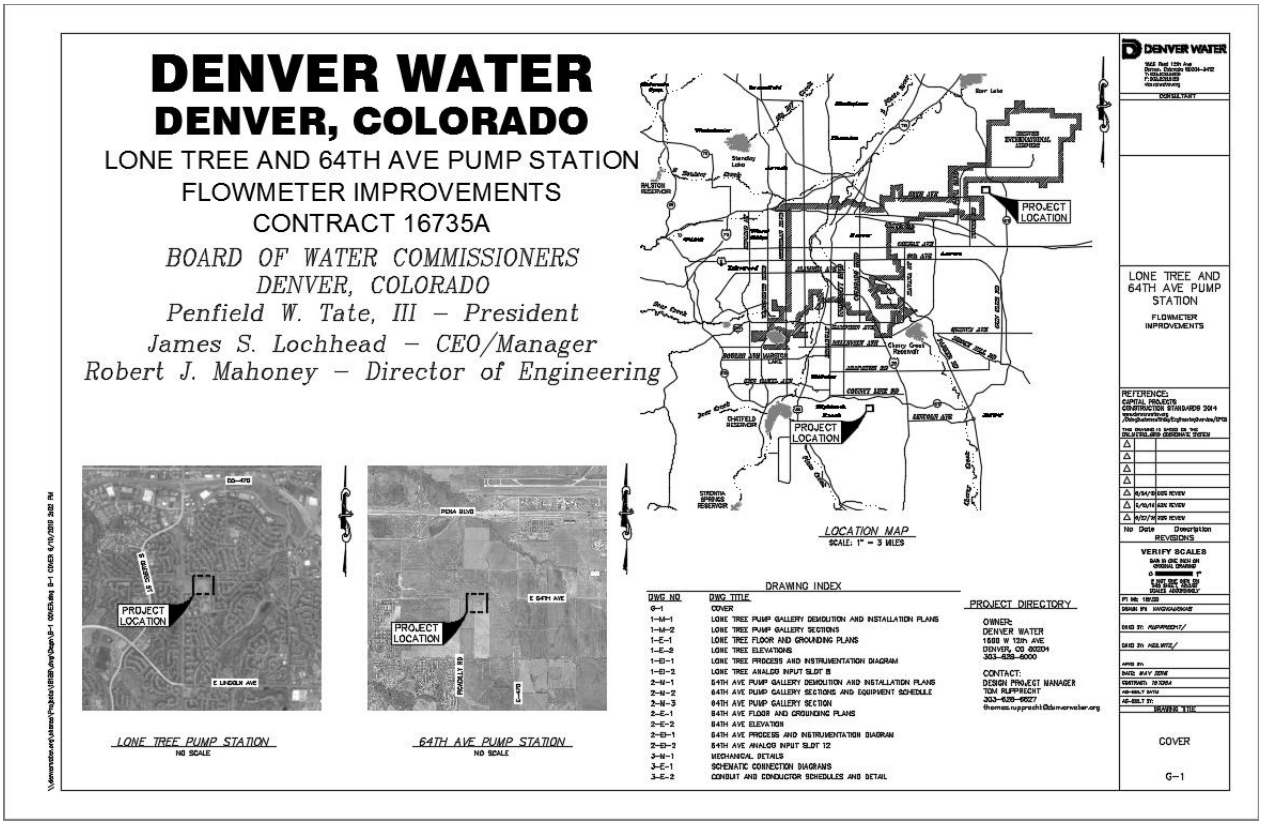
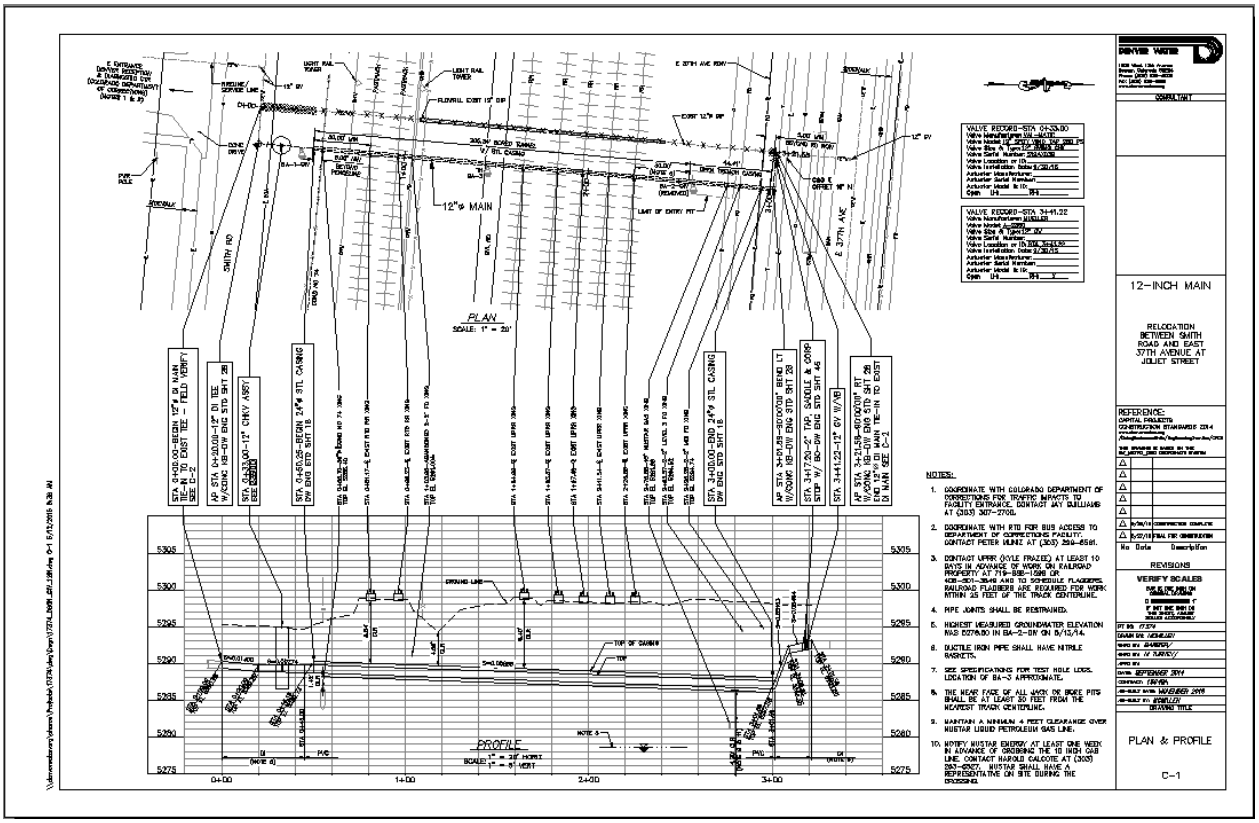
Overview - Section 5.0

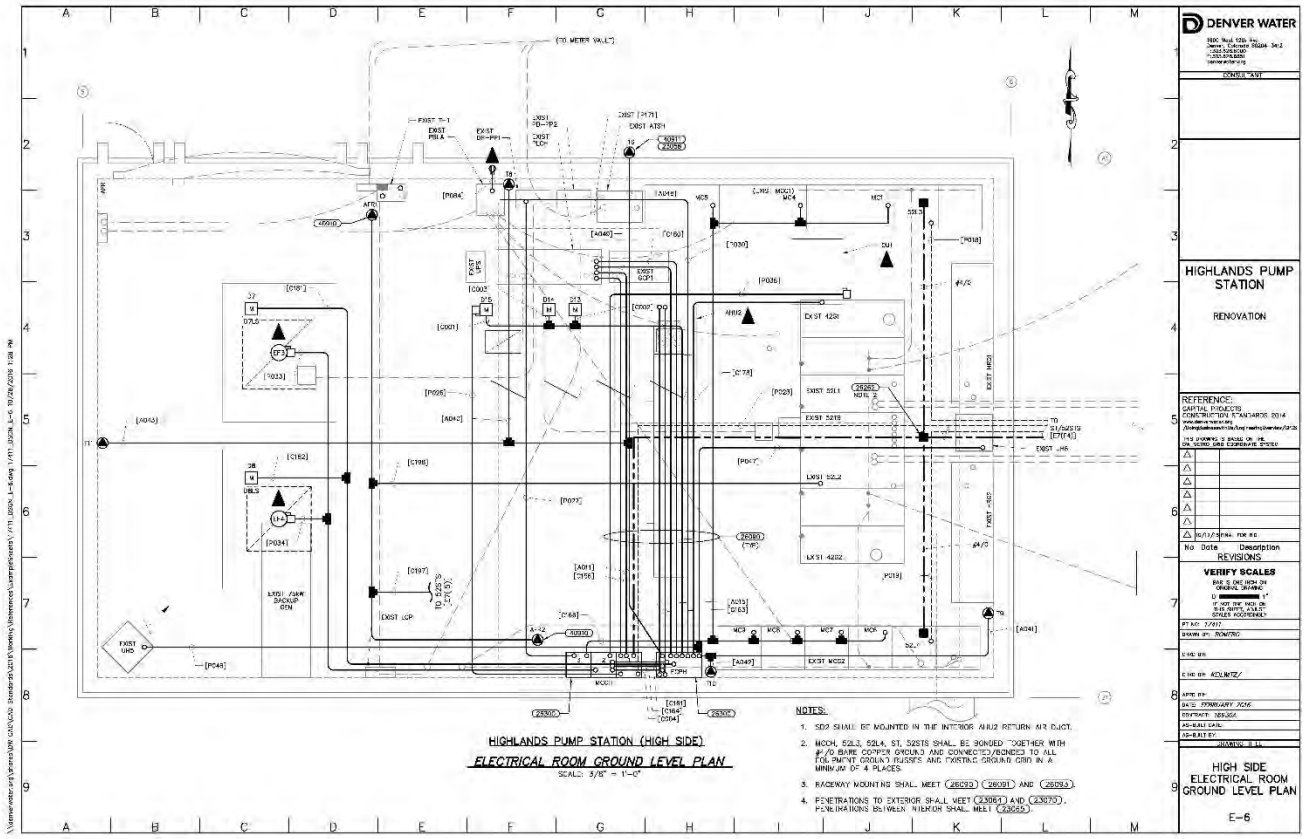
Each section within Denver Water creates specific drawings based on their project scope. The Example Sheets in the following subsections are to give the user an overall feel of how specific plans should appear aesthetically and how they differ from each other. A few basic sample drawings are shown here:

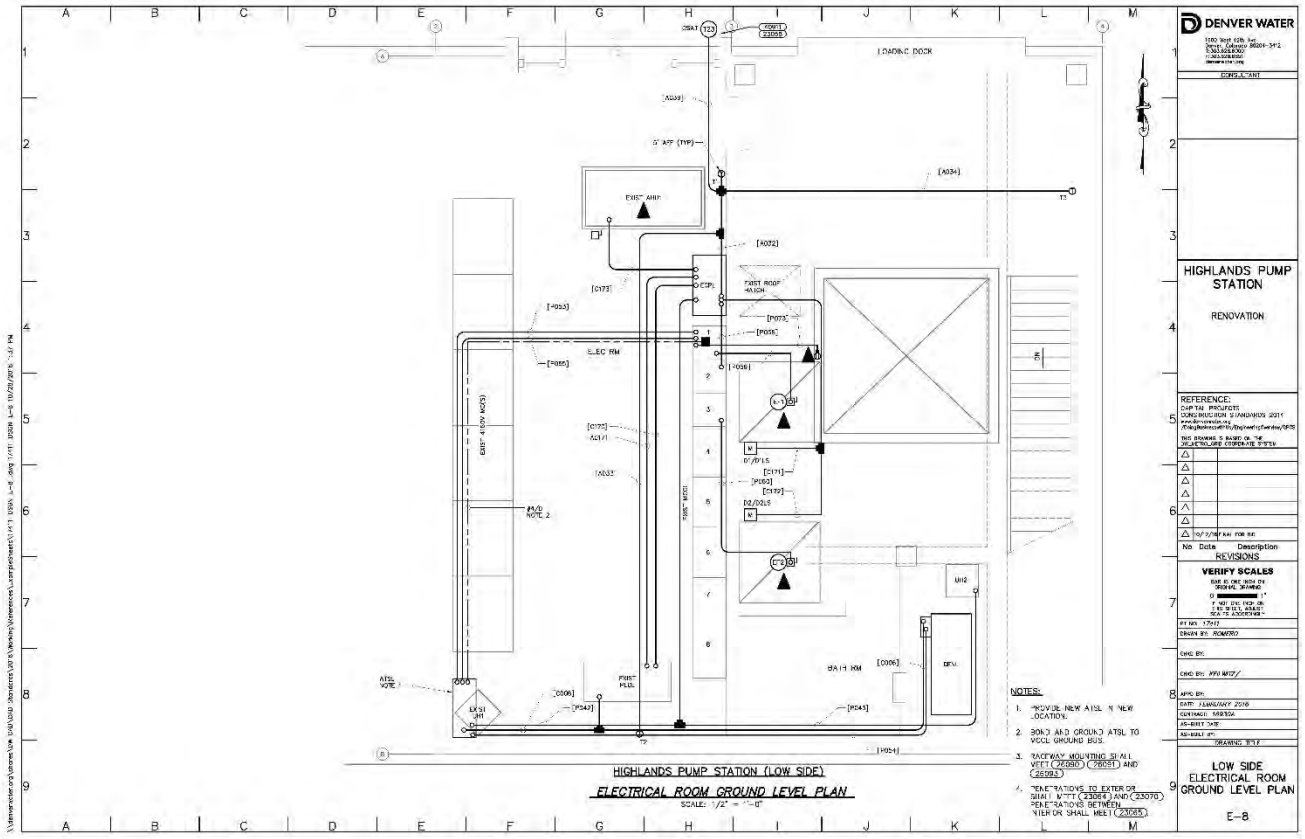
Capital Projects:



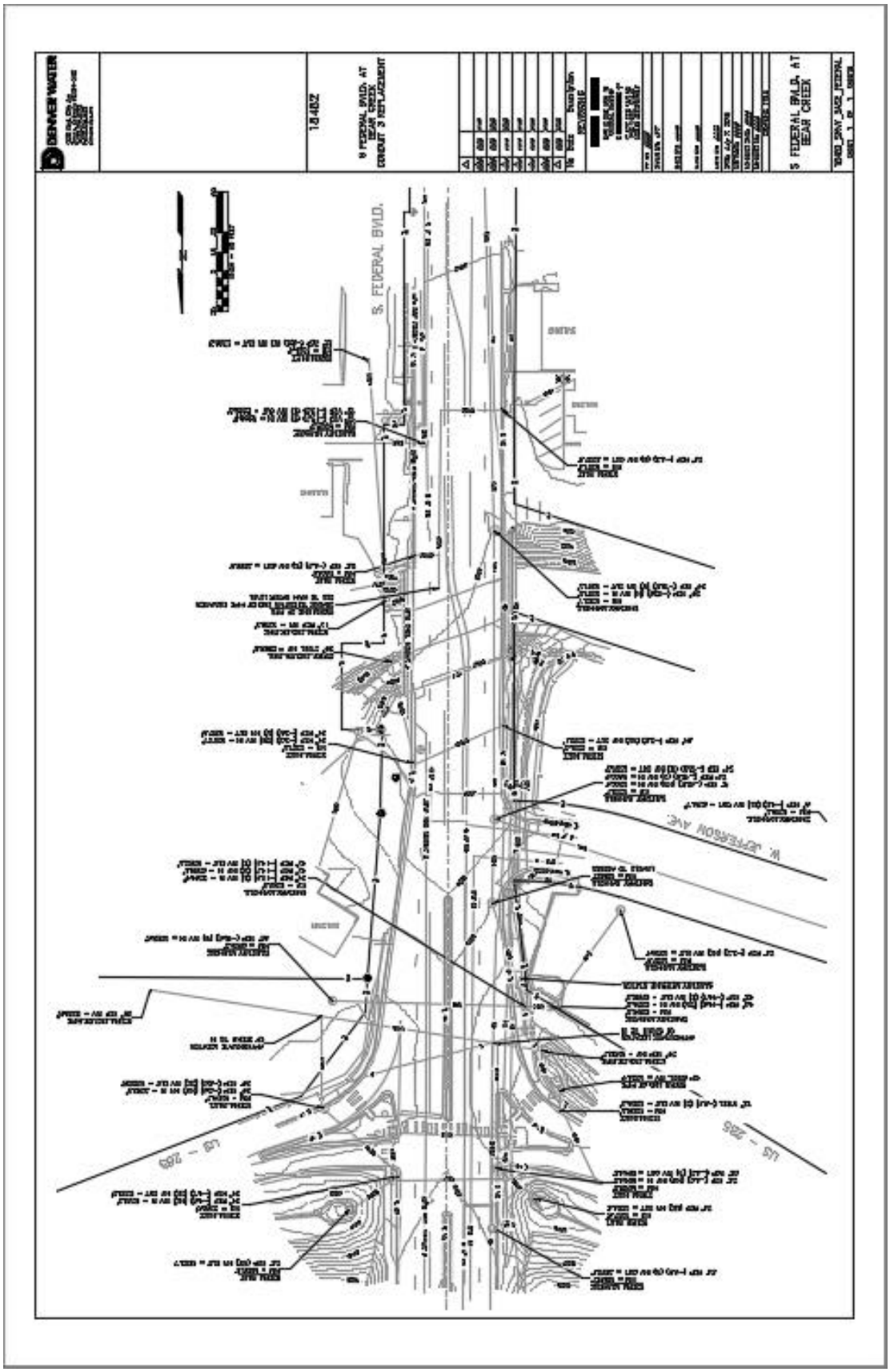


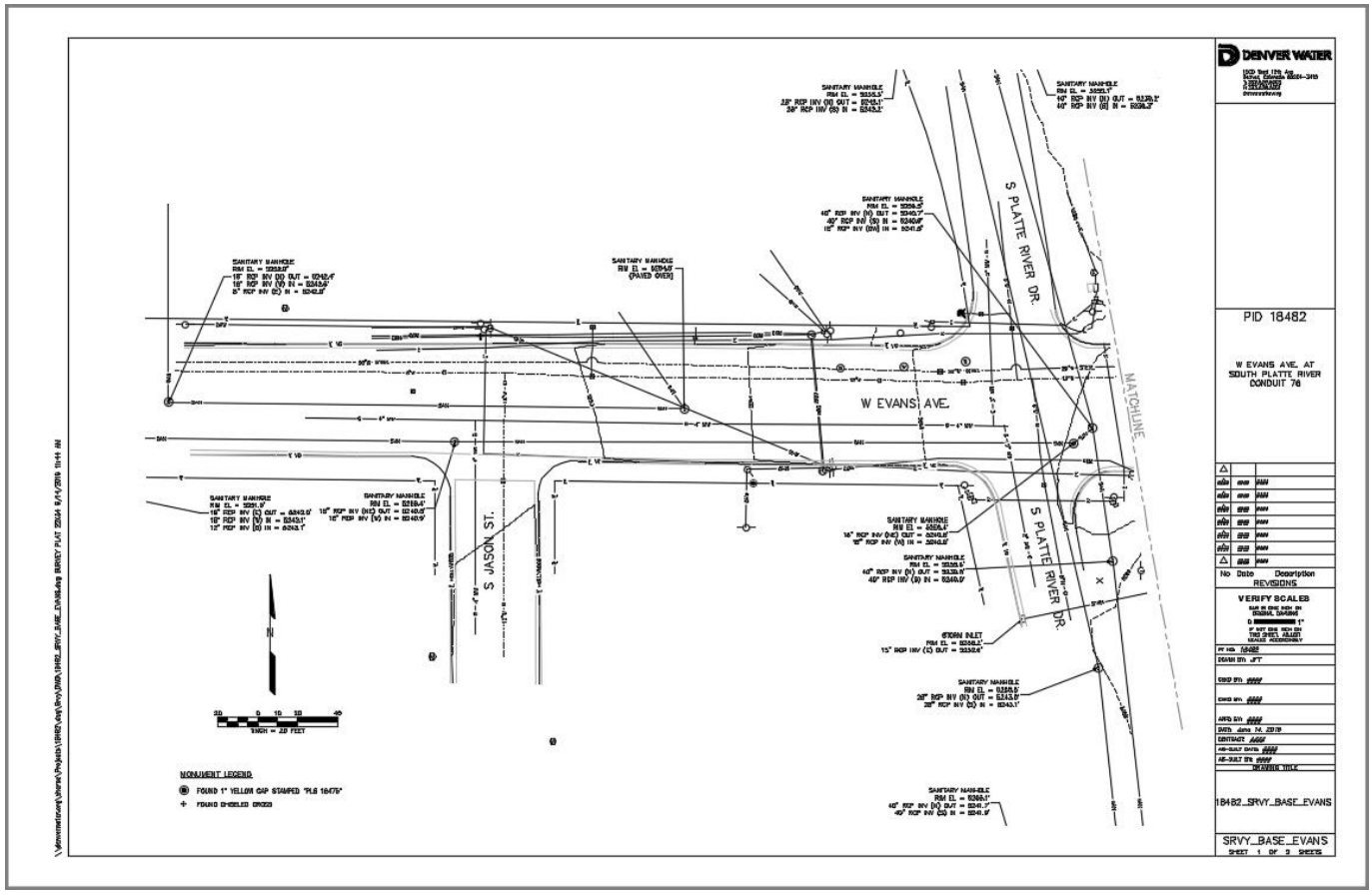
Capital Electrical Projects:

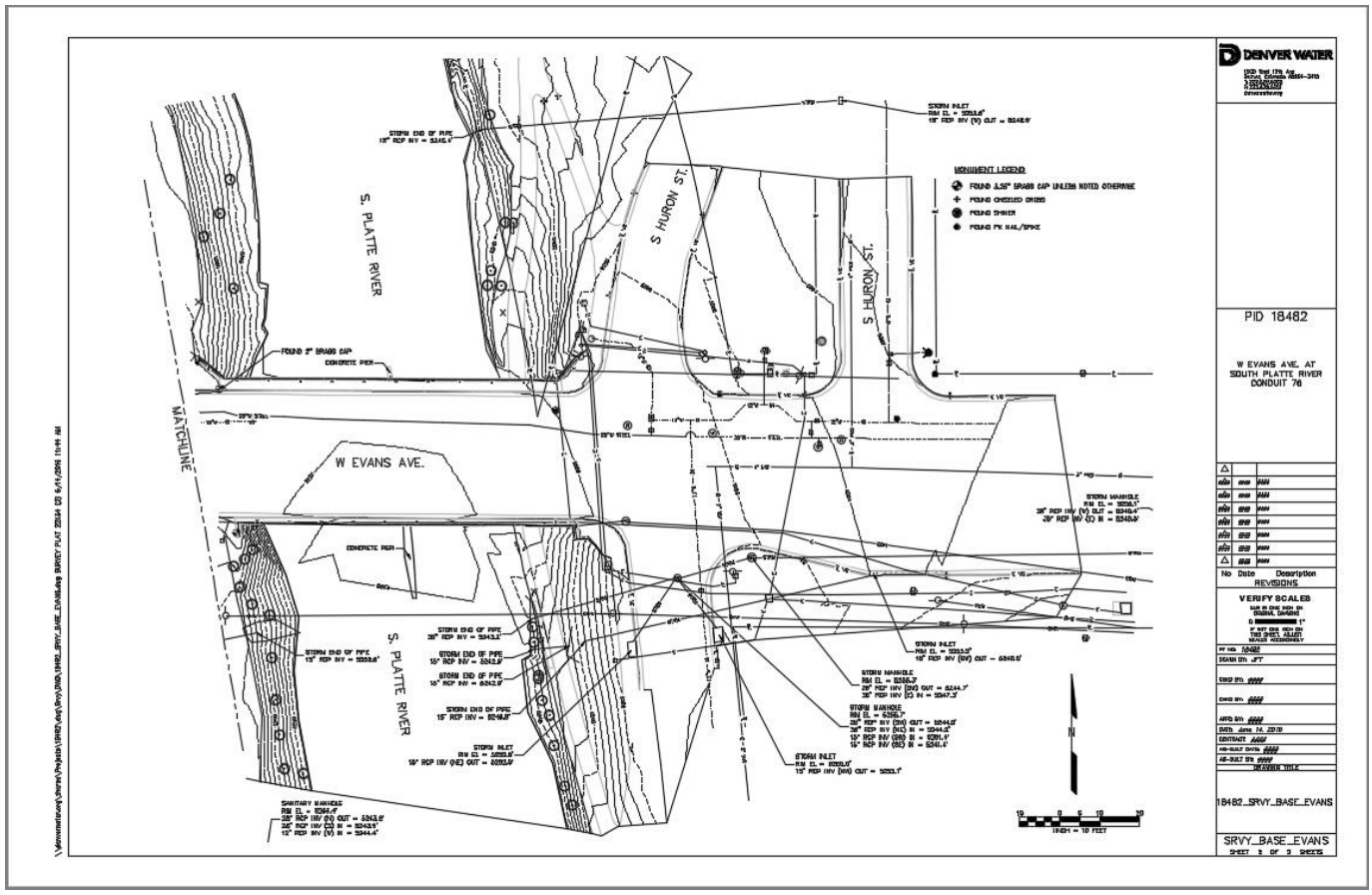


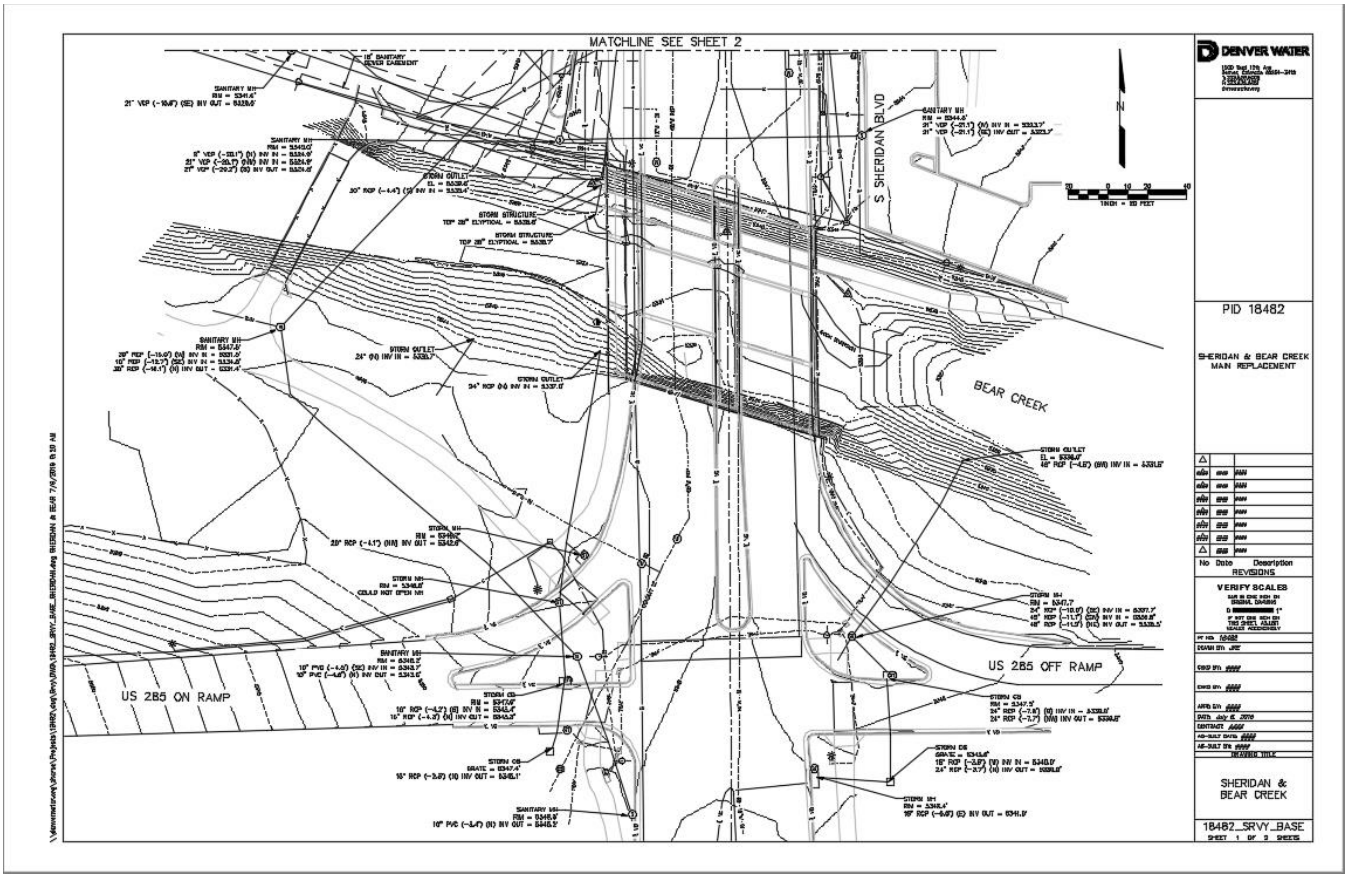


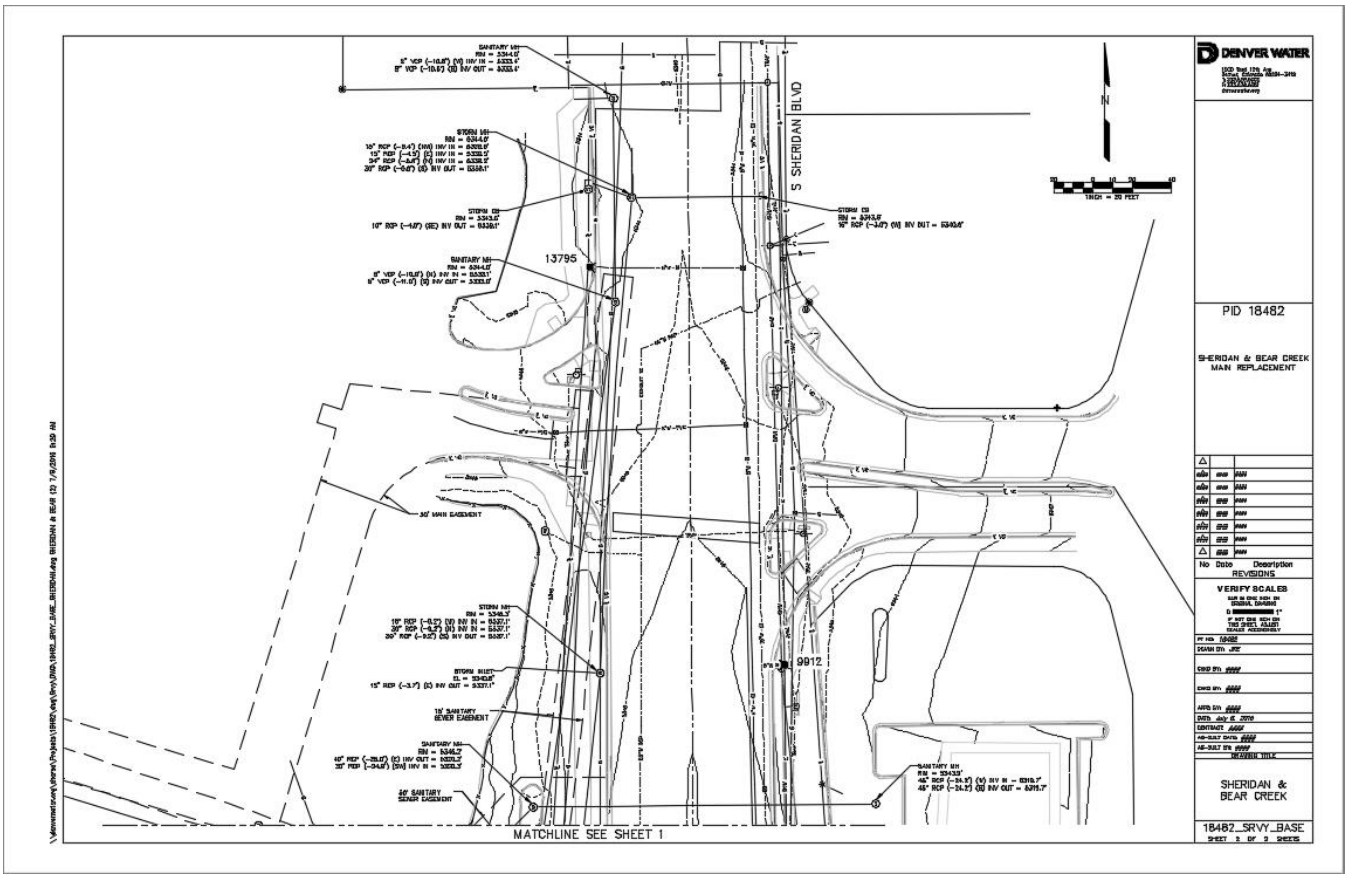
Survey Projects:

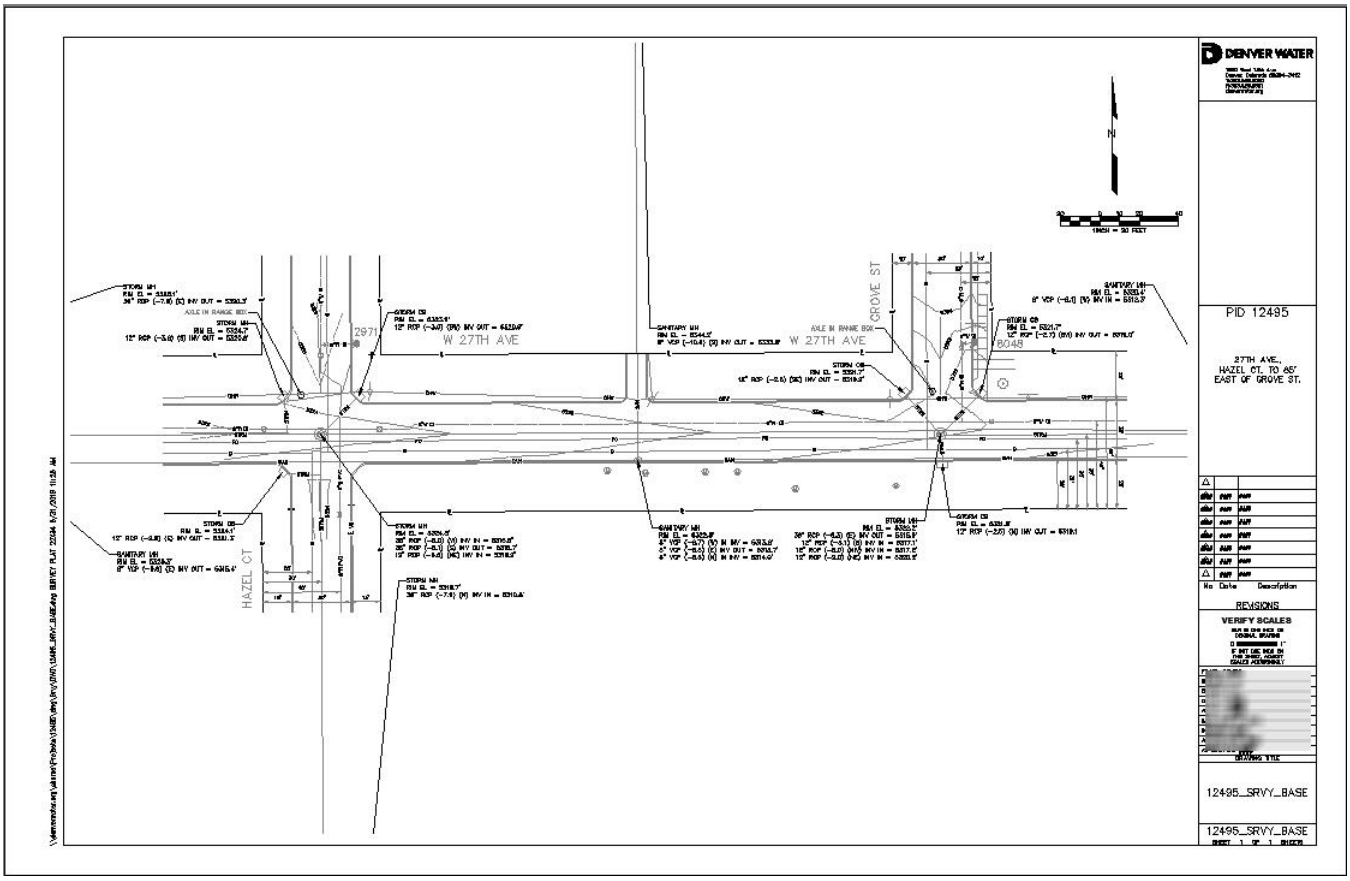


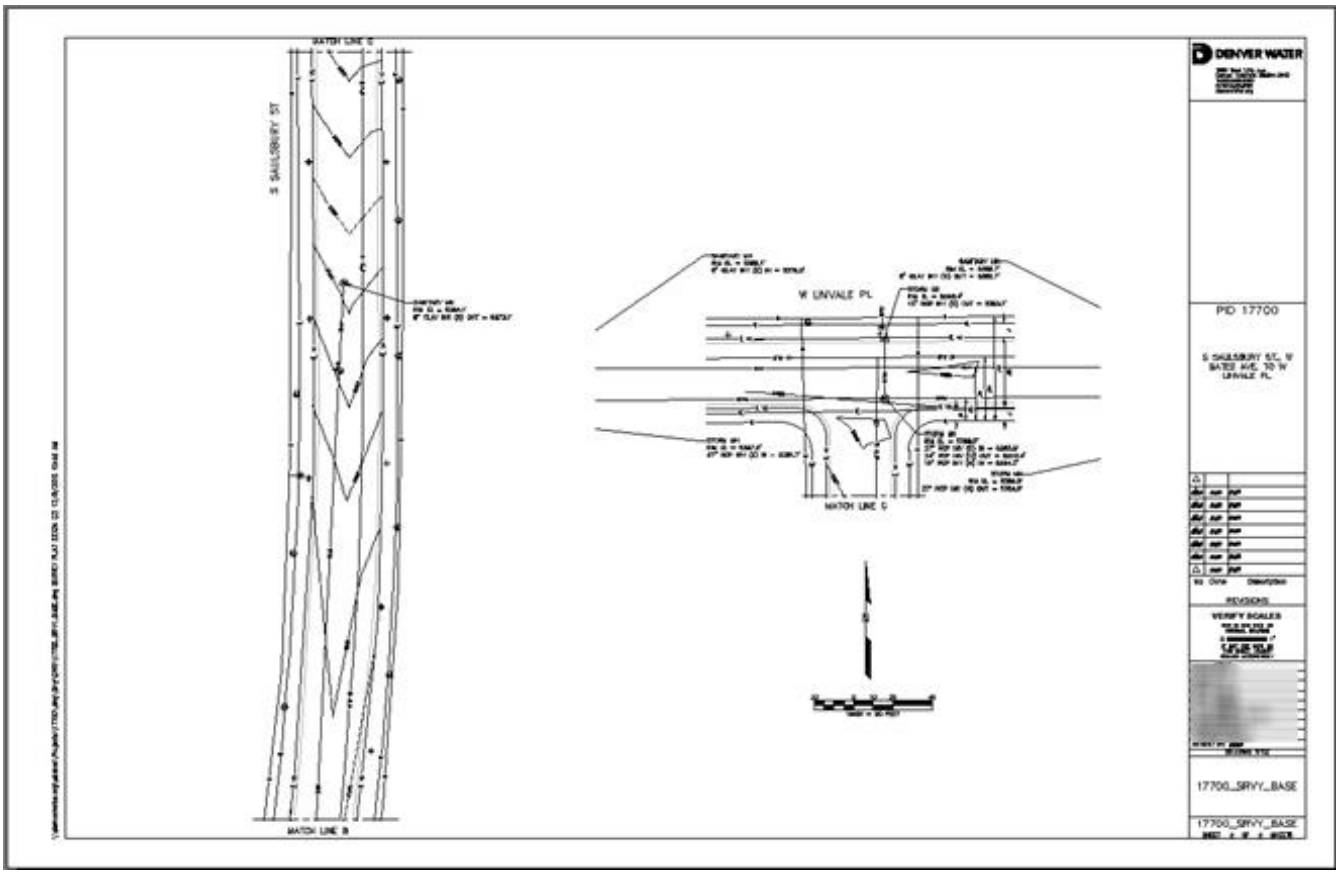

DENVER WATER
PID 18482
W EVANS AVE. AT SOUTH PLATTE RIVER CONDUIT 76
W EVANS AVE.
S. JASON ST.
S PLATTE RIVER DR.
MATCHLINE
MONUMENT LEGEND
FOUND 1" YELLOW CAP STAMPED "PLS 18475"
FOUND CHISELED CROSS
REVISIONS
VERIFY SCALES
18482_SRVY_BASE_EVANS
SRVY_BASE_EVANS
SHEET 1 OF 3 SHEETS

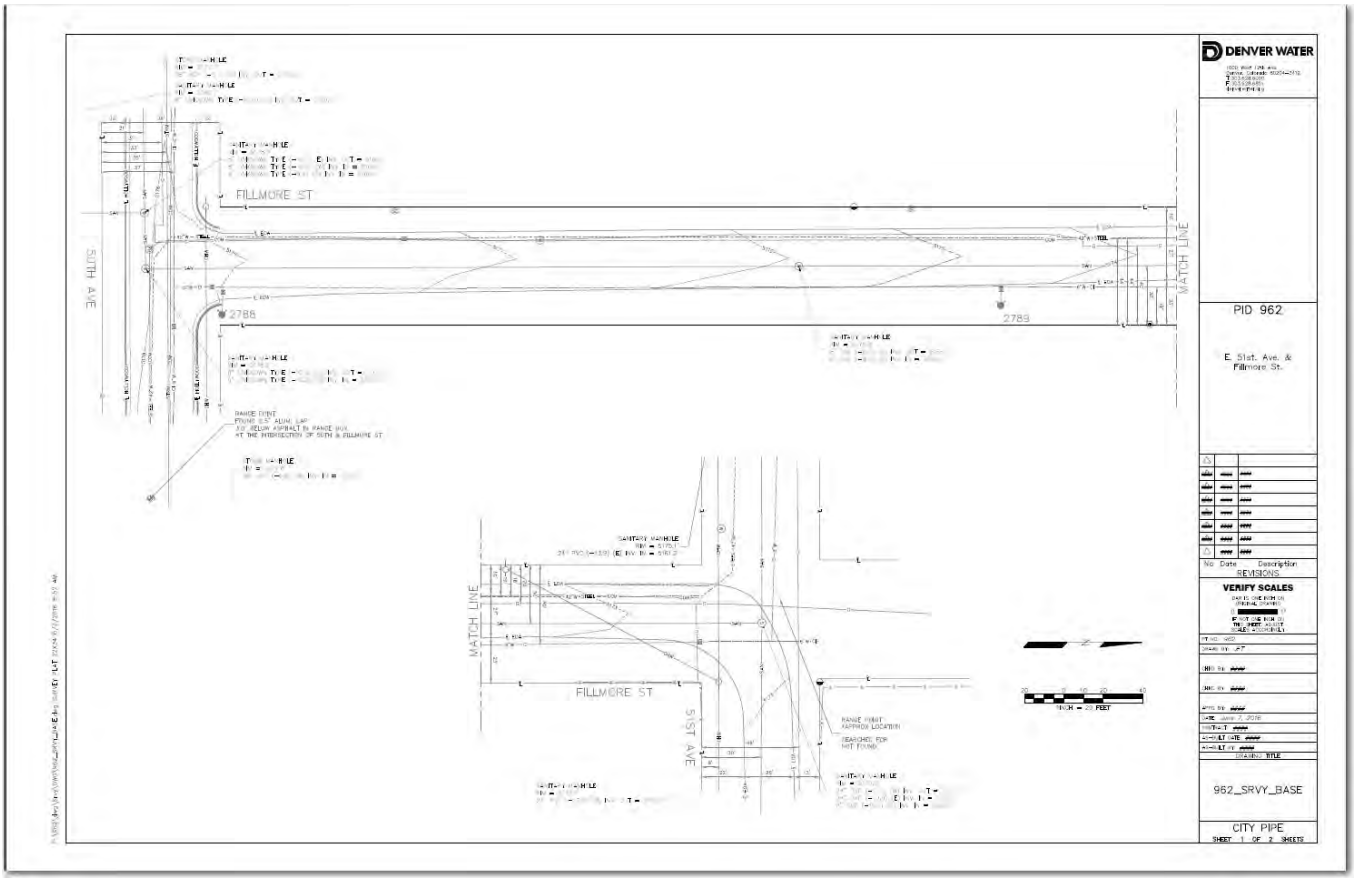

DENVER WATER
PID 18482
W EVANS AVE. AT SOUTH PLATTE RIVER CONDUIT 76
S. PLATTE RIVER
S HURON ST.
W EVANS AVE.
MATCHLINE
MONUMENT LEGEND
FOUND 2" BRASS CAP
REVISIONS
VERIFY SCALES
18482_SRVY_BASE_EVANS
SRVY_BASE_EVANS
SHEET 2 OF 3 SHEETS

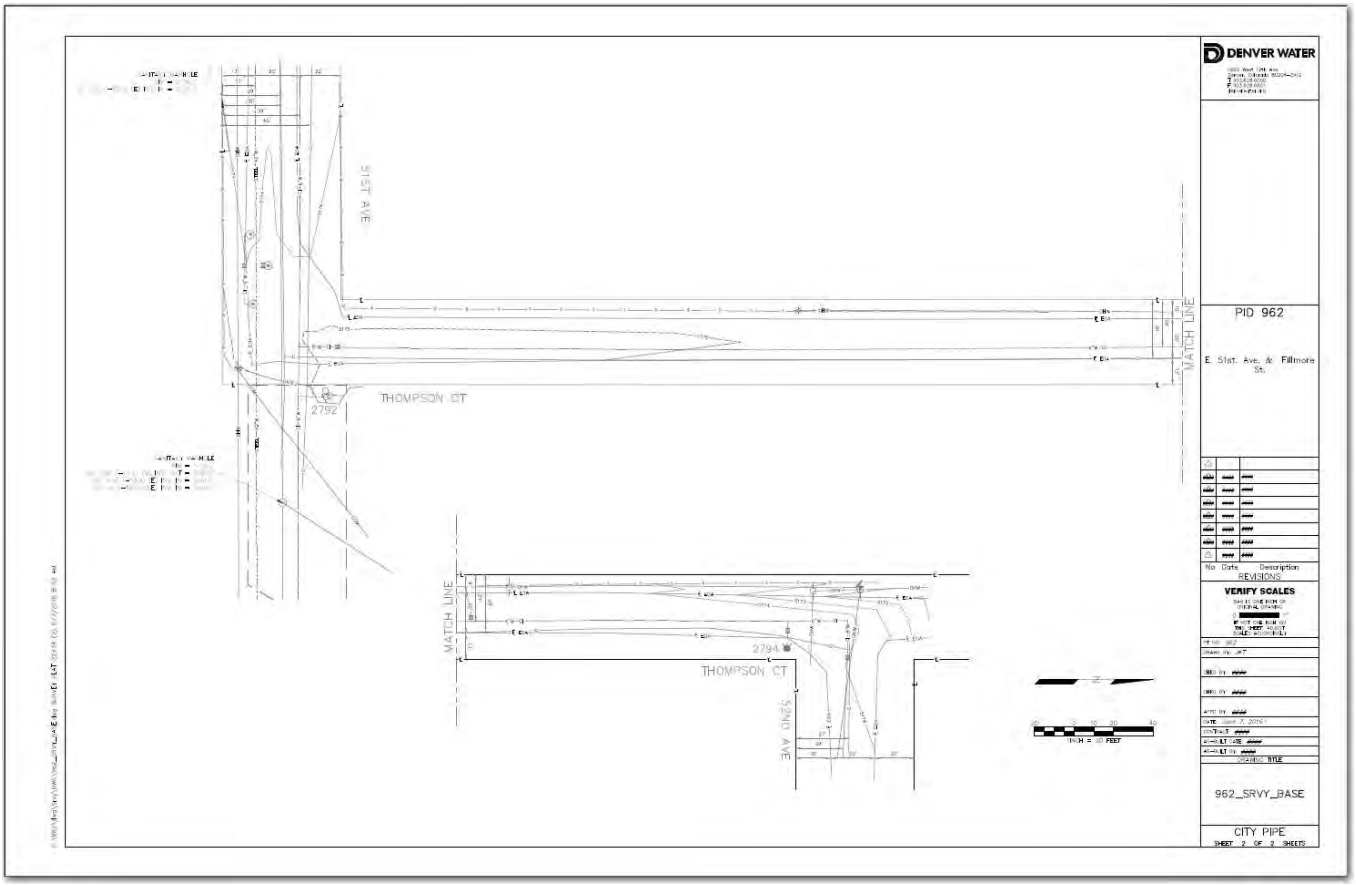

MATCHLINE SEE SHEET 2
S SHERIDAN BLVD
BEAR CREEK
US 285 ON RAMP
US 285 OFF RAMP
DENVER WATER
PID 18482
SHERIDAN & BEAR CREEK MAIN REPLACEMENT
No Date Description
REVISIONS
VERIFY SCALES
SHERIDAN & BEAR CREEK
18482_SRVY_BASE

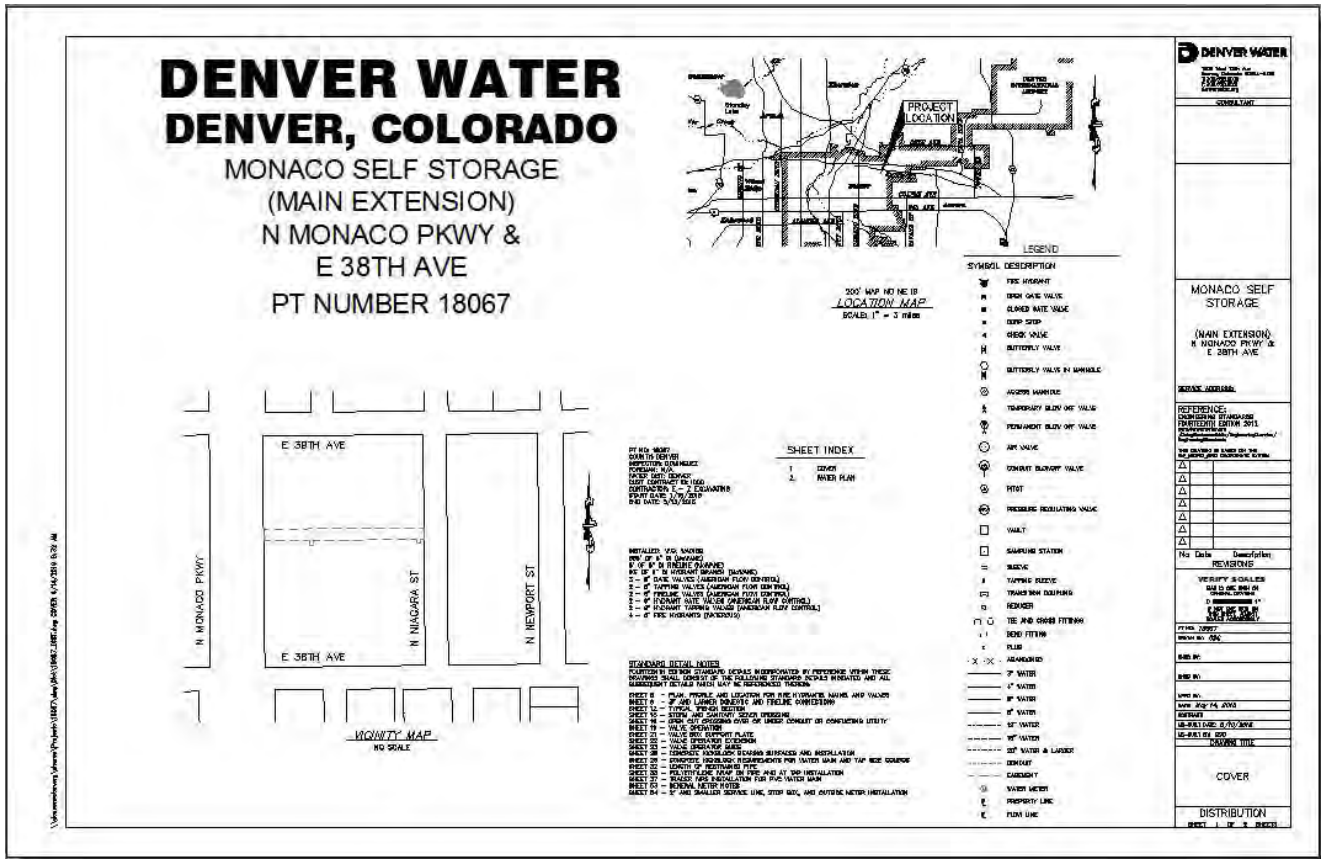

S SHERIDAN BLVD
13795
9912
30' MAIN EASEMENT
16' SANITARY SEWER EASEMENT
MATCHLINE SEE SHEET 1
DENVER WATER
PID 18482
SHERIDAN & BEAR CREEK MAIN REPLACEMENT
No Date Description
REVISIONS
VERIFY SCALES
SHERIDAN & BEAR CREEK
18482_SRVY_BASE

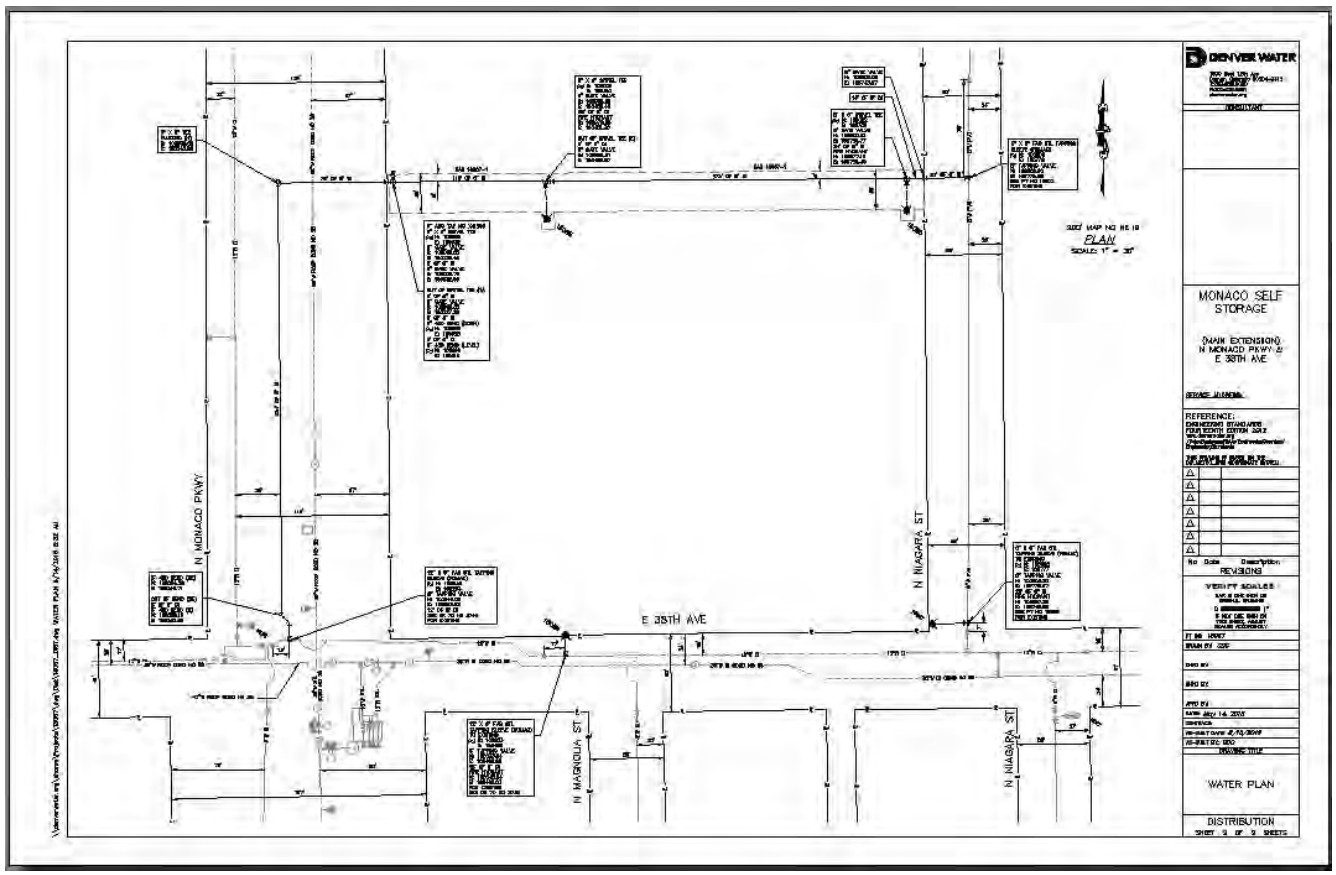

DENVER WATER
PID 12495
27TH AVE., HAZEL CT. TO 65' EAST OF GROVE ST.
REVISIONS
VERIFY SCALES
12495_SRVY_BASE
W 27TH AVE
GROVE ST
HAZEL CT


DENVER WATER
PID 17700
S SAULSBURY ST, W BATES AVE TO W UNVALE PL
REVISIONS
VERIFY SCALES
17700_SRVY_BASE
S SAULSBURY ST
W UNVALE PL
MATCH LINE C
MATCH LINE B


DENVER WATER
FILLMORE ST
SOUTH AVE
MATCH LINE
2788
2789
SANITARY MANHOLE
RIM = 5755.2
(E) INV IN = 5741.2
MATCH LINE
FILLMORE ST
51ST AVE
RANGE POINT
APPROX LOCATION
SEARCHED FOR
NOT FOUND
PID 962
E. 51st. Ave. & Fillmore St.
No Date Description
REVISIONS
VERIFY SCALES
962_SRVY_BASE
CITY PIPE
SHEET 1 OF 2 SHEETS


DENVER WATER
51ST AVE
MATCH LINE
2792
THOMPSON CT
MATCH LINE
2794
THOMPSON CT
51ST AVE
PID 962
E. 51st. Ave. & Fillmore St.
No Date Description
REVISIONS
VERIFY SCALES
962_SRVY_BASE
CITY PIPE
SHEET 2 OF 2 SHEETS


DENVER WATER
DENVER, COLORADO
MONACO SELF STORAGE
(MAIN EXTENSION)
N MONACO PKWY &
E 38TH AVE
PT NUMBER 18067
PROJECT LOCATION
LOCATION MAP
SCALE: 1" = 3 miles
LEGEND
SYMBOL DESCRIPTION
E 38TH AVE
N MONACO PKWY
N NIAGARA ST
N NEWPORT ST
VICINITY MAP
NO SCALE
SHEET INDEX
COVER
DISTRIBUTION


PLAN
SCALE: 1" = 30'
N MONACO PKWY
N NIAGARA ST
E 38TH AVE
N MAGNOLIA ST
MONACO SELF STORAGE
(MAIN EXTENSION)
N MONACO PKWY &
E 38TH AVE
WATER PLAN
DISTRIBUTION

Section 5.1

Distribution Engineering Examples

Overview - Section 5.1

This section outlines how Denver Water's Distribution drawings should appear.

- Contract Installed As-Built
- City Pipe Preliminary
- City Pipe As-Built

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DENVER WATER
DENVER, COLORADO
STAPLETON FILING #19 - PHASE 2B
(MAIN EXTENSION)
E 35TH AVE & N BOSTON ST
PT NUMBER 15801

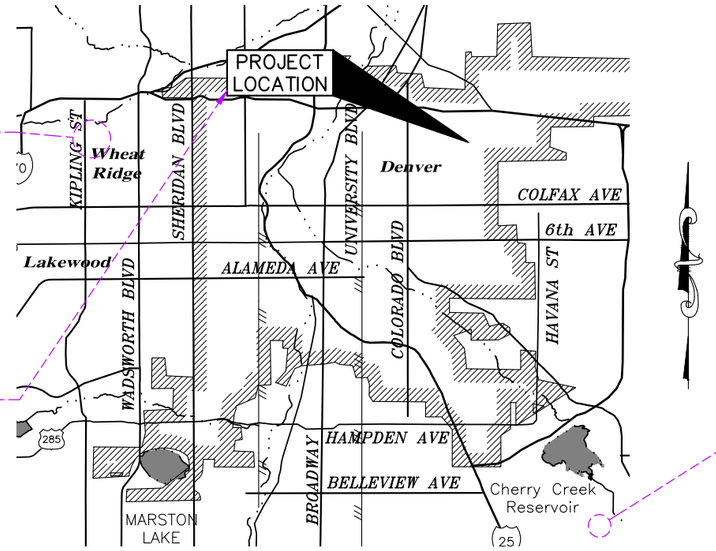
- TOOL PALETTE: "DW General Drafting"
- BLOCK NAME: Location Map
INSERT IN MODEL SPACE

- TOOL PALETTE: "DW General Drafting"
- BLOCK NAME: LABEL-Project Location
- LAYER: G-ANNO-L175

USE TITLE BLOCK VISIBILITY STATE TO SEE COVER SHEET INFO

COVER INFO AND TITLE BLOCK INFO TO MATCH EXACTLY

ALL INFO POPULATED USING SSM



LOCATION MAP SHOWS THE OVERALL CITY AND COUNTY (LARGE MAP)

200' MAP NO NE H12

LOCATION MAP

Custom

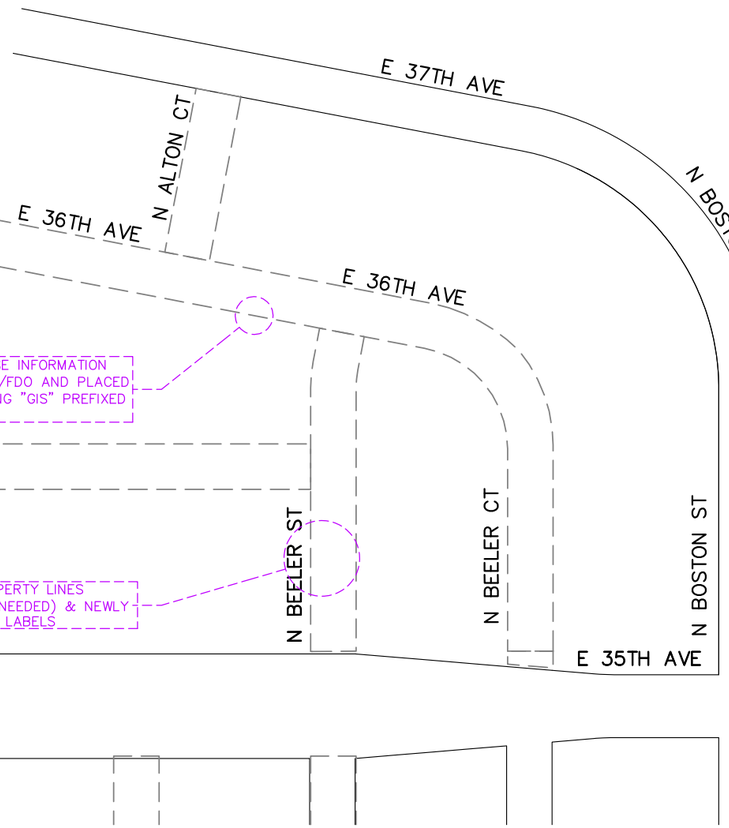
VIEWPORTS ARE INCLUDED IN THE TEMPLATE AS A GUIDE - ADJUST OR RECREATE AS NEEDED

DISTRIBUTION:

CONTRACT INSTALLED "AS-BUILT" EXAMPLE

(COLOR TEXT IS A GRAPHIC REPRESENTATION ONLY, NO COLOR PLOTS)

THIS EXAMPLE COVERS CAD STANDARDS & DRAFTING FUNDAMENTALS



PRIVATE PIPE BASE INFORMATION PULLED FROM GIS/FDO AND PLACED ON CORRESPONDING "GIS" PREFIXED LAYERS

SHOW ONLY PROPERTY LINES (EASEMENTS AS NEEDED) & NEWLY CREATED STREET LABELS

VICINITY MAP

NO SCALE

VICINITY MAP SHOWS THE LIMITS OF WORK TO BE DONE - INCLUDE THE NEAREST MAJOR INTERSECTION

* DENVER WATER AS-BUILT DISCLAIMER:

THIS AS-BUILT MAP WAS PREPARED BY DENVER WATER (DW) FOR ITS INTERNAL PURPOSES ONLY. DW PROVIDES AS-BUILT MAPS AS A SERVICE TO THE DISTRIBUTOR WITH NO CLAIM BY DW OR ITS EMPLOYEES AS TO THE COMPLETENESS, USEFULNESS, TIMELINESS OR ACCURACY OF THEIR CONTENT, POSITIONAL OR OTHERWISE. USE OF THIS MAP IS AT YOUR OWN RISK AND IS NOT BASED ON INFORMATION PROVIDED BY THE DISTRIBUTOR. ANY SALE, REPRODUCTION OR DISTRIBUTION OF THIS MAP, OR PRODUCTS DERIVED THEREFROM, IN ANY FORMAT IS EXPRESSLY PROHIBITED. THE DISTRIBUTOR SHALL COMMUNICATE DISCREPANCIES BETWEEN THE DW MAP AND THE DISTRIBUTOR RECORD IN ACCORDANCE WITH THE WATER SERVICE AGREEMENT OR DISTRIBUTOR'S CONTRACT.

- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: Dist-As-Built Disclaimer
- * ONLY USED FOR PRIVATE DISTRICTS

- TOOL PALETTE: "DW Distribution"
- BLOCK NAME: Sheet Index
EDIT AS NEEDED

- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: Contractors_Stamp

- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: Installed Note
EXPLODE AND EDIT AS NEEDED

- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: Abandoned or Removed Note
EXPLODE AND EDIT AS NEEDED

- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: Standard Detail Notes
EDIT ATTRIBUTE AS NEEDED

SHEET INDEX

PT NO: 15801
COUNTY: DENVER
INSPECTOR: BATTS
FOREMAN: N/A
WATER DIST: DENVER
CUST CONTRACT ID: 1000
CONTRACTOR: JBS PIPELINE
START DATE: 5/10/2011
END DATE: 6/28/2011

INSTALLED: W.O XXXXX
3' OF 12" PVC (VINYL-TECH)
1049' OF 8" PVC (VINYL-TECH)
630' OF 6" PVC (VINYL-TECH)
45' OF 6" DI FIRELINE (US PIPE)
10' OF 3" DI DOMESTIC (US PIPE)
44' OF 6" DI HYDRANT BRANCH (GRIFFIN)
3-8" VALVES (MUELLER)
3-6" VALVES (MUELLER)
1-6" FIRELINE VALVE (MUELLER)
1-6" FIRELINE TAPPING VALVE (MUELLER)
2-3" DOMESTIC VALVES (MUELLER)
4-6" HYDRANT VALVES (MUELLER)
4-6" NEW HYDRANTS (AVK)

ABANDONED:
30' OF 6" PVC

STANDARD DETAIL NOTES

FOURTEENTH EDITION STANDARD DETAILS INCORPORATED BY REFERENCE WITHIN THESE DRAWINGS SHALL CONSIST OF THE FOLLOWING STANDARD DETAILS INDICATED AND ALL SUBSEQUENT DETAILS WHICH MAY BE REFERENCED THEREIN:

SHEET 8 - PLAN, PROFILE AND LOCATION FOR FIRE HYDRANTS, MAINS, AND VALVES
SHEET 9 - 3" AND LARGER DOMESTIC AND FIRELINE CONNECTIONS
SHEET 12 - TYPICAL TRENCH SECTION
SHEET 15 - STORM AND SANITARY SEWER CROSSING
SHEET 16 - OPEN CUT CROSSING OVER OR UNDER CONDUIT OR CONFLICTING UTILITY
SHEET 19 - VALVE OPERATION
SHEET 21 - VALVE BOX SUPPORT PLATE
SHEET 22 - VALVE OPERATOR EXTENSION
SHEET 23 - VALVE OPERATOR GUIDE
SHEET 28 - CONCRETE KICKBLOCK BEARING SURFACES AND INSTALLATION
SHEET 29 - CONCRETE KICKBLOCK REQUIREMENTS FOR WATER MAIN AND TAP SIZE COMBOS
SHEET 32 - LENGTH OF RESTRAINED PIPE
SHEET 33 - POLYETHYLENE WRAP ON PIPE AND AT TAP INSTALLATION
SHEET 37 - TRACER WIRE INSTALLATION FOR PVC WATER MAIN
SHEET 53 - GENERAL METER NOTES
SHEET 54 - 2" AND SMALLER SERVICE LINE, STOP BOX, AND OUTSIDE METER INSTALLATION

- TOOL PALETTE: "DW Distribution"
- BLOCK NAME: Distribution Legend - AS-BUILT
EDIT AS NEEDED TO INCLUDE INFO SHOWN IN PLANS BUT NOT IN BASIC LEGEND

LEGEND

SYMBOL	DESCRIPTION
	FIRE HYDRANT
	OPEN GATE VALVE
	CLOSED GATE VALVE
	CORP STOP
	CHECK VALVE
	BUTTERFLY VALVE
	BUTTERFLY VALVE IN MANHOLE
	TEMPORARY BLOW OFF VALVE
	PERMANENT BLOW OFF VALVE
	SAMPLING STATION
	SLEEVE
	TAPPING SLEEVE
	PLUG
	TRANSITION COUPLING
	REDUCER
	TEE AND CROSS FITTINGS
	PLUG
	BEND FITTING
	ABANDONED
	3" WATER
	4" WATER
	6" WATER
	8" WATER
	12" WATER
	16" WATER
	20" WATER & LARGER
	CONDUIT
	EASEMENT
	WATER METER
	PROPERTY LINE
	FLOW LINE

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T:303.628.6000
F:303.628.6851
denverwater.org

CONSULTANT

STAPLETON FILING #19 - PHASE 2B

(MAIN EXTENSION)
E 35TH AVE & N BOSTON ST

SERVICE ADDRESS:

REFERENCE:
ENGINEERING STANDARDS
FOURTEENTH EDITION 2012
www.denverwater.org
/DoingBusinesswithUs/EngineeringOverview/EngineeringStandards

THIS DRAWING IS BASED ON THE DW_METRO_GRID COORDINATE SYSTEM

No	Date	Description
		REVISIONS

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PT NO: 15801
DRAWN BY: TSS
CHKD BY:
CHKD BY:
APPD BY:
DATE: March 10, 2011
CONTRACT:
AS-BUILT DATE: 1/1/2014
AS-BUILT BY: NDR

DRAWING TITLE

COVER

DISTRIBUTION
SHEET 1 OF 3 SHEETS

DISCLAIMER: THESE PLANS ARE FOR EXAMPLE ONLY AND ARE NOT REFLECTIVE OF ACTUAL FIELD CONDITIONS

EXAMPLE UPDATED: Tuesday, December 27, 2016

CONTRACT INSTALLED "AS-BUILT" EXAMPLE

\\denverwater.org\shares\UW CAD\CAD Standards\2016\Working\References\Examplesheets\List\PrvtPipe-Unslt-ASBd.dwg COVER 12/27/2016 10:32 AM

ALL DIMENSIONS:
- LAYER: C-ANNO-DIMS
- DIM STYLE: L80 - 0' - Nearest Ft
- UTILIZE OSNAPS

WHEN CONNECTING TO EXISTING, REFERENCE THE RECORD IN THE TEXT BOX

ACCEPTABLE FORMS:
- CITY PIPE FIELD BK 168, PG 1
- PRIVATE PIPE BK 168, PG 1
- RECORD TRACING BK 1, PG 4
- PT NO 15000
- DR 100 NO 4
- UNKNOWN RECORD FOR EXISTING

STREET NAMES SHOWN IN EACH VIEWPORT
- LAYER: C-ANNO-L175
- TEXT STYLE: L175
- NO PUNCTUATION
- SHOW DIRECTIONS

ROTATE NORTH ARROW AS PER DW CAD STANDARDS

LOCATE IN UPPER RIGHT HAND CORNER OF SHEETS, UNLESS MULTIPLE VIEWPORT ROTATIONS

200' MAP NO NE H12

PLAN

SCALE: 1" = 30'

200' MAP EDITED IN THE DRAWING PROPERTIES, INCLUDE SPACE

- TOOL PALETTE: "DW General Drafting"
- BLOCK NAME: PLAN Title

ALL TITLE BLOCK INFORMATION EDITED THROUGH SSM UNLESS NOTED OTHERWISE

EXAMPLE UPDATED: Tuesday, December 27, 2016

CONTRACT INSTALLED "AS-BUILT" EXAMPLE

ALTON CT

E 37TH AVE

N BOSTON ST

8" PVC

CAD 15801-1

8" SLEEVE TO EXISTING (W)
N: 104950
E: 174581

REMOVED EXISTING
8" PLUG AND 2" BLOWOFF
SEE PT NO 13281 FOR EXISTING

8" GATE VALVE
TO EXISTING (W)
N: 104984.48
E: 174395.66
OUT OF VALVE (E)
3' OF 8" PVC
8" SLEEVE TO EXISTING (E)
N: 104984
E: 174399
SEE PT NO 13281
FOR EXISTING

14732

15186

8" ASC TAP NO X*****
8" X 8" FAB STL TAPPING SLEEVE
N: 104967
E: 174488
8" TAPPING VALVE
N: 104968.90
E: 174488.55
34' OF 8" DI
8" GATE VALVE
N: 105002.40
E: 174494.74
SEE PT NO 13281
FOR EXISTING

4" DOM TAP NO X*****
8" X 4" FAB STL TAPPING SLEEVE
N: 104966
E: 174498
4" TAPPING VALVE
N: 104967.11
E: 174498.24
34' OF 4" DI
4" GATE VALVE
N: 105000.59
E: 174504.57
SEE PT NO 13281
FOR EXISTING

NOTE: ONLY USE THE "FAB STL TAPPING SLEEVE", UNLESS INSPECTION NOTES CALL OUT A "STAINLESS STEEL TAPPING SLEEVE".
- USE APPROPRIATE C3D STRUCTURE FROM PIPE NETWORK

8" ASC TAP NO X*****
W/ 3" DOM TAP NO X*****
8" X 6" SWIVEL TEE
N: 104932
E: 174683
8" GATE VALVE
N: 104932.98
E: 174683.18
17' OF 8" DI
8" X 3" TEE
N: 104950
E: 174686
17' OF 8" DI
8" GATE VALVE
N: 104966.49
E: 174689.37

OUT OF 8" X 3" TEE (SE)
10' OF 3" DI
3" 90D BEND
N: 104948
E: 174696
17' OF 3" DI
3" GATE VALVE
N: 104964.68
E: 174699.20

LABEL FIRELINE NUMBERS AND LABEL DOMESTIC LINE NUMBERS:
(EXAMPLE) 4" DOM TAP NO X****

8" 11.25D BEND
N: 104907
E: 174814

8" X 6" SWIVEL TEE
N: 104886
E: 174854
6" GATE VALVE
N: 104885.02
E: 174853.29
10' OF 6" DI
FIRE HYDRANT
N: 104875.83
E: 174848.69

8' OF 8" PVC

- ONLY INCLUDE MATERIAL TYPE ON HYDRANT BRANCH LABELS
- IF HYDRANT WAS REMOVED PLACE NOTE IN SAME TEXT BOX

DOUBLE CHECK DRAW/DISPLAY ORDER OF SYMBOLOGY

8" GATE VALVE
N: 104882.96
E: 174860.79

8" 11.25D BEND
N: 104865
E: 174897

8" 11.25D BEND
N: 104804
E: 174966

8" 11.25D BEND
N: 104728
E: 175020

WHEN TEXT BOXES AND LEADERS ARE ADDED MANUALLY:
- LAYER: CU-WATR-TEXT
- LEADERS MUST:
  - HAVE A LANDING
  - BE CONNECTED AT SIDE OF TEXT BOX
  - PLACED AS NEAR THE MIDPOINT AS POSSIBLE
- USE CONSISTENT SPACING

CONNECTED TO EXISTING (W)
6" X 6" SWIVEL TEE
N: 104686
E: 174570

REMOVED EXISTING
6" PLUG AND 2" BLOWOFF
SEE PT NO 13281 FOR EXISTING

DO NOT INCLUDE DIRECTIONS WHEN BENDS ARE LABELED ALONE (N,E,S OR W), EXCEPTIONS MAY OCCUR ON VERTICAL BENDS

E 36TH AVE

6" PVC

6" 22.5D BEND
N: 104669
E: 174657

88' OF 6" PVC

97' OF 6" PVC

CAD 15801-1

BEELER ST

6" 11.25D BEND
N: 104615
E: 174737

32' OF 6" PVC

6" 22.5D BEND
N: 104592
E: 174759

44' OF 6" PVC

6" GATE VALVE
N: 104552.05
E: 174775.20

7' OF 6" PVC

6" 11.25D BEND
N: 104546
E: 174778

40' OF 6" PVC
(BEND TO BEND)

WHEN A PIPE LABEL SPANS ACROSS MATCH LINES INDICATE WHERE THE DISTANCE IS TO AND FROM
EXAMPLES: (VALVE TO VALVE)
(BEND TO VALVE)

USE C3D LABELS - SHOW IN TEXT BOX

102' OF 8" PVC
(BEND TO BEND)

MATCH LINE A

MATCH LINE B

DO NOT SHOW MATERIAL ON STRUCTURE LABELS (PVC)
EDIT STRUCTURE PROPERTIES OR SWAP PARTS TO ACCOMPLISH THIS

VIEWPORTS TO DISPLAY A CONSISTENT DISTANCE FROM PROPERTY LINES AND/ OR EASEMENTS

PROJECT TITLE: MATCH TO APPROVED PLANS, IF POSSIBLE

PROJECT DESCRIPTION: MATCH TO APPROVED PLANS AND PROJECT TRACKER AS MUCH AS POSSIBLE
- NO PUNCTUATION
- INCLUDE DIRECTIONS

PHYSICAL ADDRESS ONLY, IF APPLICABLE SSM PROPERTY

AS PER DW CAD STANDARDS - SET COORDINATE SYSTEM

EDIT TITLE BLOCK INFO USING DRAWING PROPERTIES

DO NOT SHOW ANY REVISION INFORMATION

PROJECT INITIATION DATE
ONLY EXCEPTION TO DOUBLE CLICKING TITLE BLOCK
FORMAT IS SPELLED OUT
USE THE EARLIEST DATE LISTED IN PROJECT TRACKER

CONTRACT NOT FOR DISTRIBUTION USE

FORMAT AS-BUILT DATE: MM/DD/YYYY (NO ZEROS - 1/2/2012)

WATER PLAN XX
WHAT IS THE TITLE OF THE CURRENT SHEET?

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T:303.628.6000
F:303.628.6851
denverwater.org

CONSULTANT

STAPLETON FILING #19 - PHASE 2B

(MAIN EXTENSION) E 35TH AVE & N BOSTON ST

SERVICE ADDRESS:

REFERENCE:
ENGINEERING STANDARDS
FOURTEENTH EDITION 2012
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THIS DRAWING IS BASED ON THE DW_METRO_GRID COORDINATE SYSTEM

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△		

No Date Description
REVISIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PT NO: *15801*
DRAWN BY: *TSS*
CHKD BY:
CHKD BY:
APPD BY:
DATE: *March 10, 2011*
CONTRACT:
AS-BUILT DATE: *1/1/2014*
AS-BUILT BY: *NDR*

DRAWING TITLE

WATER PLAN 1

DISTRIBUTION

SHEET 2 OF 3 SHEETS

\\denverwater.org\shares\DW CAD\CAD Standards\2016 Working\References\ExampleSheets\Dist\PrvtPipe-Dnst-Asbd.dwg WATER PLAN 1 12/2/2016 10:32 AM

QA DRAFTING CHECKLIST:

- FOLLOW CHECKLISTS IN DW CAD STANDARDS [See Section 4.0]
- BASE INFO WILL BE PULLED FROM GIS
- NO PUNCTUATION ON ABBREVIATIONS
- •• TITLE BLOCK AND PLAN VIEWS SHALL MATCH
- NOTES & LEGENDS SHALL BE PLACED ON THE COVER
- ON SHEETS WITH ONE VIEWPORT, PLACE VIEWPORT ON RIGHT SIDE OF PAGE
- LABELING OF EACH FEATURE SHALL BE PLACED IN AN INDIVIDUAL TEXT BOX LABEL UNLESS SPACE IS RESTRICTIVE
- PROPER USE OF LAYERS, ANNOTATION, AND STYLES
- COORDINATE SYSTEM DEFINED AND NOTED IN TITLE BLOCK
- ALL APPLICABLE NOTES AND LEGENDS HAVE BEEN ADDED
- ALL LABELS HAVE BEEN CHECKED FOR CORRECT INFORMATION AND PROPER FORMAT
- SYMBOLS HAVE BEEN ROTATED TO THE CORRECT ORIENTATION
- DISPLAY/DRAW ORDER HAS BEEN REVIEWED ON SYMBOLOGY
- DIMENSIONS AND SYMBOLS HAVE NOT BEEN EXPLODED
- DIMENSION AND LEADERS LINES ARE NOT CROSSING EACH OTHER OR OTHER PERTINENT INFORMATION
- ALL LABELS AND TEXT ARE LEGIBLE WITH CONSISTENT SPACING
- •• AVOID TEXT CONFLICTS
- WIPEOUT FRAMES HAVE BEEN TURNED OFF BEFORE PLOTTING
- HARD COPY AND/OR DWF HAS BEEN REVIEWED

MATCH LINES

LINEWORK SHALL MEET MATCH LINES WITHOUT CROSSING THEM

MUST BE PERPENDICULAR TO WATER LINES AND CENTERED BETWEEN PROPERTY LINES/EASEMENTS

BLOCK TO BE PLACED IN PAPER SPACE
- TOOL PALETTE: "Misc DW Symbols"
- BLOCK NAME: MATCH LINE
- LAYER: C-ANNO-MATC
- LETTER MATCH LINES ONLY WHEN THERE IS NOT ANY STATIONING

MATCH LINE A

MATCH LINE B

ADD FIRE HYDRANT NUMBERS
- LAYER: C-ANNO-L100
- TEXT STYLE: L100

ORIENT LABELS CONSISTENTLY

IF IN A PRIVATE DISTRICT, ADD DISTRICT NUMBER TO END OF PIPE CALL OUT. EXAMPLES:
MM195
TSCP10

ALIGN LABELS - PIN AS NEEDED TO AVOID "JUMPING"

NORTHINGS AND EASTINGS:
- LABELS WITH THE APPROXIMATE (≈) ARE USER DEFINED LOCATIONS, REPRESENTED AS 300cm AND SHOWN WITHOUT DECIMALS
- LABELS WITHOUT THE APPROXIMATE ARE GPS COLLECTED POINTS, REPRESENTED AS 5cm AND SHOWN WITH 2 DECIMAL PLACES

DIRECTIONS ONLY SHOWN WHEN MULTIPLE COMPONENTS ARE LABELED IN ONE TEXT BOX. (EXCEPTIONS FOR VERTICAL BENDS)
- ABBREVIATE THE DIRECTIONS, DO NOT SPELL OUT (N, E, S, W, ETC.)

WHEN CALLING OUT MULTIPLE DIRECTIONS FROM A CROSS OR TEE FITTING, SEPARATE THE NEW DIRECTION WITH A SPACE IN THE LABEL

LABEL EXISTING LINEWORK USING C3D LABELS WHENEVER POSSIBLE.

IF LABELING MANUALLY:
- LAYER: GIS-ANNO
- TEXT STYLE: L80

HYDRANT ASSEMBLIES LABELED IN ONE BOX:
- FITTING
- N & E
- VALVE
- N & E
- BRANCH LENGTH & MATERIAL
- FIRE HYDRANT
- N & E

LABEL ALL EASEMENTS
- LAYER: GIS-ANNO
- TEXT STYLE: L80

WHEN A FEATURE IS BEING ABANDONED, USE THE LAYER "CU-WATR-ABAN" LINETYPE ON TOP OF WHAT IIS BEING ABANDONED. ALSO USE THE CIVIL 3D LABEL "ABANDONED IN PLACE".

EXISTING HYDRANT LABELS
- LAYER: GIS-ANNO
- TEXT STYLE: L100

PLACE DIMENSIONS NEAR VIEWPORT CLIP AND MATCH LINES WHEN POSSIBLE

INFORMATION PULLED FROM GIS, USING FDO, TO BE PLACED ON THE PROPER "GIS" PREFIXED LAYERS

IF THE PROPER SYMBOLOGY DOES NOT COME THROUGH USING FDO, REPLACE IT WITH THE SYMBOLS FROM THE "DW Civil Symbols" TOOL PALETTE

200' MAP NO NE H12

PLAN

SCALE: 1" = 30'

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T:303.628.6000
F:303.628.6851
denverwater.org

CONSULTANT

STAPLETON FILING #19 – PHASE 2B

(MAIN EXTENSION) E 35TH AVE & N BOSTON ST

SERVICE ADDRESS:

REFERENCE:
ENGINEERING STANDARDS
FOURTEENTH EDITION 2012
www.denverwater.org
/DoingBusinesswithUs/EngineeringOverview/EngineeringStandards

THIS DRAWING IS BASED ON THE DW_METRO_GRID COORDINATE SYSTEM

No	Date	Description
△		
△		
△		
△		
△		
△		
△		

REVISIONS

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 ——— 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PT NO: 15801
DRAWN BY: TSS
CHKD BY:
CHKD BY:
APPD BY:
DATE: March 10, 2011
CONTRACT:
AS-BUILT DATE: 1/1/2014
AS-BUILT BY: NDR

DRAWING TITLE

WATER PLAN 2

DISTRIBUTION

SHEET 3 OF 3 SHEETS

EXAMPLE UPDATED: Tuesday, December 27, 2016

CONTRACT INSTALLED "AS-BUILT" EXAMPLE

\\denverwater.org\shares\UW CAU\CAU Standards\2016 Working\References\ExampleSheets\ExampleSheets\Dist\PrvtPipe-Const-A3bd.dwg WATER PLAN 2 12/27/2016 10:32 AM

DENVER WATER
DENVER, COLORADO

S LOWELL BLVD
FROM W FLORIDA AVE TO W MEXICO AVE
(REPLACEMENT)
INSTALL APPROX 1750' OF 12" PVC MAIN
PT NUMBER 13467

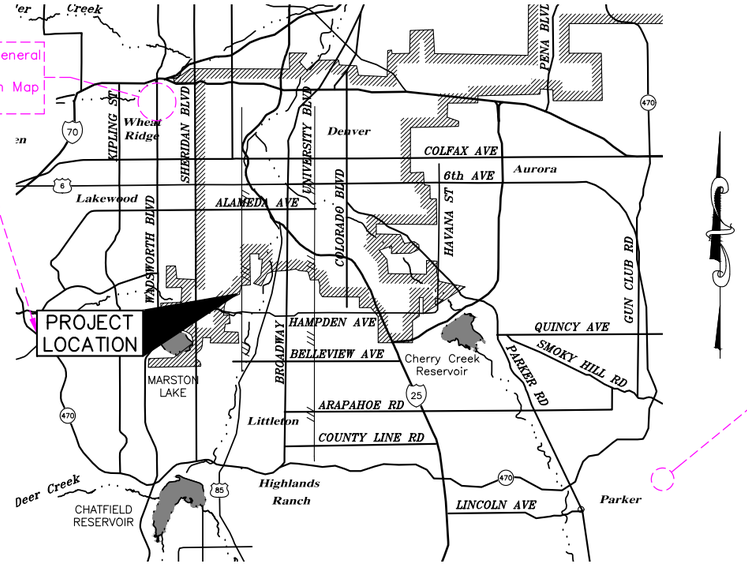
- TOOL PALETTE: "DW General Drafting"
- BLOCK NAME: Location Map
INSERT IN MODEL SPACE

- TOOL PALETTE: "DW General Drafting"
- BLOCK NAME: LABEL-Project Location
- LAYER: G-ANNO-L175

USE TITLE BLOCK VISIBILITY STATE TO SEE COVER SHEET INFO

COVER INFO AND TITLE BLOCK INFO TO MATCH EXACTLY

ALL INFO POPULATED USING SSM



LOCATION MAP SHOWS THE OVERALL CITY AND COUNTY (LARGE MAP)

200' MAP NO SW D6

LOCATION MAP

1" = 3 miles

VIEWPORTS ARE INCLUDED IN THE TEMPLATE AS A GUIDE - ADJUST OR RECREATE AS NEEDED

DISTRIBUTION:
CITY PIPE "PROPOSED DESIGN" EXAMPLE
(COLOR TEXT IS A GRAPHIC REPRESENTATION ONLY, NO COLOR PLOTS)
THIS EXAMPLE COVERS CAD STANDARDS & DRAFTING FUNDAMENTALS

- TOOL PALETTE: "DW Distribution"
- BLOCK NAME: Distribution Legend - PRELIMINARY
EDIT AS NEEDED TO INCLUDE INFO SHOWN IN PLANS

LEGEND

SYMBOL	DESCRIPTION
	FIRE HYDRANT
	OPEN GATE VALVE
	SLEEVE
	REDUCER
	TEE AND CROSS FITTINGS
	BEND FITTING
	TAPPING SLEEVE
IP	INLET PROTECTION
CS	CURB SOCK
	FLOW ARROW
CAUTION	AVOID DANGER OR HARM
X X	ABANDON
	3" WATER OR SMALLER
	4" WATER
	6" WATER
	8" WATER
	12" WATER
	16" WATER
	CONDUIT
E	ELECTRIC MANHOLE
S	SANITARY SEWER MANHOLE
ST	STORM MANHOLE
M	WATER METER
	LIGHT POLE
	UTILITY POLE
PL	PROPERTY LINE
FL	FLOW LINE
E	ELECTRICAL
FO	FIBER OPTIC
G	NATURAL GAS LINE
OHW	OVERHEAD WIRE
SAN	SANITARY SEWER
STRM	STORM SEWER

- TOOL PALETTE: "DW Distribution"
- BLOCK NAME: Sheet Index
EDIT AS NEEDED

SHEET INDEX

- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: Hydrant Branch Replacement Note

Hydrant Branch Replacement Note

VISUALLY INSPECT THE CONDITION OF ANY CONNECTING HYDRANT BRANCH AND REPLACE IF NECESSARY REGARDLESS OF HYDRANT BARREL INSTALLATION DATE.

SIGNATURE

- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: WorkOrder

MAXIMO WORK ORDER NO: 11-232614

- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: CityPipe-Survey Stamp
USE VISIBILITY STATE TO CHOOSE PROPOSED PIPE TYPE

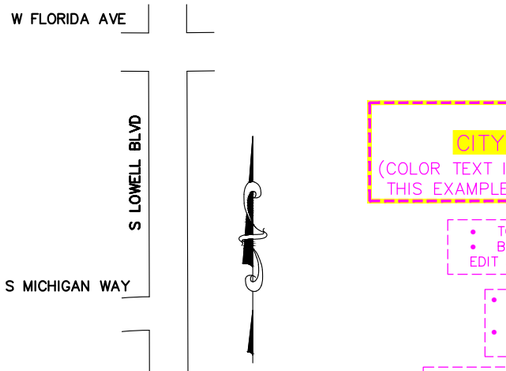
- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: Disturbance Note
SHOW CALCULATED NUMBER (EQUATION: 25' X Total length of pipe <beyond 1,742'> + 400 sq ft)

ESTIMATED AREA OF DISTURBANCE = 49,200 SQ FT

- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: UNCC STAMP AS PER DW CAD STANDARDS - CALL BEFORE YOU DIG NOTE ON EACH SET OF PLANS

811 FOR BURIED UTILITY INFORMATION
THREE (3) BUSINESS DAYS BEFORE YOU DIG
CALL 811
(or 1-800-922-1987)
UTILITY NOTIFICATION CENTER OF COLORADO (UNCC)
www.co811.org

NOTES:
1. ALL EXISTING INFORMATION SHOWN IS BASED ON A FIELD SURVEY COMPLETED BY DENVER WATER OR ON AN IMPORT FROM DENVER WATER'S GIS SYSTEM, OR A COMBINATION OF BOTH. CONTACT LOU VULLO (303-628-6671) IF FIELD CONDITIONS DIFFER FROM THOSE SHOWN.
2. RIGHT-OF-WAY INFORMATION SHOWN IS BASED ON EXISTING CITY MAPS.
3. PIPE DEFLECTION SHALL NOT EXCEED MANUFACTURER SPECIFICATIONS.
4. ALL PROPOSED PIPE SHALL BE POLYVINYL CHLORIDE UNLESS OTHERWISE NOTED.
5. ALL EXISTING PIPE IS CAST IRON UNLESS OTHERWISE NOTED.
6. REMOVE ALL VALVE BOXES AND FIRE HYDRANTS ON MAINS BEING ABANDONED.
7. ALL CONDUIT CROSSINGS BY DISTRIBUTION MAINS SHALL MEET BACKFILL REQUIREMENTS AS SPECIFIED IN CHAPTER 7, DENVER WATER ENGINEERING STANDARDS.



- TOOL PALETTE: "DW General Drafting"
- BLOCK NAME: LABEL-Project Location
- LAYER: G-ANNO-L175

- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: Standard Detail Notes
EDIT ATTRIBUTE AS NEEDED

STANDARD DETAIL NOTES
FOURTEENTH EDITION STANDARD DETAILS INCORPORATED BY REFERENCE WITHIN THESE DRAWINGS SHALL CONSIST OF THE FOLLOWING STANDARD DETAILS INDICATED AND ALL SUBSEQUENT DETAILS WHICH MAY BE REFERENCED THEREIN:

SHEET 8 - PLAN, PROFILE AND LOCATION FOR FIRE HYDRANTS, MAINS, AND VALVES
SHEET 9 - 3" AND LARGER DOMESTIC AND FIRELINE CONNECTIONS
SHEET 12 - TYPICAL TRENCH SECTION
SHEET 15 - STORM AND SANITARY SEWER CROSSING
SHEET 16 - OPEN CUT CROSSING OVER OR UNDER CONDUIT OR CONFLICTING UTILITY
SHEET 19 - VALVE OPERATION
SHEET 21 - VALVE BOX SUPPORT PLATE
SHEET 22 - VALVE OPERATOR EXTENSION
SHEET 23 - VALVE OPERATOR GUIDE
SHEET 28 - CONCRETE KICKBLOCK BEARING SURFACES AND INSTALLATION
SHEET 29 - CONCRETE KICKBLOCK REQUIREMENTS FOR WATER MAIN AND TAP SIZE COMBOS
SHEET 32 - LENGTH OF RESTRAINED PIPE
SHEET 33 - POLYETHYLENE WRAP ON PIPE AND AT TAP INSTALLATION
SHEET 37 - TRACER WIRE INSTALLATION FOR PVC WATER MAIN
SHEET 53 - GENERAL METER NOTES
SHEET 54 - 2" AND SMALLER SERVICE LINE, STOP BOX, AND OUTSIDE METER INSTALLATION

VICINITY MAP

NO SCALE

VICINITY MAP SHOWS THE LIMITS OF WORK TO BE DONE - INCLUDE THE NEAREST MAJOR INTERSECTION

DISCLAIMER: THESE PLANS ARE FOR EXAMPLE ONLY AND ARE NOT REFLECTIVE OF ACTUAL FIELD CONDITIONS

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T: 303.628.6000
F: 303.628.6851
denverwater.org

CONSULTANT

S LOWELL BLVD FROM W FLORIDA AVE TO W MEXICO AVE

(REPLACEMENT)
INSTALL APPROX 1750' OF 12" PVC

SERVICE ADDRESS:

REFERENCE:
ENGINEERING STANDARDS
FOURTEENTH EDITION 2012
www.denverwater.org
/DoingBusinesswithUs/EngineeringOverview/EngineeringStandards

THIS DRAWING IS BASED ON THE DW_METRO_GRID COORDINATE SYSTEM

No	Date	Description
4	11/16/13	PE REVIEW COMPLETE
3	11/15/13	READY FOR PE REVIEW
2	10/19/13	REDLINE REVIEW COMPLETE
1	10/18/13	READY FOR REDLINE REVIEW

REVISIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PT NO: *13467*
DRAWN BY: *TSS*
CHKD BY:
CHKD BY:
APPD BY:
DATE: *November 8, 2006*
CONTRACT:
AS-BUILT DATE:
AS-BUILT BY:

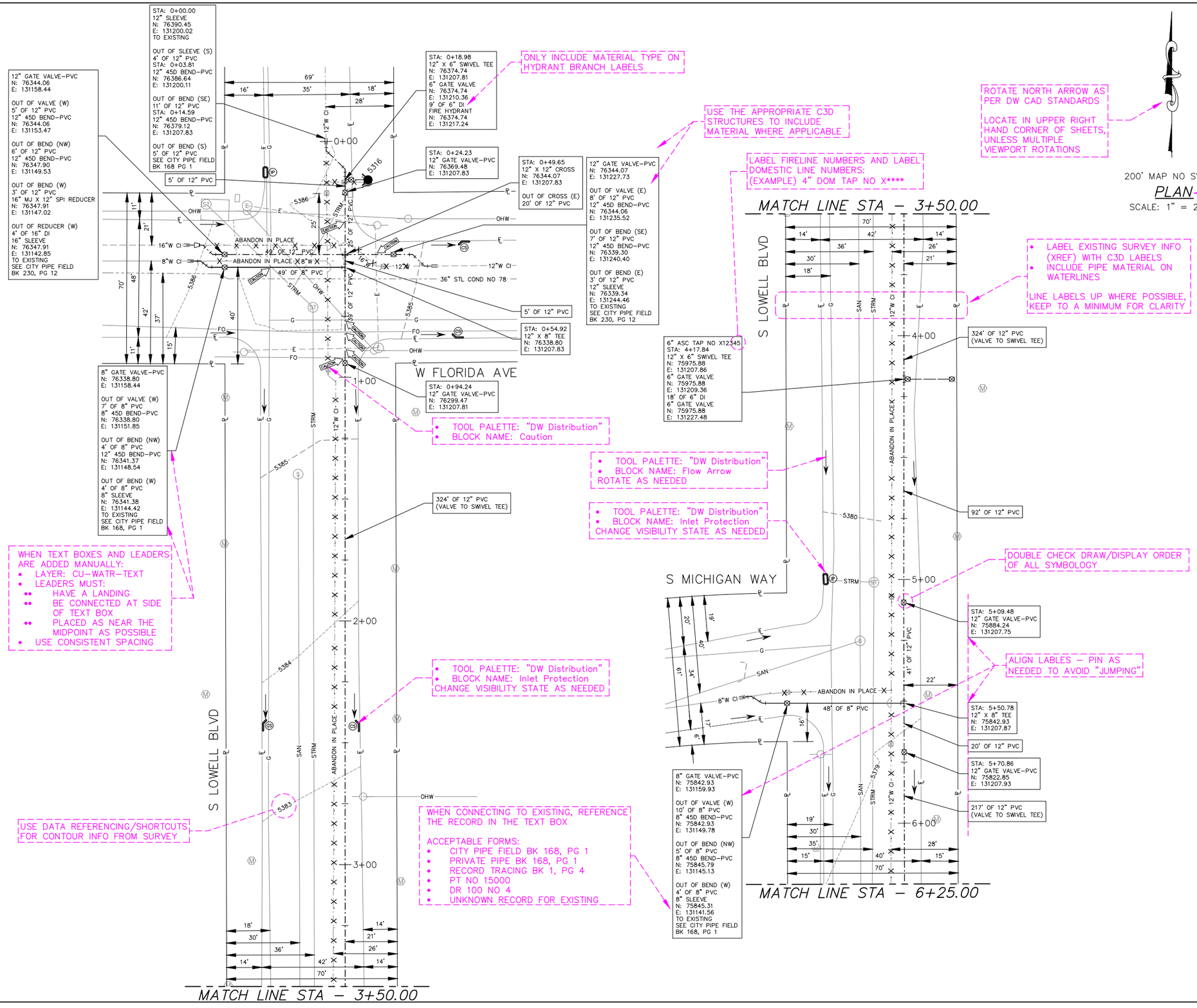
DRAWING TITLE

COVER

DISTRIBUTION
SHEET 1 OF 4 SHEETS

EXAMPLE UPDATED: Tuesday, December 27, 2016
CITY PIPE "PROPOSED DESIGN" EXAMPLE

\\denverwater.org\shares\DW CAD\CAD Standards\2016 Working\References\ExampleSheets\West\CityPipe-PNL.dwg COVER 12/27/2016 10:17 AM



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200' MAP EDITED USING THE DRAWING PROPERTIES, INCLUDE SPACE

- TOOL PALETTE: "DW General Drafting"
- BLOCK NAME: PLAN Title

S LOWELL BLVD FROM W FLORIDA AVE TO W MEXICO AVE

(REPLACEMENT) INSTALL APPROX 1750' OF 12" PVC MAIN

SERVICE ADDRESS:

REFERENCE:
ENGINEERING STANDARDS
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No	Date	Description
△		
△		
△		
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△	11/15/13	READY FOR PE REVIEW
△	10/19/13	REDLINE REVIEW COMPLETE
△	10/18/13	READY FOR REDLINE REVIEW

REVISIONS

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0 1"

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PT NO: 13467
DRAWN BY: TSS
CHKD BY:
CHKD BY:
APPD BY:
DATE: November 8, 2006
CONTRACT:
AS-BUILT DATE:
AS-BUILT BY:

DRAWING TITLE

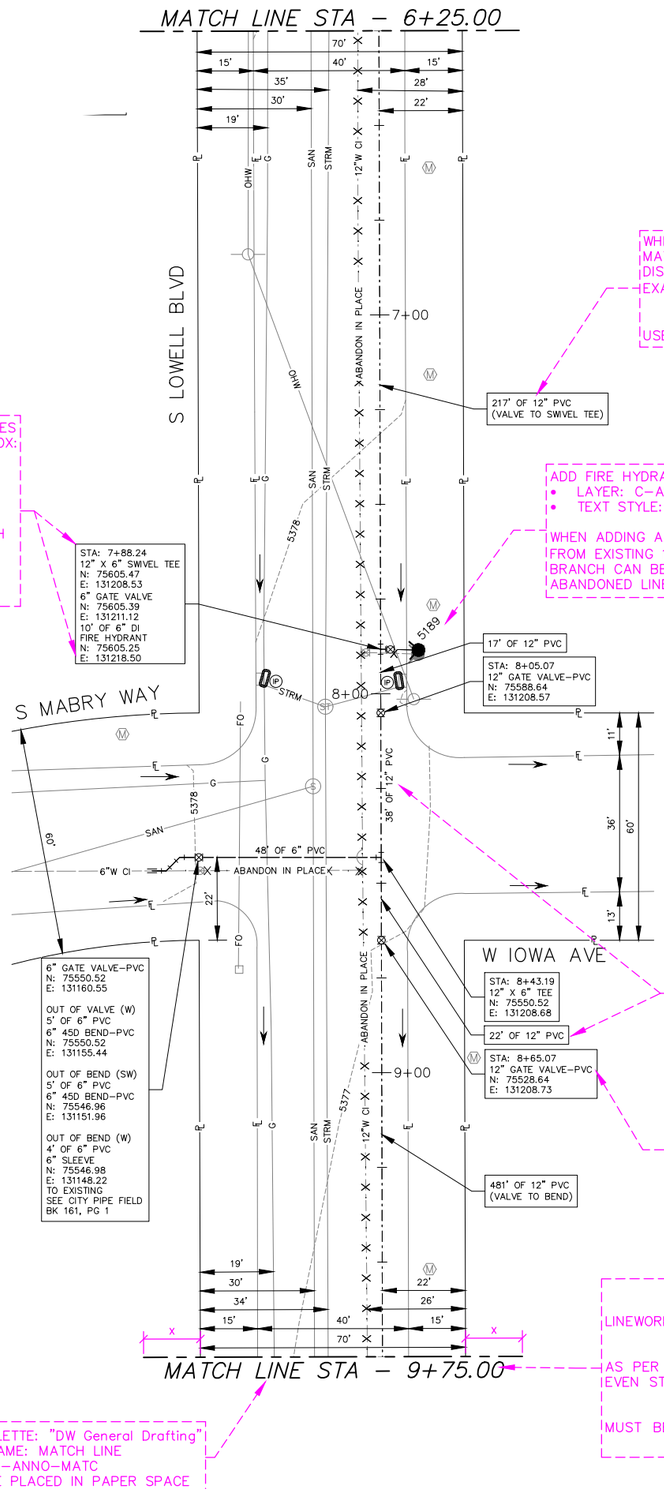
WATER PLAN 1

DISTRIBUTION
SHEET 2 OF 4 SHEETS

EXAMPLE UPDATED: Tuesday, December 27, 2016

"PROPOSED DESIGN" EXAMPLE CITY PIPE

\\denverwater.org\shares\UW CAU\CAU Standards\2016\Working\References\ExampleSheets\Dist\City*pipe-PHL.dwg WATER PLAN 1 12/27/2016 10:17 AM



HYDRANT ASSEMBLIES LABELED IN ONE BOX:
- STA
- FITTING
- N & E
- VALVE
- N & E
- BRANCH LENGTH & MATERIAL
- NEW OR REUSE FIRE HYDRANT
- N & E

WHEN A PIPE LABEL SPANS ACROSS MATCH LINES INDICATE WHERE THE DISTANCE IS TO AND FROM
EXAMPLES: (VALVE TO VALVE)
(BEND TO VALVE)

USE C3D LABELS – SHOWN IN TEXT BOX

ADD FIRE HYDRANT NUMBERS
- LAYER: C–ANNO–L100
- TEXT STYLE: L100

WHEN ADDING A NEW BRANCH OFFSET FROM EXISTING 1.5' SO EXISTING BRANCH CAN BE SHOWN WITH THE ABANDONED LINETYPE

STREET NAMES SHOWN IN EACH VIEWPORT
- LAYER: C–ANNO–L175
- TEXT STYLE: L175
- NO PUNCTUATION
- SHOW DIRECTIONS

PIPE LENGTHS TO REMAIN ALONG ALIGNMENT WHEN POSSIBLE, OTHERWISE THEY SHALL BE IN A TEXT BOX

FOR CITY PIPE PRELIMINARY DRAWINGS ONLY: WHEN PVC PIPE IS BEING PROPOSED, ALL FITTINGS NEED THE "–PVC" PREFIX AT THE END WHEN SELECTING THE FITTING IN PIPE NETWORK. THIS IS FOR ESTIMATING PURPOSES ONLY.

- TOOL PALETTE: "DW General Drafting"
- BLOCK NAME: MATCH LINE
- LAYER: C–ANNO–MATC

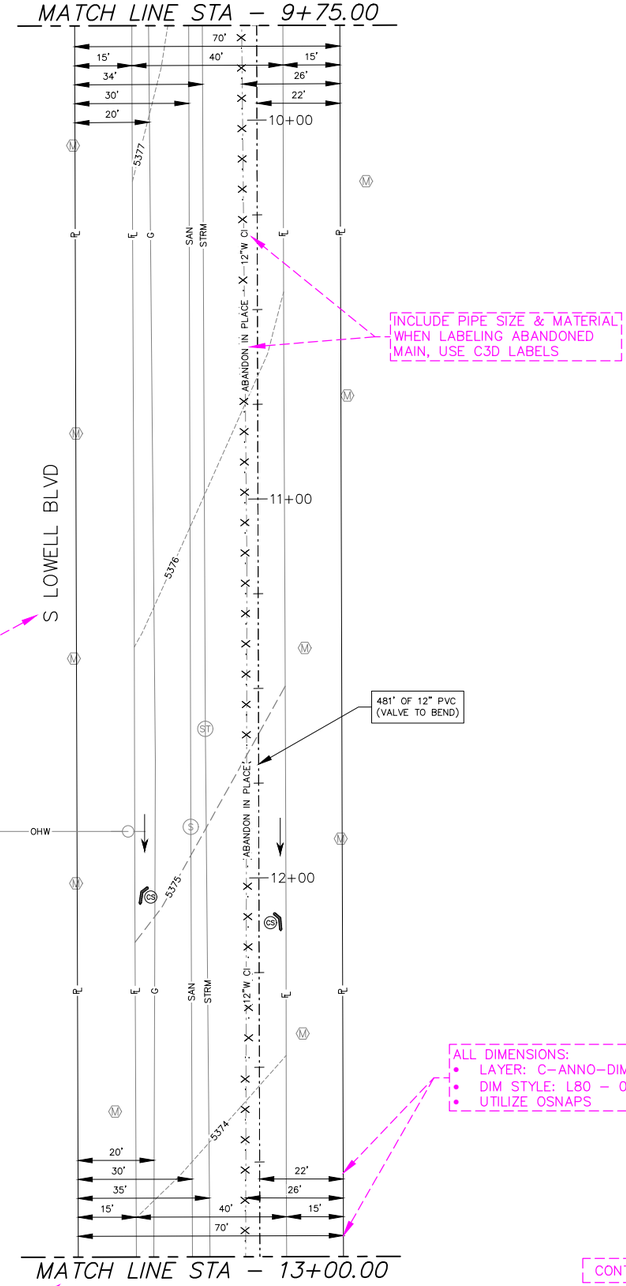
BLOCK TO BE PLACED IN PAPER SPACE

MATCH LINES

LINEWORK/VPORTS SHALL MEET MATCH LINES WITHOUT CROSSING THEM

AS PER DW CAD STANDARDS – MATCH LINES SHALL BE AT EVEN STATIONS OR TICK MARKS, TURN OFF STATION LABELS AT THESE PLACES – KEEP DECIMALS

MUST BE PERPENDICULAR TO WATER LINES AND CENTERED BETWEEN PROPERTY LINES/EASEMENTS



INCLUDE PIPE SIZE & MATERIAL WHEN LABELING ABANDONED MAIN, USE C3D LABELS

ALL DIMENSIONS:
- LAYER: C–ANNO–DIMS
- DIM STYLE: L80 – 0' – Nearest Ft
- UTILIZE OSNAPS

200' MAP NO SW D6

PLAN

SCALE: 1" = 20'

PROJECT TITLE: "WHERE IS THE JOB?"
- NO PUNCTUATION
- INCLUDE DIRECTIONS

PROJECT DESCRIPTION: "WHAT WORK IS BEING DONE?"
- INCLUDE INSTALLATION TYPE (REPLACEMENT) OR (IMPROVEMENT)

PHYSICAL ADDRESS ONLY, IF APPLICABLE SSM PROPERTY

AS PER DW CAD STANDARDS – SET COORDINATE SYSTEM

EDIT TITLE BLOCK INFO USING DRAWING PROPERTIES

REVISION BLOCK – EVERY SHEET SHALL MATCH, USE SSM TO EDIT. START FROM BOTTOM AND WORK UPWARDS, NEWEST DATE ON TOP LINE

PROJECT INITIATION DATE ***ONLY EXCEPTION TO DOUBLE CLICKING TITLE BLOCK*** FORMAT IS SPELLED OUT USE THE CREATED DATE LISTED IN PROJECT TRACKER

CONTRACT NOT FOR DISTRIBUTION USE

NO AS–BUILT DATE ON "PROPOSED DESIGN" PLANS

WATER PLAN XX
WHAT IS THE TITLE OF THE CURRENT SHEET?

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Denver, Colorado 80204–3412
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F:303.628.6851
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CONSULTANT

ALL TITLE BLOCK INFORMATION EDITED THROUGH SSM UNLESS NOTED OTHERWISE

S LOWELL BLVD FROM W FLORIDA AVE TO W MEXICO AVE

(REPLACEMENT) INSTALL APPROX 1750' OF 12" PVC MAIN

SERVICE ADDRESS:

REFERENCE:
ENGINEERING STANDARDS
FOURTEENTH EDITION 2012
www.denverwater.org
/DoingBusinesswithUs/EngineeringOverview/EngineeringStandards

THIS DRAWING IS BASED ON THE DW_METRO_GRID COORDINATE SYSTEM

No	Date	Description
△		
△		
△		
△	11/16/13	PE REVIEW COMPLETE
△	11/15/13	READY FOR PE REVIEW
△	10/19/13	REDLINE REVIEW COMPLETE
△	10/18/13	READY FOR REDLINE REVIEW

REVISIONS

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 ■ 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PT NO: *13467*
DRAWN BY: *TSS*
CHKD BY:
CHKD BY:
APPD BY:
DATE: *November 8, 2006*
CONTRACT:
AS–BUILT DATE:
AS–BUILT BY:

DRAWING TITLE

WATER PLAN 2

DISTRIBUTION

SHEET 3 OF 4 SHEETS

EXAMPLE UPDATED: Tuesday, December 27, 2016

CITY PIPE "PROPOSED DESIGN" EXAMPLE

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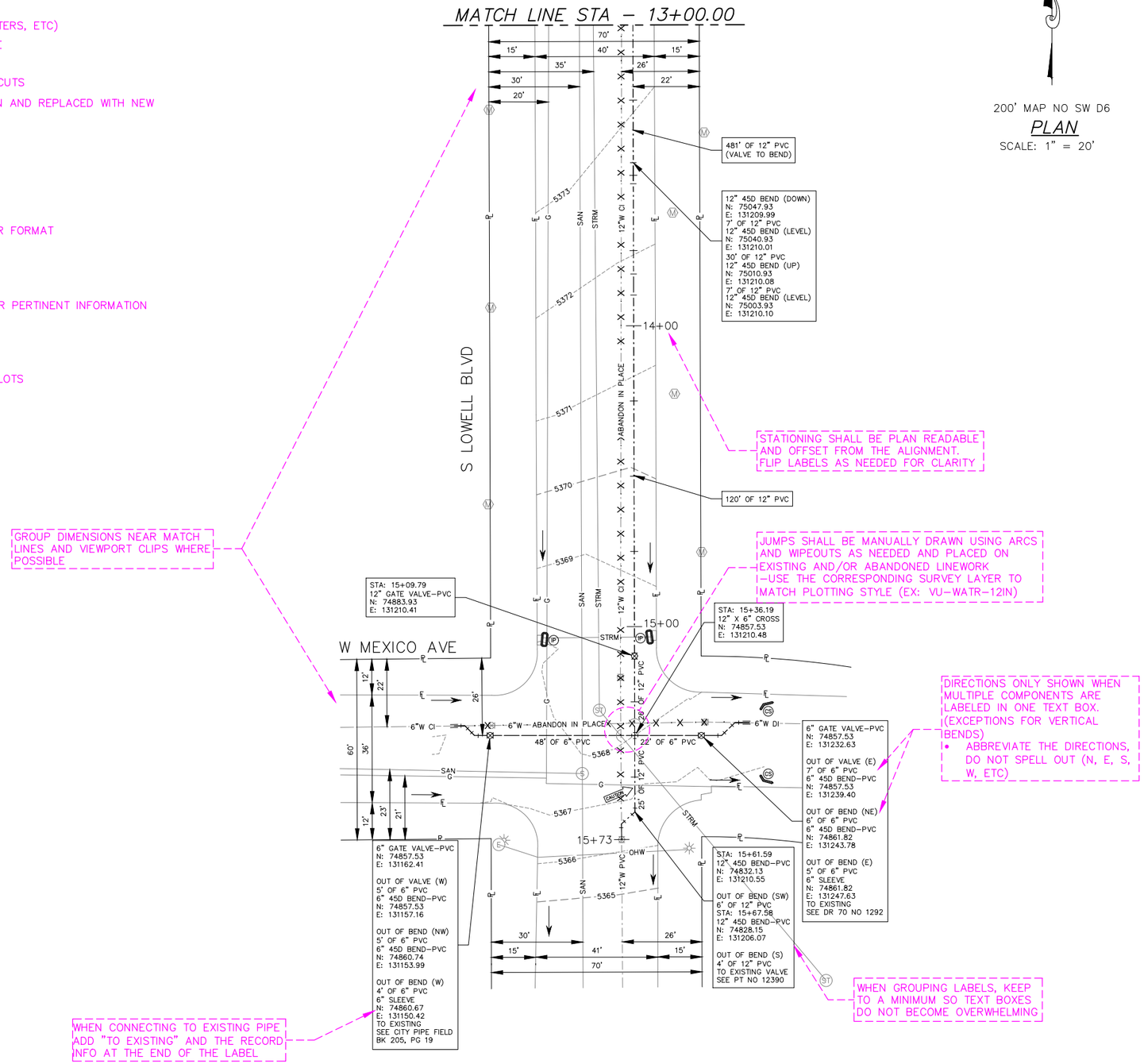
QA DRAFTING CHECKLIST

- FOLLOW CHECKLISTS IN DW CAD STANDARDS [See Section 4.0]
- NO PUNCTUATION ON ABBREVIATIONS
  - TITLE BLOCK AND PLAN VIEWS SHALL MATCH
- NOTES & LEGENDS SHALL BE PLACED ON THE COVER
  - LEGEND SHALL INCLUDE SURVEY'S SURFACE FEATURES (MANHOLES, METERS, ETC)
- ON SHEETS WITH ONE VIEWPORT, PLACE VIEWPORT ON RIGHT SIDE OF PAGE
- ALL UTILITIES ARE SHOWN AND LABELED
- 1' CONTOURS ARE SHOWN AND LABELED – USE DATA REFERENCES/SHORTCUTS
- SURVEY'S DIMENSIONS AND LABELS (STREETS, HYDT NO., ETC) ARE FROZEN AND REPLACED WITH NEW LABELS, ON THE PROPER LAYERS – UTILIZE C3D LABELS WHERE POSSIBLE
- DRAINAGE SYMBOLOGY ADDED AS NEEDED
- CAUTION SYMBOLS ADDED AS NEEDED
- PROPER USE OF LAYERS, ANNOTATION, AND STYLES
- COORDINATE SYSTEM DEFINED AND NOTED IN TITLE BLOCK
- ALL APPLICABLE NOTES AND LEGENDS HAVE BEEN ADDED
- ALL LABELS HAVE BEEN CHECKED FOR CORRECT INFORMATION AND PROPER FORMAT
- SYMBOLS HAVE BEEN ROTATED TO THE CORRECT ORIENTATION
- DISPLAY/DRAW ORDER HAS BEEN REVIEWED ON SYMBOLOLGY
- DIMENSIONS AND SYMBOLS HAVE NOT BEEN EXPLODED
- DIMENSION AND LEADERS LINES ARE NOT CROSSING EACH OTHER OR OTHER PERTINENT INFORMATION
- ALL LABELS AND TEXT ARE LEGIBLE WITH CONSISTENT SPACING
  - AVOID TEXT CONFLICTS
- WIPEOUT FRAMES HAVE BEEN TURNED OFF BEFORE PLOTTING
- HARD COPY PRINT/PLOT HAS BEEN REVIEWED – NO COLOR IS USED ON PLOTS



200' MAP NO SW D6

PLAN

SCALE: 1" = 20'

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EXAMPLE UPDATED: Tuesday, December 27, 2016

CITY PIPE "PROPOSED DESIGN" EXAMPLE

S LOWELL BLVD FROM W FLORIDA AVE TO W MEXICO AVE

(REPLACEMENT) INSTALL APPROX 1750' OF 12" PVC MAIN

SERVICE ADDRESS:

REFERENCE:
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△	10/18/13	READY FOR REDLINE REVIEW

REVISIONS

VERIFY SCALES

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PT NO: *13467*

DRAWN BY: *TSS*

CHKD BY:

CHKD BY:

APPD BY:

DATE: *November 8, 2006*

CONTRACT:

AS–BUILT DATE:

AS–BUILT BY:

DRAWING TITLE

WATER PLAN 3

DISTRIBUTION

SHEET 4 OF 4 SHEETS

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DENVER WATER
DENVER, COLORADO

S LOWELL BLVD
FROM W FLORIDA AVE TO W MEXICO AVE
(REPLACEMENT)
INSTALLED 1750' OF 12" PVC MAIN
PT NUMBER 13467

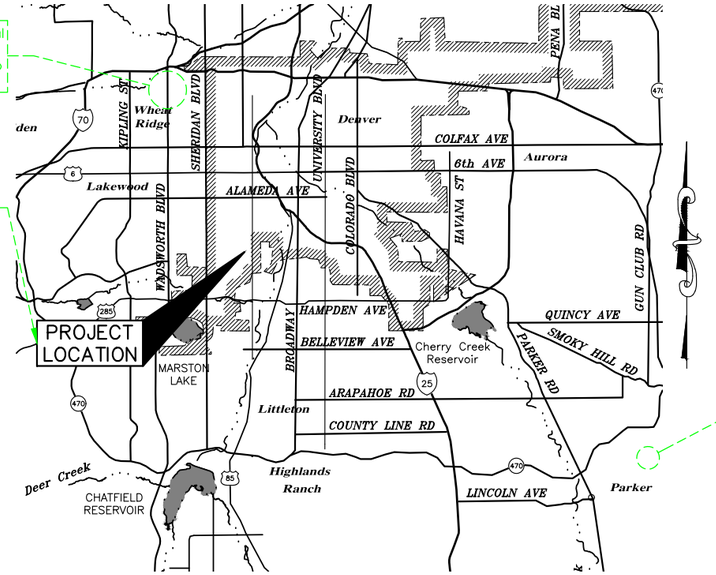
- TOOL PALETTE: "DW General Drafting"
- BLOCK NAME: Location Map INSERT IN MODEL SPACE

- TOOL PALETTE: "DW General Drafting"
- BLOCK NAME: LABEL–Project Location
- LAYER: G–ANNO–L175

USE TITLE BLOCK VISIBILITY STATE TO SEE COVER SHEET INFO

COVER INFO AND TITLE BLOCK INFO TO MATCH EXACTLY

ALL INFO POPULATED USING SSM



LOCATION MAP SHOWS THE OVERALL CITY AND COUNTY (LARGE MAP)

200' MAP NO SW D6

LOCATION MAP

1"= 3 Miles

VIEWPORTS ARE INCLUDED IN THE TEMPLATE AS A GUIDE – ADJUST OR RECREATE AS NEEDED

DISTRIBUTION:

CITY PIPE "AS–BUILT" EXAMPLE

(COLOR TEXT IS A GRAPHIC REPRESENTATION ONLY, NO COLOR PLOTS)
THIS EXAMPLE COVERS CAD STANDARDS & DRAFTING FUNDAMENTALS

BEGIN AS–BUILT USING "PROPOSED DESIGN" DRAWING, MAINTAIN SURVEY XREF, ALIGNMENTS, STATIONING, AND PIPE NETWORKS

- TOOL PALETTE: "DW Distribution"
- BLOCK NAME: Distribution Legend – AS–BUILT

EDIT AS NEEDED TO INCLUDE INFO SHOWN IN PLANS BUT NOT IN BASIC LEGEND

LEGEND

SYMBOL	DESCRIPTION
	FIRE HYDRANT
	OPEN GATE VALVE
	CLOSED GATE VALVE
	CORP STOP
	CHECK VALVE
	BUTTERFLY VALVE
	BUTTERFLY VALVE IN MANHOLE
	TEMPORARY BLOW OFF VALVE
	PERMANENT BLOW OFF VALVE
	SAMPLING STATION
	SLEEVE
	TAPPING SLEEVE
	PLUG
	TRANSITION COUPLING
	REDUCER
	TEE AND CROSS FITTINGS
	BEND FITTING
	ABANDONED
	3" WATER
	4" WATER
	6" WATER
	8" WATER
	12" WATER
	16" WATER
	20" WATER & LARGER
	CONDUIT
	EASEMENT
	WATER METER
	PROPERTY LINE
	FLOW LINE

- TOOL PALETTE: "DW General Drafting"
- BLOCK NAME: Sheet Index

EDIT AS NEEDED

SHEET INDEX

- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: Contractors_Stamp

PT NO: 13467
COUNTY: DENVER
INSPECTOR: O'MALLEY
FOREMAN: N/A
WATER DIST: DENVER
CUST CONTRACT ID: 1000
CONTRACTOR: JBS PIPELINE
START DATE: 12/19/2011
END DATE: 12/28/2011

- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: Installed Note

EXPLODE AND EDIT AS NEEDED

INSTALLED: W.O. XXXXX, XXXXX
4' OF 16" DI (GRIFFIN)
1672' OF 12" PVC (VINYL–TECH)
131' OF 8" PVC (VINYL–TECH)
164' OF 6" PVC (VINYL–TECH)
19' OF 6" DI HYDRANT BRANCH (GRIFFIN)

9 – 12" VALVES (CLOW)
2 – 8" VALVES (CLOW)
2 – 6" VALVES (CLOW)
2 – 6" HYDRANT VALVES (CLOW)
2 – 6" NEW HYDRANTS (WATEROUS)

- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: Abandoned or Removed Note

EXPLODE AND EDIT AS NEEDED

ABANDONED:
115' OF 6" PVC
105' OF 8" PVC
1575' OF 12" PVC
74' OF 16" PVC

- TOOL PALETTE: "DW Notes & Stamps"
- BLOCK NAME: Standard Detail Notes

EDIT ATTRIBUTE AS NEEDED

STANDARD DETAIL NOTES

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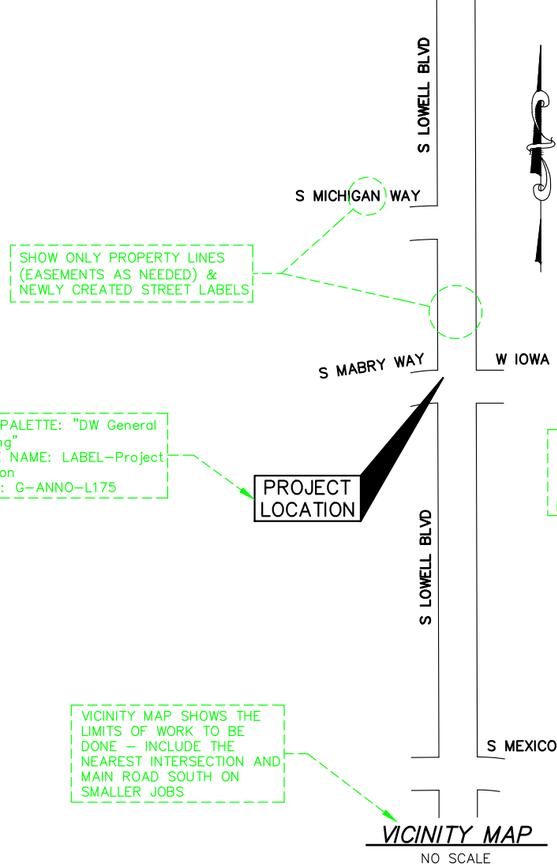

SHOW ONLY PROPERTY LINES (EASEMENTS AS NEEDED) & NEWLY CREATED STREET LABELS

VICINITY MAP SHOWS THE LIMITS OF WORK TO BE DONE – INCLUDE THE NEAREST INTERSECTION AND MAIN ROAD SOUTH ON SMALLER JOBS

VICINITY MAP

NO SCALE

DISCLAIMER: THESE PLANS ARE FOR EXAMPLE ONLY AND ARE NOT REFLECTIVE OF ACTUAL FIELD CONDITIONS;

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denverwater.org

CONSULTANT

S LOWELL BLVD FROM W FLORIDA AVE TO W MEXICO AVE

(REPLACEMENT)
INSTALLED 1750' OF 12" PVC MAIN

SERVICE ADDRESS:

REFERENCE:
ENGINEERING STANDARDS
FOURTEENTH EDITION 2012
www.denverwater.org
/DoingBusinesswithUs/EngineeringOverview/EngineeringStandards

THIS DRAWING IS BASED ON THE DW_METRO_GRID COORDINATE SYSTEM

No	Date	Description

REVISIONS

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PT NO: *13467*
DRAWN BY: *TSS*
CHKD BY:
CHKD BY:
APPD BY:
DATE: *November 8, 2006*
CONTRACT:
AS–BUILT DATE: *1/1/2014*
AS–BUILT BY: *NDR*

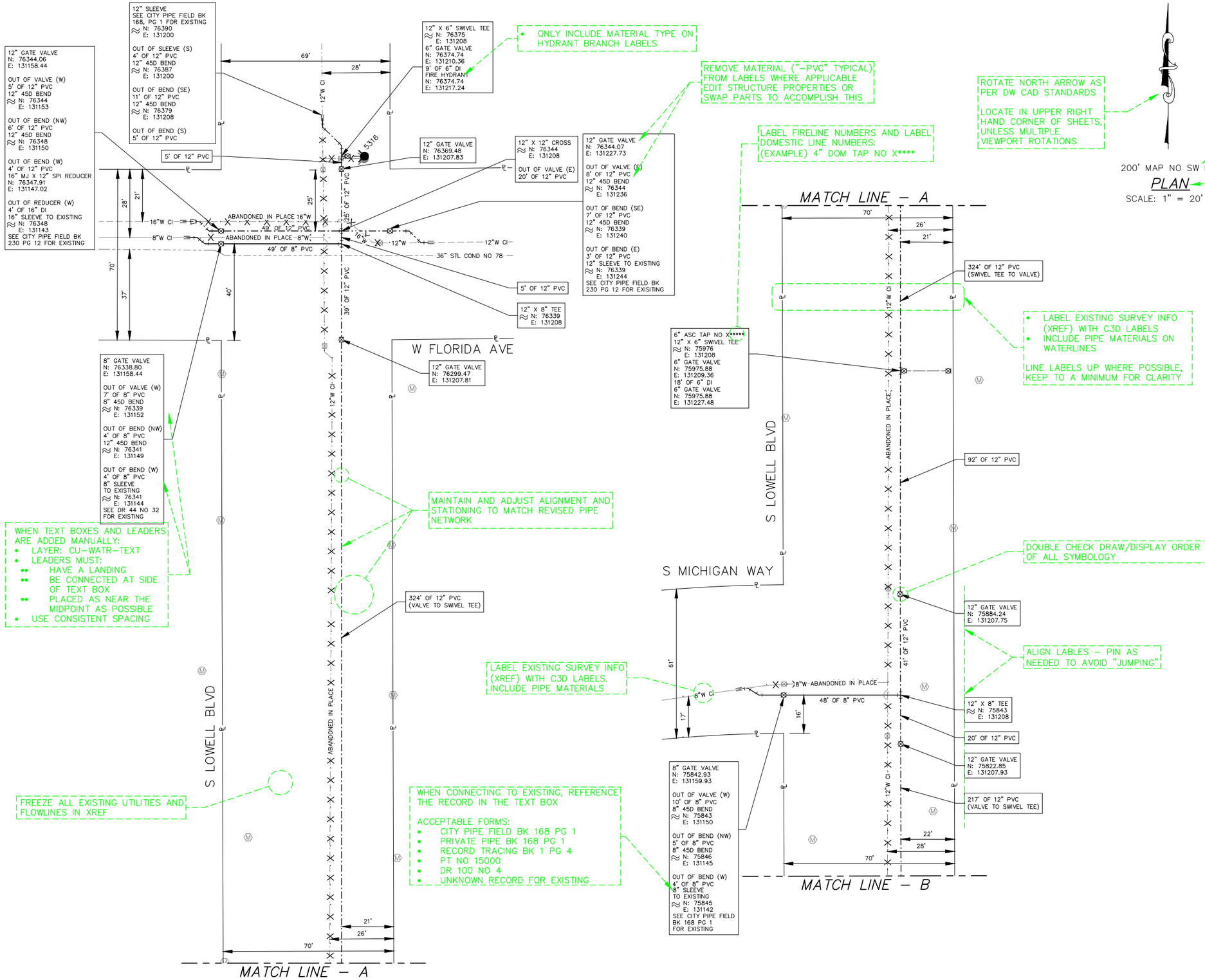
DRAWING TITLE

COVER

DISTRIBUTION

SHEET 1 OF 4 SHEETS

EXAMPLE UPDATED: Thursday, August 11, 2016 CITY PIPE "AS–BUILT" EXAMPLE



DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T:303.628.6000
F:303.628.6851
denverwater.org

CONSULTANT

200' MAP EDITED USING THE DRAWING PROPERTIES, INCLUDE SPACE

- TOOL PALETTE: "DW General Drafting"
- BLOCK NAME: PLAN Title

EXAMPLE UPDATED: Thursday, August 11, 2016

S LOWELL BLVD FROM W FLORIDA AVE TO W MEXICO AVE

(REPLACEMENT)
INSTALLED APPROX 1750' OF 12" PVC MAIN

SERVICE ADDRESS:

REFERENCE:
ENGINEERING STANDARDS
FOURTEENTH EDITION 2012
www.denverwater.org
/DoingBusinesswithUs/EngineeringOverview/EngineeringStandards

THIS DRAWING IS BASED ON THE DW_METRO_GRID COORDINATE SYSTEM

No	Date	Description
△		
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REVISIONS

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING
0 ——— 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PT NO: *13467*
DRAWN BY: *TSS*
CHKD BY:
CHKD BY:
APPD BY:
DATE: *November 8, 2006*
CONTRACT:
AS-BUILT DATE: *1/1/2014*
AS-BUILT BY: *NDR*

DRAWING TITLE

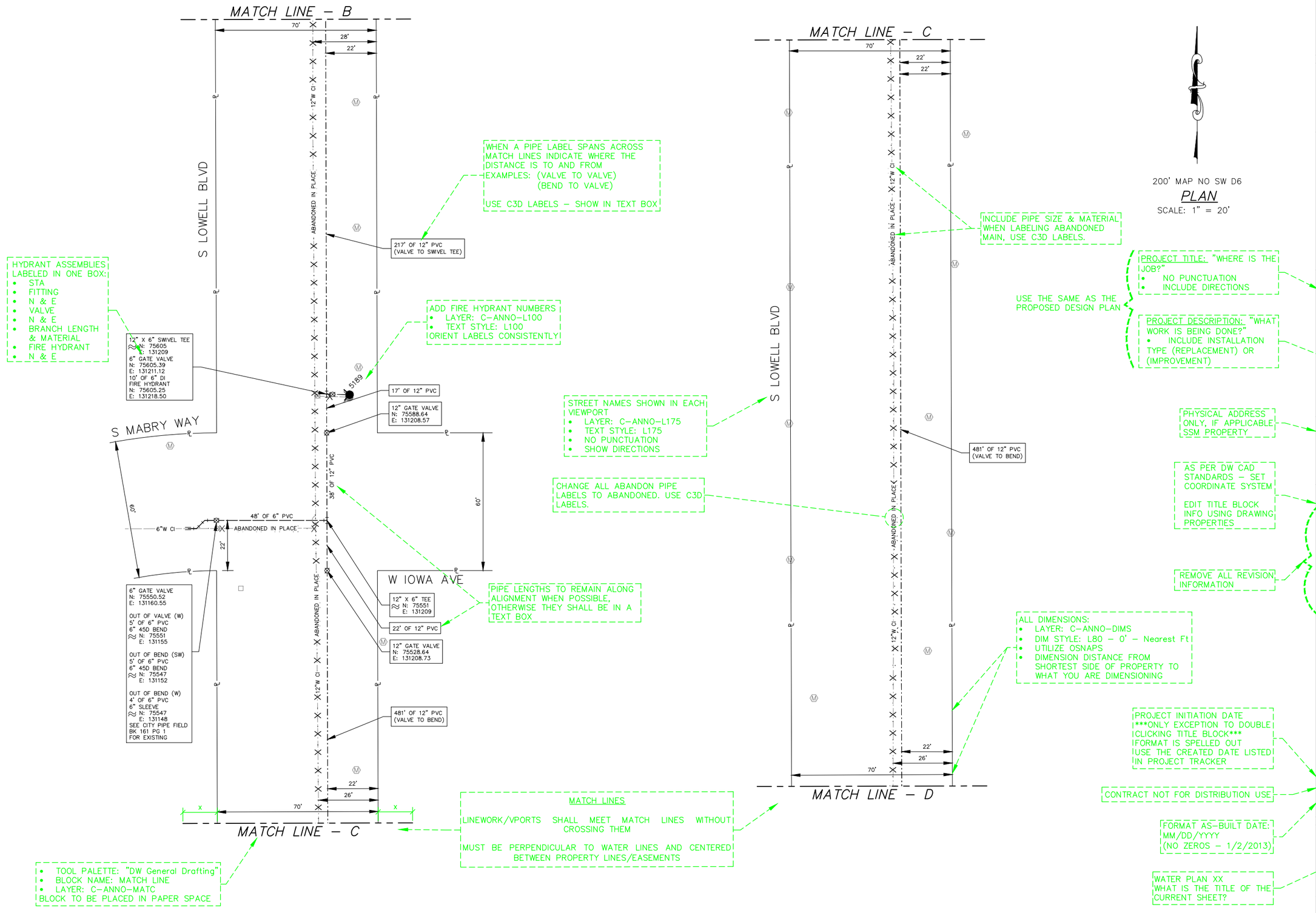
WATER PLAN 1

DISTRIBUTION

SHEET 2 OF 4 SHEETS

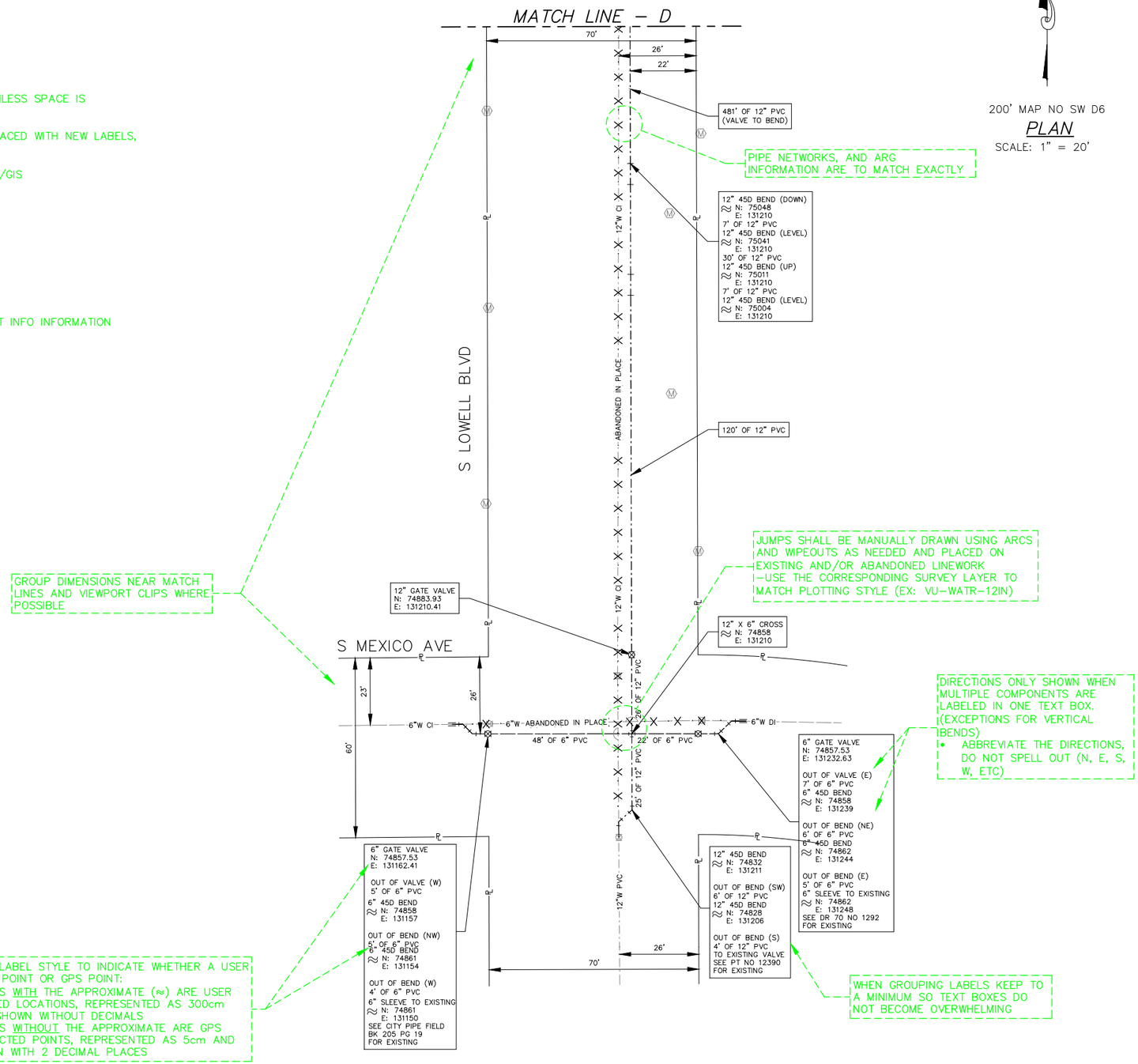
CITY PIPE "AS-BUILT" EXAMPLE

\\denverwater.org\shares\UW CAD\CAD Standards\2016\Working\References\ExampleSheets\Just\CityPipe-AsBd.dwg WATER PLAN 1 12/21/2016 9:34 AM


MATCH LINE – B
70'
28'
22'
S LOWELL BLVD
12"W CI - ABANDONED IN PLACE
WHEN A PIPE LABEL SPANS ACROSS MATCH LINES INDICATE WHERE THE DISTANCE IS TO AND FROM
EXAMPLES: (VALVE TO VALVE)
(BEND TO VALVE)
USE C3D LABELS – SHOW IN TEXT BOX
217' OF 12" PVC (VALVE TO SWIVEL TEE)
HYDRANT ASSEMBLIES LABELED IN ONE BOX:
• STA
• FITTING
• N & E
• VALVE
• N & E
• BRANCH LENGTH & MATERIAL
• FIRE HYDRANT
• N & E
12" X 6" SWIVEL TEE
N: 75605
E: 131209
6" GATE VALVE
N: 75605.39
E: 131211.12
10' OF 6" DI
FIRE HYDRANT
N: 75605.25
E: 131218.50
ADD FIRE HYDRANT NUMBERS
• LAYER: C-ANNO-L100
• TEXT STYLE: L100
ORIENT LABELS CONSISTENTLY
5189
17' OF 12" PVC
12" GATE VALVE
N: 75588.64
E: 131208.57
S MABRY WAY
38' OF 12" PVC
60'
48' OF 6" PVC
6"W CI
ABANDONED IN PLACE
22'
6" GATE VALVE
N: 75550.52
E: 131160.55
OUT OF VALVE (W)
5' OF 6" PVC
6" 45D BEND
N: 75551
E: 131155
OUT OF BEND (SW)
5' OF 6" PVC
6" 45D BEND
N: 75547
E: 131152
OUT OF BEND (W)
4' OF 6" PVC
6" SLEEVE
N: 75547
E: 131148
SEE CITY PIPE FIELD BK 161 PG 1 FOR EXISTING
W IOWA AVE
12" X 6" TEE
N: 75551
E: 131209
22' OF 12" PVC
12" GATE VALVE
N: 75528.64
E: 131208.73
PIPE LENGTHS TO REMAIN ALONG ALIGNMENT WHEN POSSIBLE, OTHERWISE THEY SHALL BE IN A TEXT BOX
481' OF 12" PVC (VALVE TO BEND)
22'
26'
70'
MATCH LINE – C
MATCH LINES
LINEWORK/VPORTS SHALL MEET MATCH LINES WITHOUT CROSSING THEM
MUST BE PERPENDICULAR TO WATER LINES AND CENTERED BETWEEN PROPERTY LINES/EASEMENTS
• TOOL PALETTE: "DW General Drafting"
• BLOCK NAME: MATCH LINE
• LAYER: C-ANNO-MATC
BLOCK TO BE PLACED IN PAPER SPACE
STREET NAMES SHOWN IN EACH VIEWPORT
• LAYER: C-ANNO-L175
• TEXT STYLE: L175
• NO PUNCTUATION
• SHOW DIRECTIONS
CHANGE ALL ABANDON PIPE LABELS TO ABANDONED. USE C3D LABELS.
MATCH LINE – C
70'
22'
22'
S LOWELL BLVD
12"W CI - ABANDONED IN PLACE
INCLUDE PIPE SIZE & MATERIAL WHEN LABELING ABANDONED MAIN, USE C3D LABELS.
481' OF 12" PVC (VALVE TO BEND)
22'
26'
70'
MATCH LINE – D
200' MAP NO SW D6
PLAN
SCALE: 1" = 20'
USE THE SAME AS THE PROPOSED DESIGN PLAN
PROJECT TITLE: "WHERE IS THE JOB?"
• NO PUNCTUATION
• INCLUDE DIRECTIONS
PROJECT DESCRIPTION: "WHAT WORK IS BEING DONE?"
• INCLUDE INSTALLATION TYPE (REPLACEMENT) OR (IMPROVEMENT)
PHYSICAL ADDRESS ONLY, IF APPLICABLE SSM PROPERTY
AS PER DW CAD STANDARDS – SET COORDINATE SYSTEM
EDIT TITLE BLOCK INFO USING DRAWING PROPERTIES
REMOVE ALL REVISION INFORMATION
ALL DIMENSIONS:
• LAYER: C-ANNO-DIMS
• DIM STYLE: L80 – 0' – Nearest Ft
• UTILIZE OSNAPS
• DIMENSION DISTANCE FROM SHORTEST SIDE OF PROPERTY TO WHAT YOU ARE DIMENSIONING
PROJECT INITIATION DATE
ONLY EXCEPTION TO DOUBLE CLICKING TITLE BLOCK
FORMAT IS SPELLED OUT
USE THE CREATED DATE LISTED IN PROJECT TRACKER
CONTRACT NOT FOR DISTRIBUTION USE
FORMAT AS-BUILT DATE: MM/DD/YYYY (NO ZEROS – 1/2/2013)
WATER PLAN XX
WHAT IS THE TITLE OF THE CURRENT SHEET?
DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
T:303.628.6000
F:303.628.6851
denverwater.org
CONSULTANT
ALL TITLE BLOCK INFORMATION EDITED THROUGH SSM UNLESS NOTED OTHERWISE
S LOWELL BLVD FROM W FLORIDA AVE TO W MEXICO AVE
(REPLACEMENT) INSTALLED APPROX 1750' OF 12" PVC MAIN
SERVICE ADDRESS:
REFERENCE:
ENGINEERING STANDARDS
FOURTEENTH EDITION 2012
www.denverwater.org
/DoingBusinesswithUs/EngineeringOverview/EngineeringStandards
THIS DRAWING IS BASED ON THE DW_METRO_GRID COORDINATE SYSTEM
No Date Description
REVISIONS
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY
PT NO: 13467
DRAWN BY: TSS
CHKD BY:
CHKD BY:
APPD BY:
DATE: November 8, 2006
CONTRACT:
AS-BUILT DATE: 1/1/2014
AS-BUILT BY: NDR
DRAWING TITLE
WATER PLAN 2
DISTRIBUTION
SHEET 3 OF 4 SHEETS
EXAMPLE UPDATED: Thursday, August 11, 2016
CITY PIPE "AS-BUILT" EXAMPLE
\\denverwater.org\shares\UW CAD\CAD Standards\2016\Working\References\ExampleSheets\Dist\CityPipe-AsBuilt.dwg WATER PLAN 2 12/21/2016 9:34 AM

QA DRAFTING CHECKLIST

- DO NOT BEGIN AS-BUILT UNTIL "PROPOSED DESIGN" DRAWING WAS ARCHIVED PROPERLY
- BEGIN AS-BUILT USING "PROPOSED DESIGN" (PTNO_DIST.dwg) DRAWING, MAINTAIN SURVEY XREF, AND PIPE NETWORKS; FREEZE ALIGNMENT STATIONING
- NO PUNCTUATION ON ABBREVIATIONS
  - TITLE BLOCK AND PLAN VIEWS SHALL MATCH
- NOTES & LEGENDS SHALL BE PLACED ON THE COVER
  - LEGEND SHALL INCLUDE SURVEY'S SURFACE FEATURES (MANHOLES, METERS, ETC)
- ON SHEETS WITH ONE VIEWPORT, PLACE VIEWPORT ON RIGHT SIDE OF PAGE
- LABELING OF EACH FEATURE SHALL BE PLACED IN AN INDIVIDUAL TEXT BOX LABEL UNLESS SPACE IS RESTRICTIVE
- SURVEY'S DIMENSIONS AND LABELS (STREETS, HYDT NO., ETC) ARE FROZEN AND REPLACED WITH NEW LABELS, ON THE PROPER LAYERS – UTILIZE C3D LABELS WHERE POSSIBLE
- WHEN SURVEY DATA IS NOT SUFFICIENT, BASE INFO CAN BE SUPPLEMENTED WITH FDO/GIS
- PROPER USE OF LAYERS, ANNOTATION, AND STYLES
- COORDINATE SYSTEM DEFINED AND NOTED IN TITLE BLOCK
- ALL APPLICABLE NOTES AND LEGENDS HAVE BEEN ADDED
- ALL LABELS HAVE BEEN CHECKED FOR CORRECT INFORMATION AND PROPER FORMAT
- SYMBOLS HAVE BEEN ROTATED TO THE CORRECT ORIENTATION
- DISPLAY/DRAW ORDER HAS BEEN REVIEWED ON SYMBOLOGY
- DIMENSIONS AND SYMBOLS HAVE NOT BEEN EXPLODED
- DIMENSION AND LEADERS LINES ARE NOT CROSSING EACH OTHER OR OTHER PERTINENT INFO INFORMATION
- ALL LABELS AND TEXT ARE LEGIBLE WITH CONSISTENT SPACING
  - AVOID TEXT CONFLICTS
- WIPEOUT FRAMES HAVE BEEN TURNED OFF BEFORE PLOTTING
- HARD COPY AND/OR DWF HAS BEEN REVIEWED – NO COLOR IS USED ON PLOTS



200' MAP NO SW D6

PLAN

SCALE: 1" = 20'

DENVER WATER

1600 West 12th Ave
Denver, Colorado 80204-3412
T:303.628.6000
F:303.628.6851
denverwater.org

CONSULTANT

S LOWELL BLVD FROM W FLORIDA AVE TO W MEXICO AVE

(REPLACEMENT)
INSTALLED APPROX 1750' OF 12" PVC MAIN

SERVICE ADDRESS:

REFERENCE:
ENGINEERING STANDARDS
FOURTEENTH EDITION 2012
www.denverwater.org
/DoingBusinesswithUs/EngineeringOverview/EngineeringStandards

THIS DRAWING IS BASED ON THE DW_METRO_GRID COORDINATE SYSTEM

No	Date	Description
△		
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REVISIONS

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING

0 ——— 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PT NO: *13467*

DRAWN BY: *TSS*

CHKD BY:

CHKD BY:

APPD BY:

DATE: *November 8, 2006*

CONTRACT:

AS-BUILT DATE: *1/1/2014*

AS-BUILT BY: *NDR*

DRAWING TITLE

WATER PLAN 3

DISTRIBUTION

SHEET 4 OF 4 SHEETS

EXAMPLE UPDATED: Thursday, August 11, 2016

CITY PIPE "AS-BUILT" EXAMPLE

\\denverwater.org\shares\UW CAD\CAD Standards\2016 Working\References\ExampleSheets\Just\CityPipe-AsBd.dwg WATER PLAN 3 12/2//2016 9:54 AM

Section 5.2

Property Management Examples

Overview - Section 5.2

In order for projects to be shared easily it is important that the method of drafting and structure of the drawing set be standardized; use the following list as a guideline for standardization. These standards will be applicable to the majority of projects; however, there may be instances where a variance from these standards will provide more flexibility. Check with Denver Water's CAD Manager for variances.

Property Management (PMGT) drawings are to be created using the *DW-PMGT 2016 C3D Template.dwt*. Every drawing shall maintain a defined coordinate system in order to allow existing conditions and design information to translate into the GIS system accurately.

NOTE: Sheet Sets are not applicable on Property Management projects.

General Startup Checklist (PMGT)

- ☐ Start or create drawings using the *DW-PMGT 2016 C3D Template.dwt*, save to Project ID under the *Pmgt* folder with the proper naming conventions
  - o [see *Section 6.1 – File Management*]
  - o [see *Section 6.2 – Naming Conventions*]
- ☐ Set appropriate Coordinate System
  - o [see *Section 11.0 – Coordinate Systems*]
- ☐ Set drawing scales – model space and paper space viewports
  - o [see *Section 13.1 – Model/Paper Space and Annotation Scales*]
- ☐ Use the specified layers*, colors, and linetypes as specified in this section
- ☐ Use Denver Water standard Civil 3D labels, text, dimension styles and templates as outlined in this section
  - o **DO NOT** explode C3D labels or dimensions
  - o **DO NOT** rescale or stretch titleblocks within templates
  - o Remove all layout titles (top of page), they are for reference only
- ☐ Where abbreviations are used, refer to the Denver Water ES and/or CPCS
- ☐ Maintain the use of DW standard blocks and symbols as outlined in this section
- ☐ Use a separate layout for each sheet /exhibit, multiple layouts are permitted in a single drawing
- ☐ Spell check all drawings
- ☐ Plot using *DW Engineering-PMGT.ctb*
  - o [see *Section 16.1 – Plot Styles (CTBs)*]
- ☐ Before exiting a drawing, zoom extents on all Layout tabs, then save drawing with the first Layout tab selected

*Do not draw on layers 0 or Defpoints

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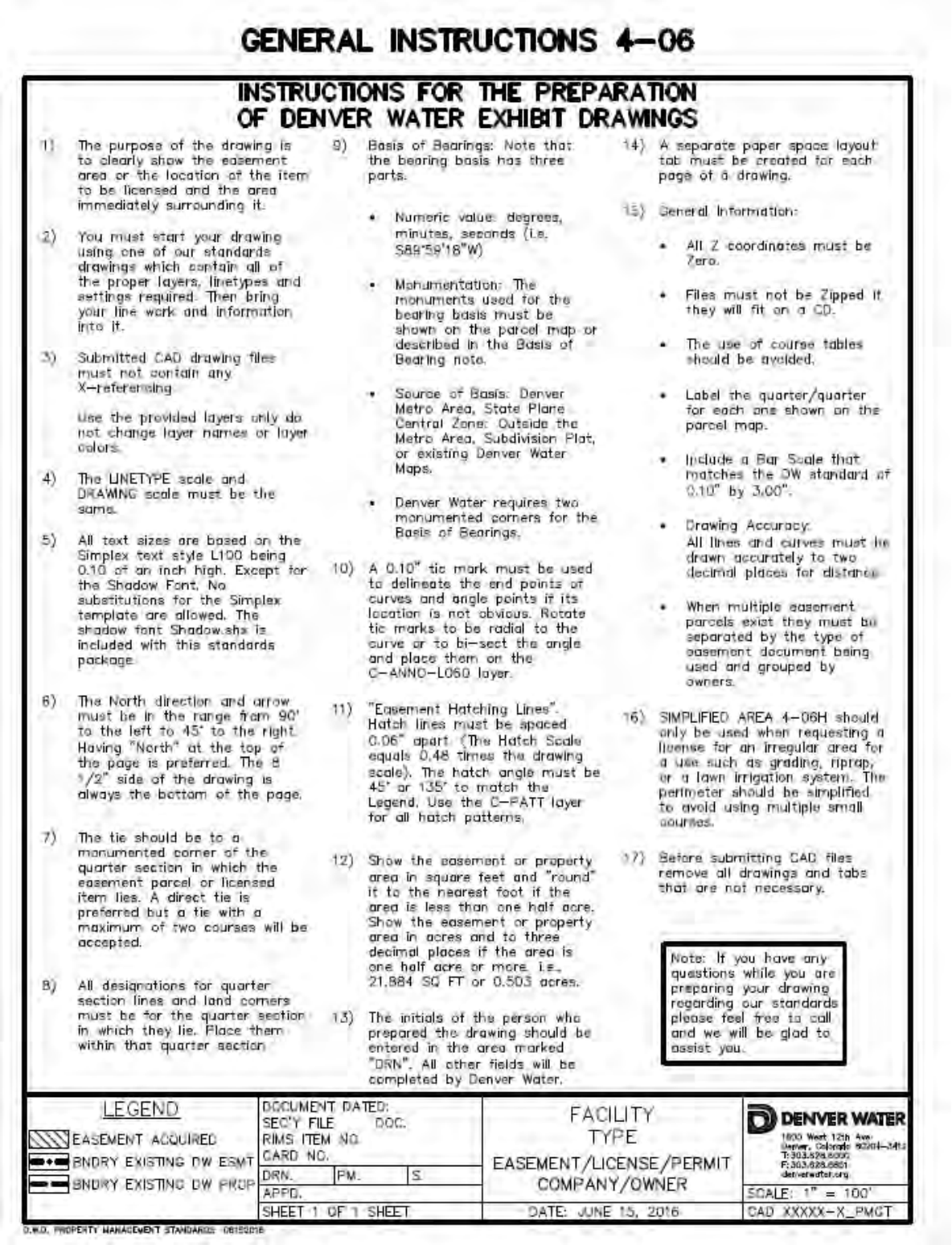
Examples

Denver Water's Property Management section requires a very specialized set of drawings/exhibits; therefore, this section has their own template [see *Section 10.3 – DW-PMGT 2016 C3D Template.dwt*]. If any work is to be done for Property Management, the user shall communicate with the Property Management section for specifics. The following examples are for visual comparison and are not shown to scale:

General Instructions 4-06



GENERAL INSTRUCTIONS 4–06

INSTRUCTIONS FOR THE PREPARATION OF DENVER WATER EXHIBIT DRAWINGS

1) The purpose of the drawing is to clearly show the easement area or the location of the item to be licensed and the area immediately surrounding it.

2) You must start your drawing using one of our standards drawings which contain all of the proper layers, linetypes and settings required. Then bring your line work and information into it.

3) Submitted CAD drawing files must not contain any X–referencing.

Use the provided layers only do not change layer names or layer colors.

4) The LINETYPE scale and DRAWING scale must be the same.

5) All text sizes are based on the Simplex text style L100 being 0.10 of an inch high. Except for the Shadow Font. No substitutions for the Simplex template are allowed. The shadow font Shadow.shx is included with this standards package.

6) The North direction and arrow must be in the range from 90° to the left to 45° to the right. Having "North" at the top of the page is preferred. The 8 1/2" side of the drawing is always the bottom of the page.

7) The tie should be to a monumented corner of the quarter section in which the easement parcel or licensed item lies. A direct tie is preferred but a tie with a maximum of two courses will be accepted.

8) All designations for quarter section lines and land corners must be for the quarter section in which they lie. Place them within that quarter section.

9) Basis of Bearings: Note that the bearing basis has three parts.

- Numeric value: degrees, minutes, seconds (i.e. S89°59'18"W)
- Monumentation: The monuments used for the bearing basis must be shown on the parcel map or described in the Basis of Bearing note.
- Source of Basis: Denver Metro Area, State Plane Central Zone; Outside the Metro Area, Subdivision Plat, or existing Denver Water Maps.
- Denver Water requires two monumented corners for the Basis of Bearings.

10) A 0.10" tic mark must be used to delineate the end points of curves and angle points if its location is not obvious. Rotate tic marks to be radial to the curve or to bi–sect the angle and place them on the C–ANNO–L060 layer.

11) "Easement Hatching Lines". Hatch lines must be spaced 0.06" apart. (The Hatch Scale equals 0.48 times the drawing scale). The hatch angle must be 45° or 135° to match the Legend. Use the C–PATT layer for all hatch patterns.

12) Show the easement or property area in square feet and "round" it to the nearest foot if the area is less than one half acre. Show the easement or property area in acres and to three decimal places if the area is one half acre or more. i.e., 21,884 SQ FT or 0.503 acres.

13) The initials of the person who prepared the drawing should be entered in the area marked "DRN". All other fields will be completed by Denver Water.

14) A separate paper space layout tab must be created for each page of a drawing.

15) General Information:

- All Z coordinates must be Zero.
- Files must not be Zipped if they will fit on a CD.
- The use of course tables should be avoided.
- Label the quarter/quarter for each one shown on the parcel map.
- Include a Bar Scale that matches the DW standard of 0.10" by 3.00".
- Drawing Accuracy: All lines and curves must be drawn accurately to two decimal places for distance.
- When multiple easement parcels exist they must be separated by the type of easement document being used and grouped by owners.

16) SIMPLIFIED AREA 4–06H should only be used when requesting a license for an irregular area for a use such as grading, riprap, or a lawn irrigation system. The perimeter should be simplified to avoid using multiple small courses.

17) Before submitting CAD files remove all drawings and tabs that are not necessary.

Note: If you have any questions while you are preparing your drawing regarding our standards please feel free to call and we will be glad to assist you.

LEGEND	DOCUMENT DATED:	FACILITY TYPE	DENVER WATER
EASEMENT ACQUIRED	SEC'Y FILE DOC.	EASEMENT/LICENSE/PERMIT	1600 West 12th Ave. Denver, Colorado 80204–3412 T: 303.628.6000 F: 303.628.6851 denverwater.org
BNDRY EXISTING DW ESMT	RIMS ITEM NO.	COMPANY/OWNER	
BNDRY EXISTING DW PROP	CARD NO.		
	DRN. PM. S		SCALE: 1" = 100'
	APPD.		
	SHEET 1 OF 1 SHEET	DATE: JUNE 15, 2016	CAD XXXXX–X_PMGT

D.W.D. PROPERTY MANAGEMENT STANDARDS 06152016

DW STANDARDS 4–06A Page 1

USE ONLY SUPPLIED LAYERS, COLORS, TEXT STYLES, LINE WEIGHTS, and LINETYPES SPECIFIED ON THIS SHEET

LAYER NAME	LAYER COLOR	TEXT STYLE	EXAMPLE	LINE WEIGHT
C–ANNO–L050	211	L50	STANDARDS 03232012	0.005 IN
C–ANNO–L060	212	L60	Lot 1	0.007 IN
C–ANNO–L060–ITAL	212	L60 Italic	N Line NW 1/4 Sec 36	0.007 IN
C–ANNO–L080	223	L80	N89°22'45"W	0.010 IN
C–ANNO–L080	223	L80	BASIS OF BEARING:	0.010 IN
C–ANNO–L100	144	L100	BLK 1	0.014 IN
C–ANNO–L120	85	L120	SCALE 1" = 100'	0.020 IN
C–ANNO–L120–ITAL	85	L120 Italic	ANY STREET	0.020 IN
C–ANNO–L120–SHAD	212	L120 Shadow	POLLOCK OAKS	0.007 IN
C–ANNO–L140	26	L140	NE1/4 NE1/4	0.028 IN
C–ANNO–L140–ITAL	26	L140 Italic	ANY STREET	0.028 IN
C–ANNO–L175	137	L175	4–06A	0.039 IN
C–ANNO–L175–SHAD	212	L175 Shadow	BAILEY HEIGHTS	0.007 IN
G–ANNO–LOGO	211	N/A		0.005 IN
			LINETYPE	
C–ANNO–TTLB	7			0.039 IN
C–CHAN–CNTR	212			0.007 IN
C–DTCH–CNTR	212			0.007 IN
C–ESMT–ACQU	156			0.028 IN
C–ESMT–CONV	26			0.028 IN
C–ESMT–DIST	165			0.020 IN
C–ESMT–DW	7			0.039 IN
C–ESMT–OTHR	212			0.007 IN
C–FENC	212		x x	0.007 IN
C–GRLN–PROF	223			0.010 IN
C–LICN–ACQU	7			0.039 IN
C–LICN–ACQU–AREA	26			0.028 IN
C–LICN–CONV	7			0.039 IN
C–LICN–CONV–AREA	26			0.028 IN
C–NPLT	212			0.007 IN
C–PATT	212			0.007 IN
C–POND	164			0.014 IN
C–PROP–ACQU	156			0.028 IN
C–PROP–CONV	26			0.028 IN
C–PROP–DW	7			0.039 IN
C–PROP–LINE	212			0.007 IN
C–PROP–LOTS	212			0.007 IN
C–ROAD–CNTR	212			0.007 IN
C–ROAD–CURB	212			0.007 IN
C–ROAD–RWAY	85			0.020 IN
C–SECT–LINE–16TH	212			0.007 IN
C–SECT–LINE–64TH	212			0.007 IN
C–SECT–LINE–FULL	212			0.007 IN
C–SECT–LINE–QTRS	212			0.007 IN
C–SITE	211			0.010 IN
CU–COND–CNTR	212			0.007 IN
CU–WATR–CNTR	212			0.007 IN
V–CTRL	85			0.020 IN
VF–MONM	212			0.007 IN

LEGEND

- EASEMENT ACQUIRED
- BNDRY EXISTING DW ESMT
- BNDRY EXISTING DW PROP

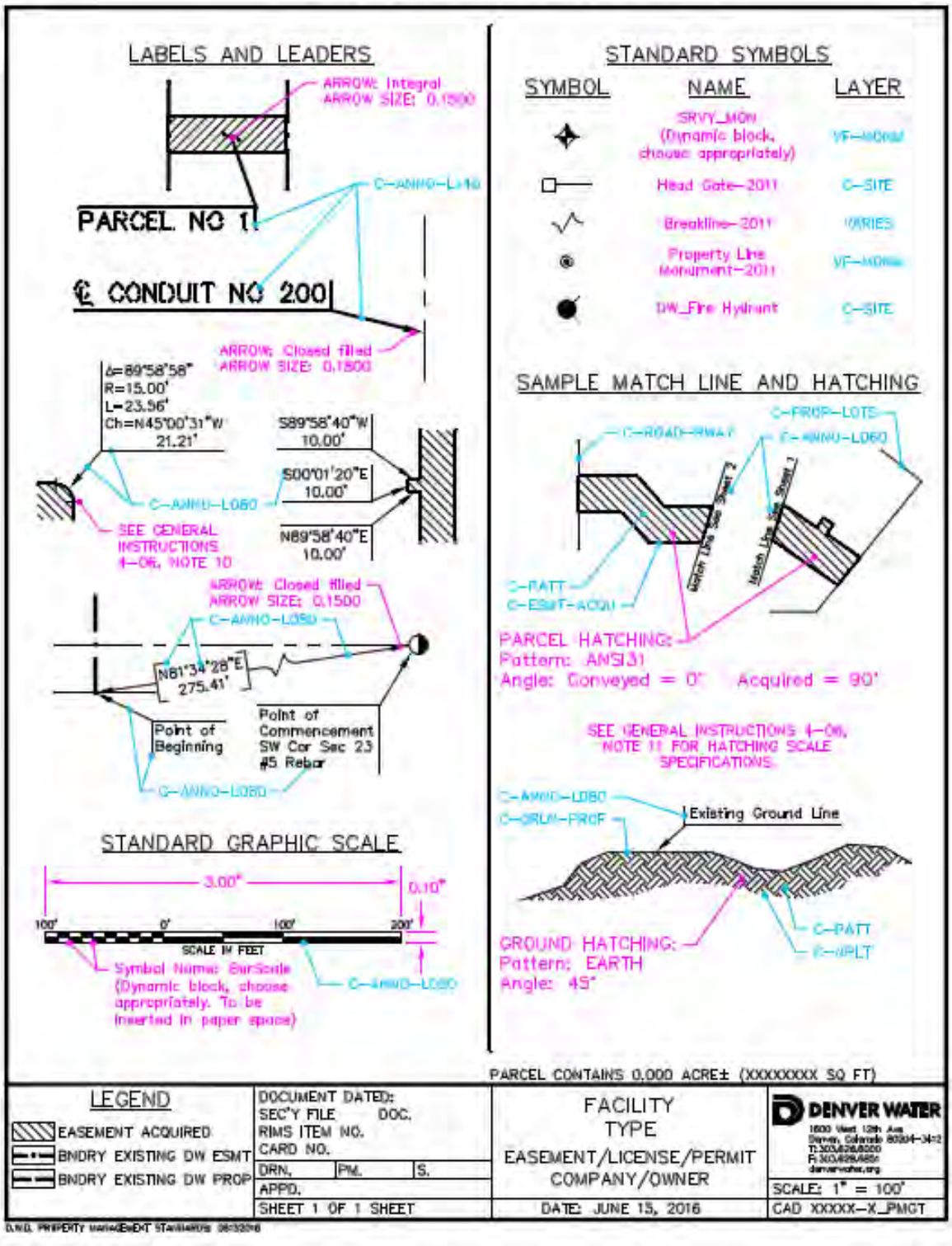
DOCUMENT DATED:
SEC'Y FILE DOC.
RIMS ITEM NO.
CARD NO.
DRN. | PM. | S.
APPD.
SHEET 1 OF 1 SHEET

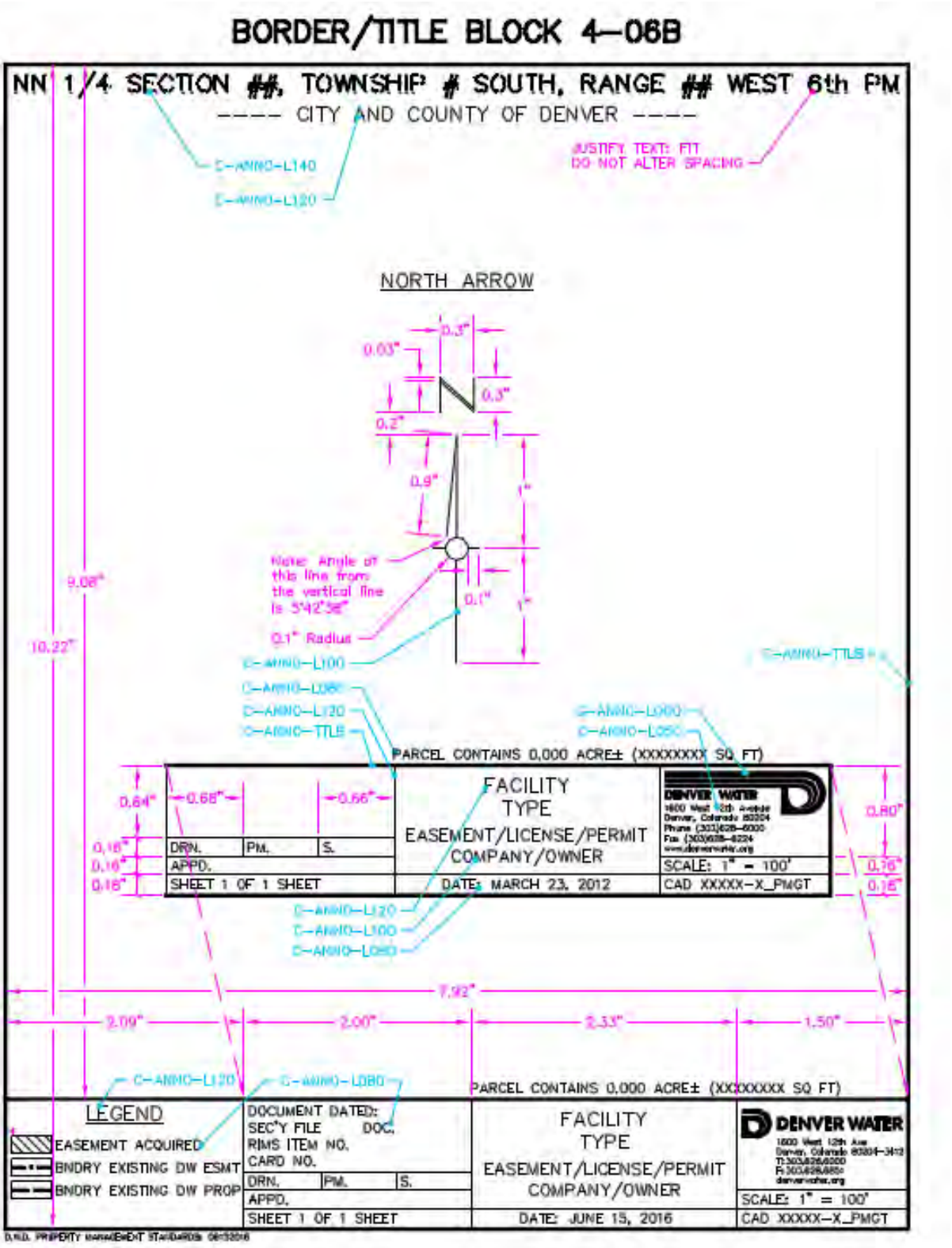
FACILITY TYPE
EASEMENT/LICENSE/PERMIT
COMPANY/OWNER
DATE: JUNE 15, 2016

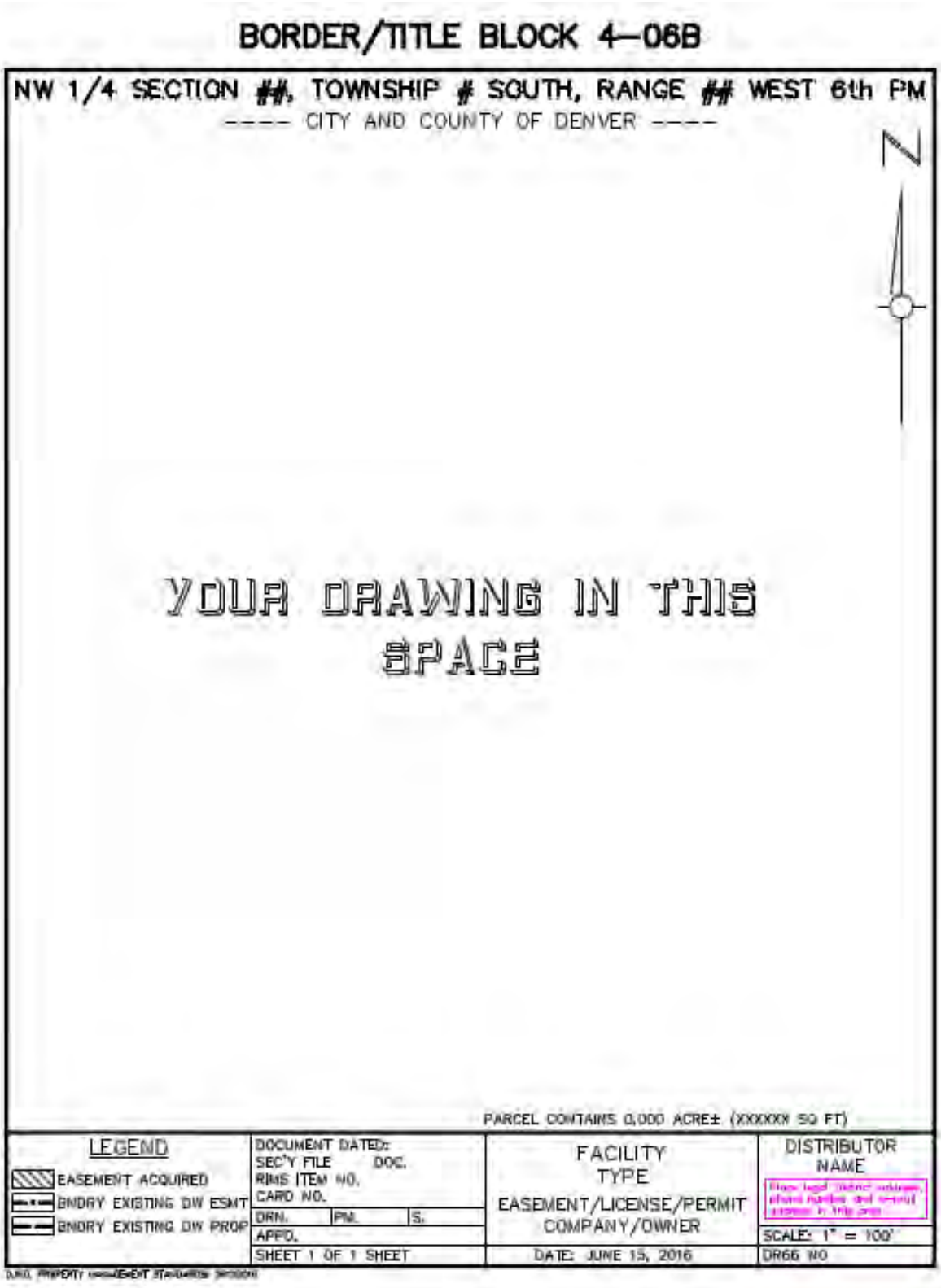
DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204-3412
P:303.628.6000
F:303.628.6851
denverwater.org
SCALE: 1" = 100'
CAD XXXXX–X_PMGT

D:\MD\...PROPERTY MANAGEMENT STANDARDS\ 06152016

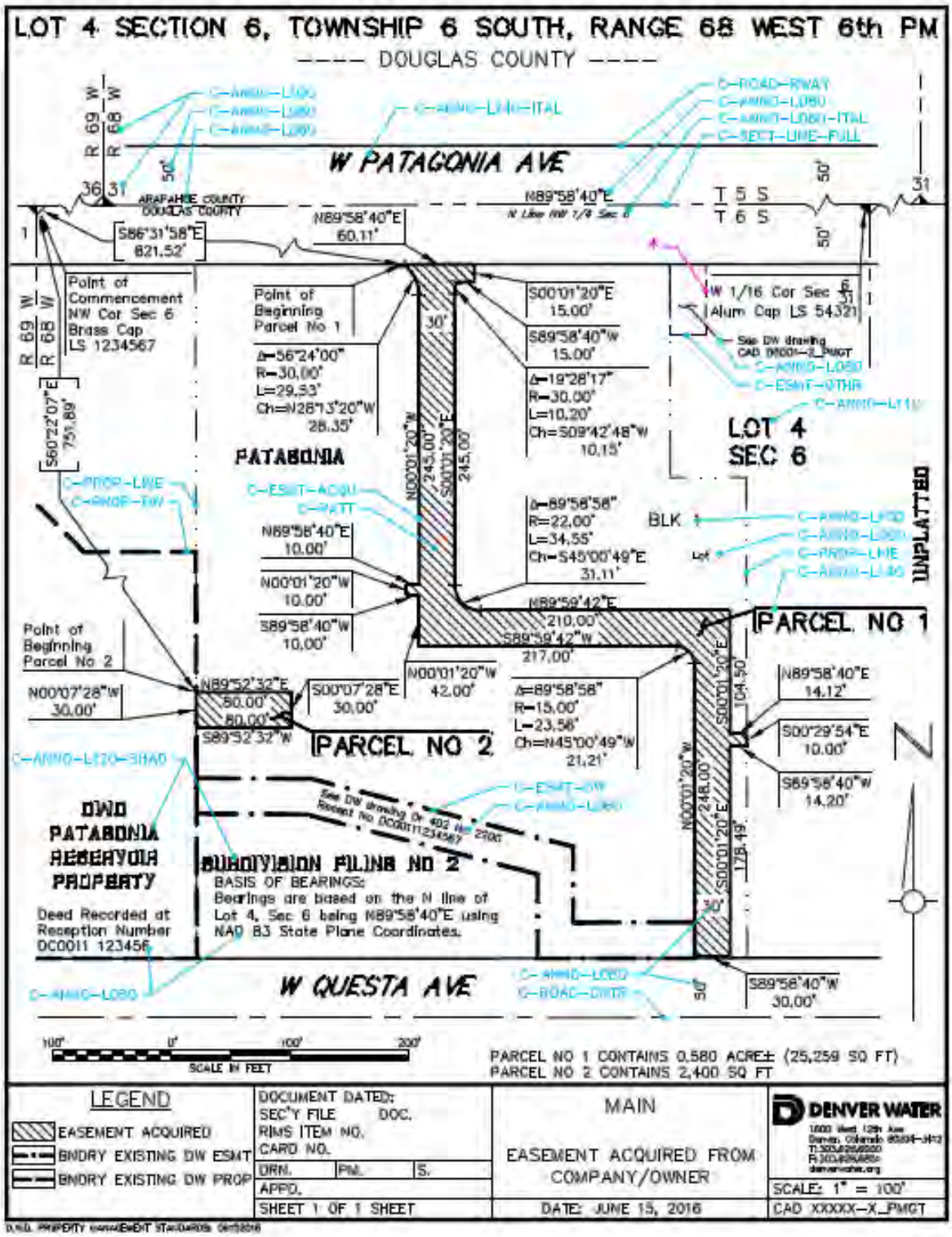
DW STANDARDS 4–06A Page 2

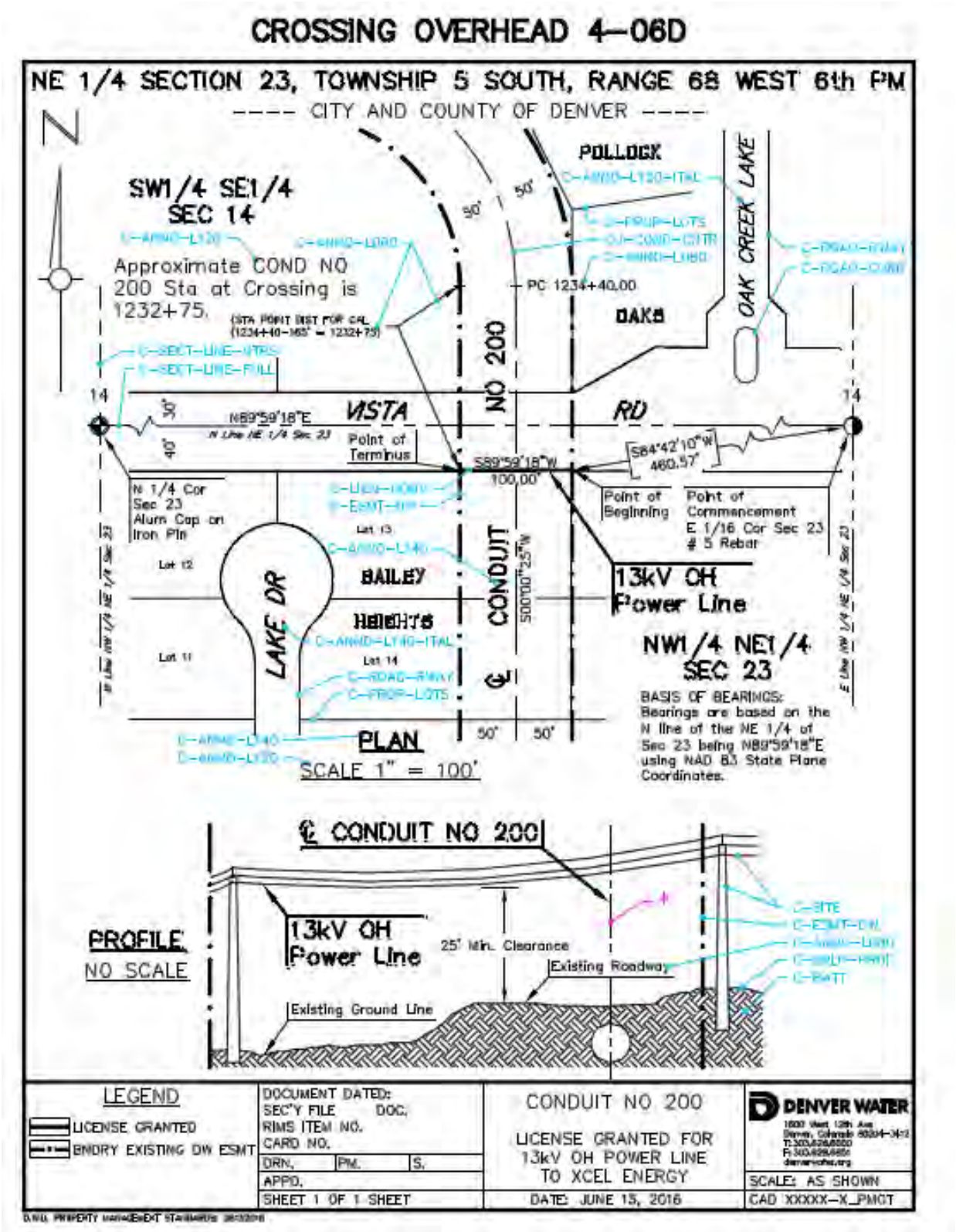


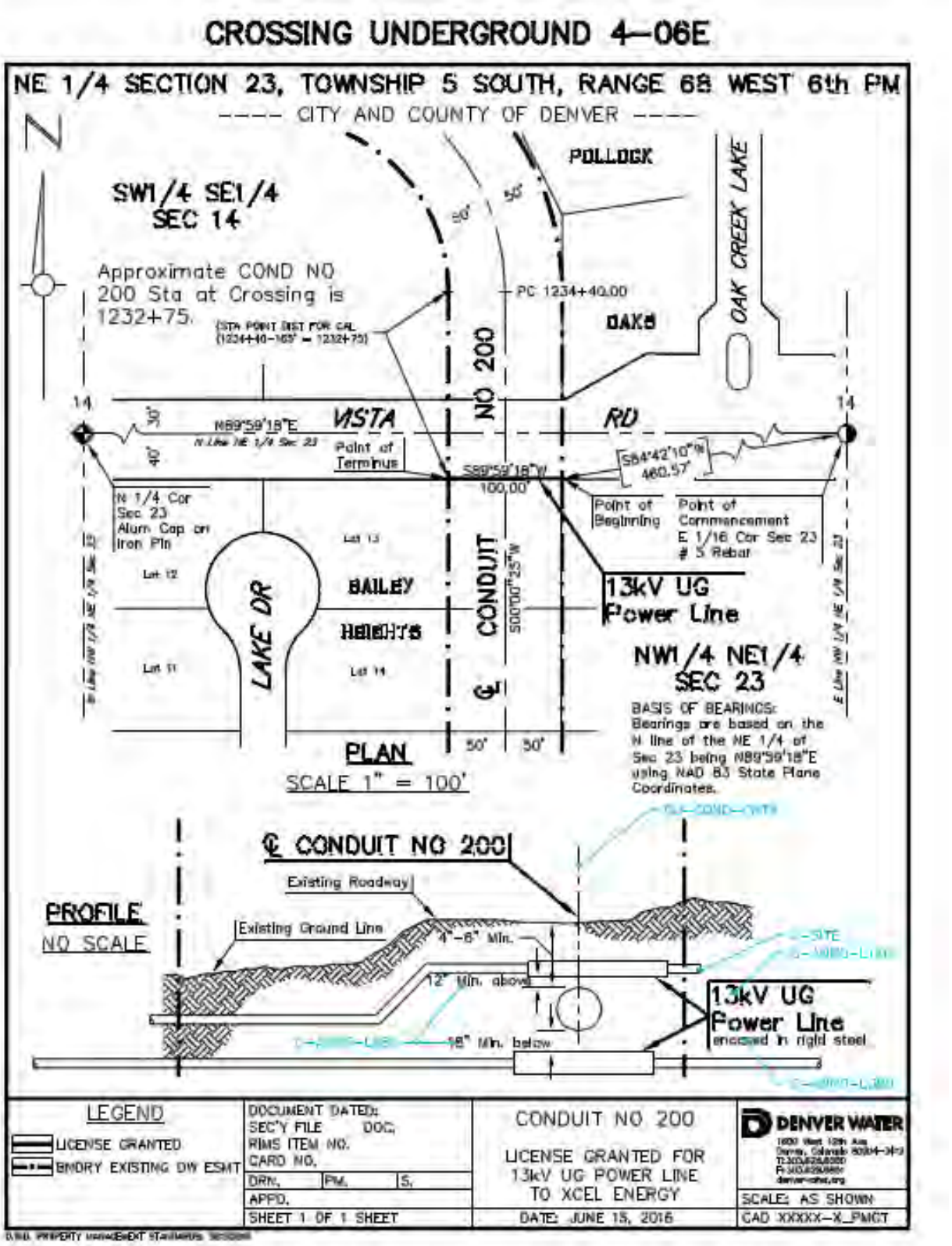

BORDER/TITLE BLOCK 4–06B
NN 1/4 SECTION ##, TOWNSHIP # SOUTH, RANGE ## WEST 6th PM
---- CITY AND COUNTY OF DENVER ----
C-ANNO-L140
C-ANNO-L120
JUSTIFY TEXT: FIT
DO NOT ALTER SPACING
NORTH ARROW
0.3"
0.03"
0.3"
0.2"
0.9"
1"
Note: Angle of this line from the vertical line is 5°42'58"
0.1"
0.1" Radius
9.08"
10.22"
C-ANNO-L100
C-ANNO-L080
C-ANNO-L120
C-ANNO-TTLE
C-ANNO-TTLS
C-ANNO-L000
C-ANNO-L050
PARCEL CONTAINS 0.000 ACRE± (XXXXXXXX SQ FT)
0.64"
0.66"
0.66"
0.80"
0.16"
0.16"
0.16"
0.76"
0.16"
DRN.
PM.
S.
APPD.
SHEET 1 OF 1 SHEET
FACILITY TYPE
EASEMENT/LICENSE/PERMIT
COMPANY/OWNER
DATE: MARCH 23, 2012
DENVER WATER
SCALE: 1" = 100'
CAD XXXXX-X_PMGT
C-ANNO-L120
C-ANNO-L100
C-ANNO-L080
7.92"
2.09"
2.00"
2.33"
1.50"
C-ANNO-L120
C-ANNO-L080
PARCEL CONTAINS 0.000 ACRE± (XXXXXXXX SQ FT)
LEGEND
EASEMENT ACQUIRED
BNDRY EXISTING DW ESMT
BNDRY EXISTING DW PROP
DOCUMENT DATED:
SEC'Y FILE DOC.
RIMS ITEM NO.
CARD NO.
DRN.
PM.
S.
APPD.
SHEET 1 OF 1 SHEET
FACILITY TYPE
EASEMENT/LICENSE/PERMIT
COMPANY/OWNER
DENVER WATER
SCALE: 1" = 100'
DATE: JUNE 15, 2016
CAD XXXXX-X_PMGT
D.W.D. PROPERTY MANAGEMENT STANDARDS 06/2016

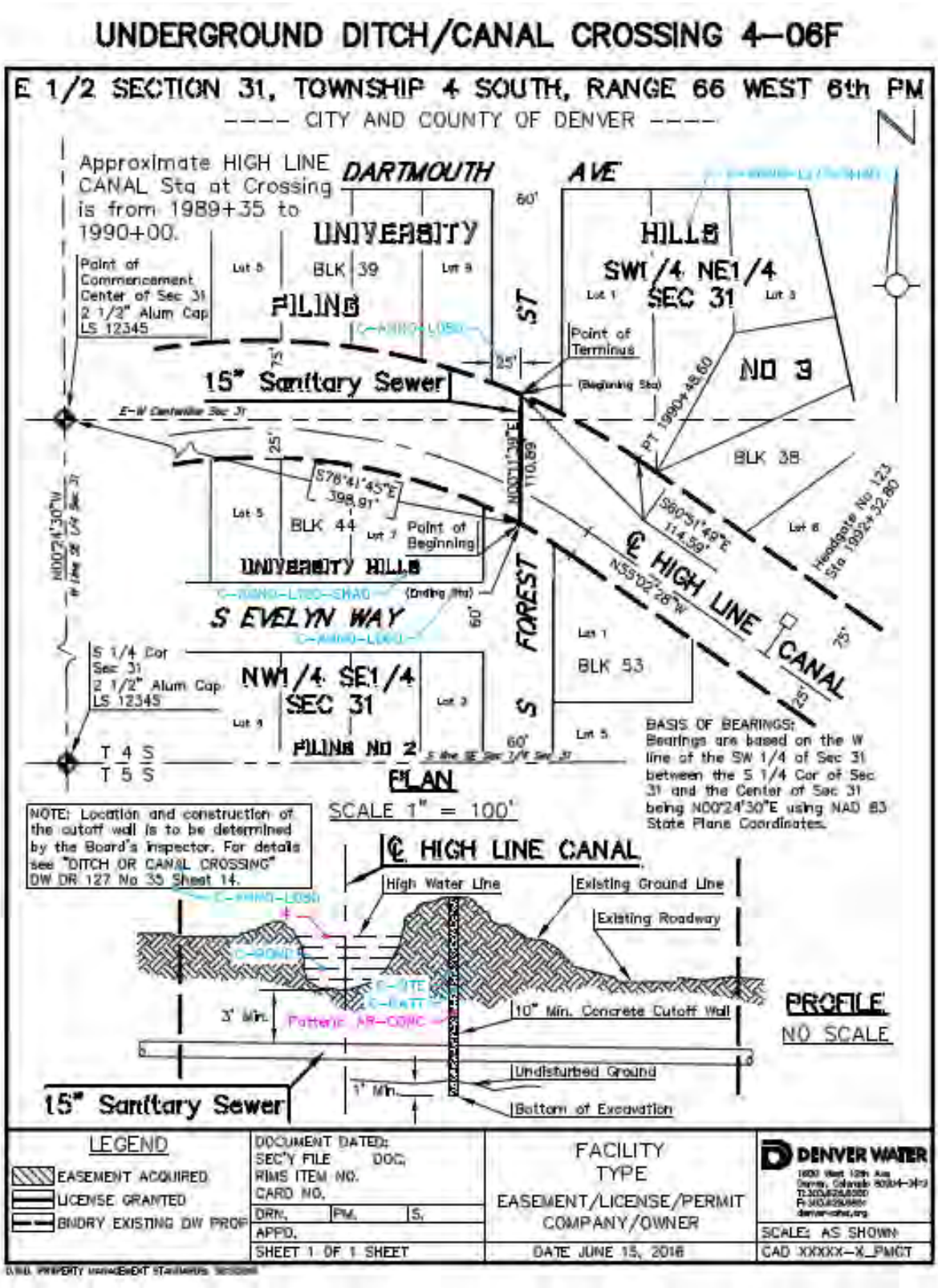

BORDER/TITLE BLOCK 4–06B
NW 1/4 SECTION ##, TOWNSHIP # SOUTH, RANGE ## WEST 6th PM
---- CITY AND COUNTY OF DENVER ----
N
YOUR DRAWING IN THIS SPACE
PARCEL CONTAINS 0.000 ACRE± (XXXXXX SQ FT)
LEGEND
EASEMENT ACQUIRED
BNDRY EXISTING DW ESMT
BNDRY EXISTING DW PROP
DOCUMENT DATED:
SEC'Y FILE DOC.
RIMS ITEM NO.
CARD NO.
DRN. PM. S.
APPD.
SHEET 1 OF 1 SHEET
FACILITY TYPE
EASEMENT/LICENSE/PERMIT
COMPANY/OWNER
DATE: JUNE 15, 2016
DISTRIBUTOR NAME
SCALE: 1" = 100'
DRGS NO

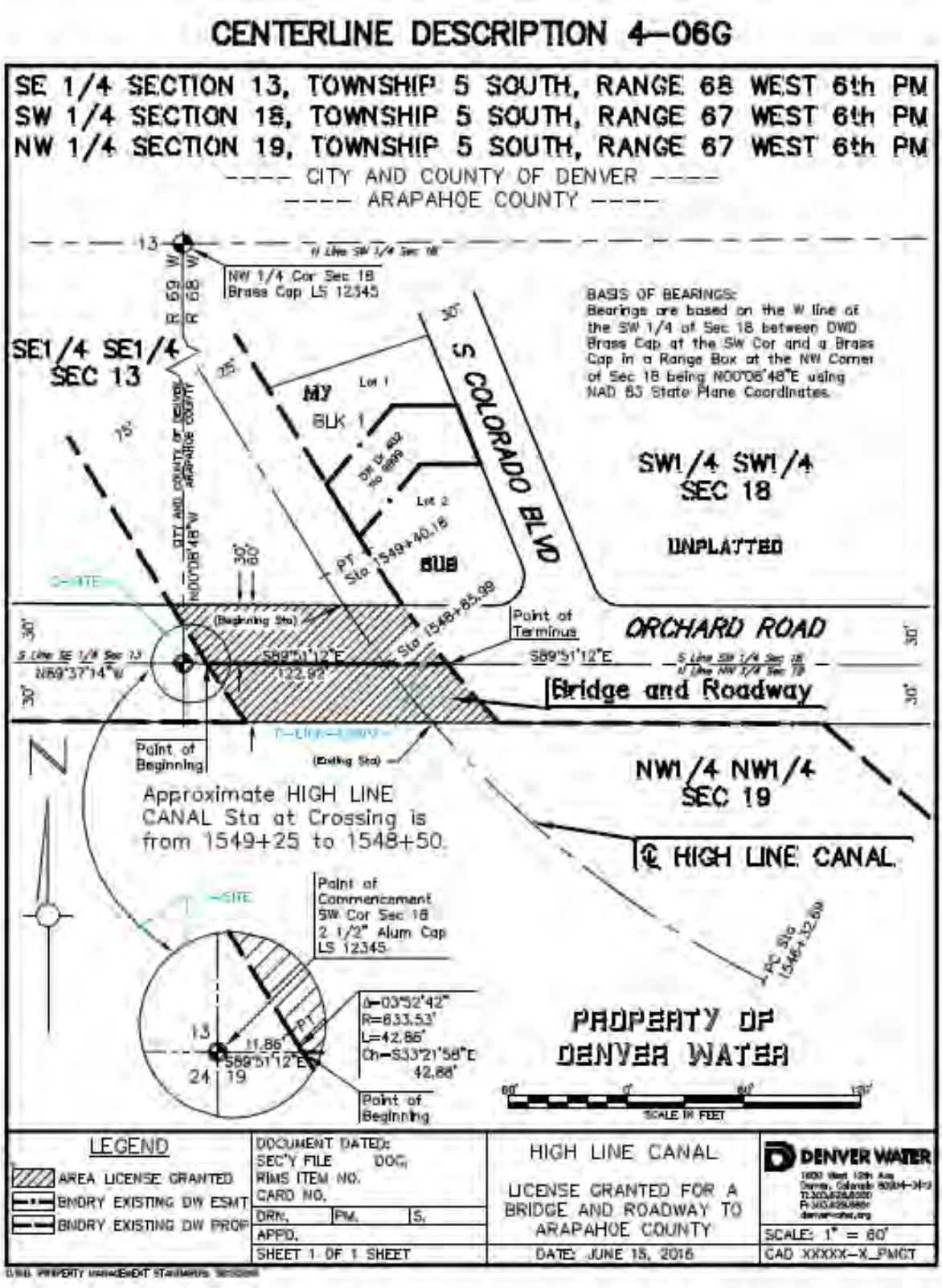
PERIMETER DESCRIPTION 4—06C



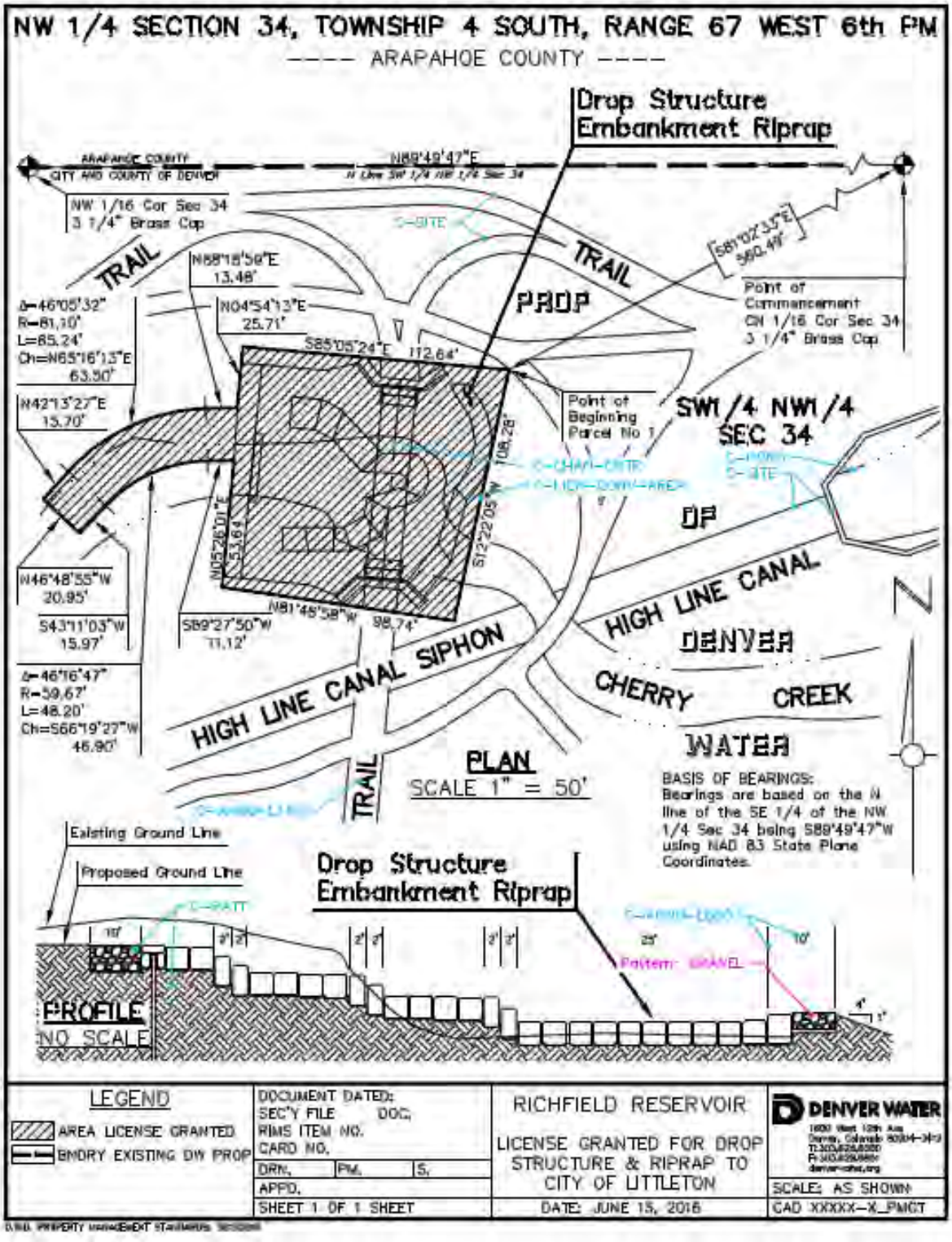

CROSSING OVERHEAD 4–06D
NE 1/4 SECTION 23, TOWNSHIP 5 SOUTH, RANGE 68 WEST 6th PM
---- CITY AND COUNTY OF DENVER ----
N
SW1/4 SE1/4
SEC 14
Approximate COND NO 200 Sta at Crossing is 1232+75.
(STA POINT DIST FOR CAL (1234+40-165' = 1232+75)
POLLOCK
OAK CREEK LAKE
PC 1234+40.00
OAKS
VISTA
RD
NO 200
CONDUIT
LAKE DR
BAILEY
HEIGHTS
N89°59'18"E
N Line NE 1/4 Sec 23
Point of Terminus
S89°59'18"W
100.00'
S84°42'10"W
460.57'
Point of Beginning
Point of Commencement
E 1/16 Cor Sec 23
5 Rebar
N 1/4 Cor Sec 23
Alum Cap on Iron Pin
13kV OH Power Line
NW1/4 NE1/4
SEC 23
BASIS OF BEARINGS:
Bearings are based on the N line of the NE 1/4 of Sec 23 being N89°59'18"E using NAD 83 State Plane Coordinates.
PLAN
SCALE 1" = 100'
℄ CONDUIT NO 200
13kV OH Power Line
25' Min. Clearance
Existing Roadway
Existing Ground Line
PROFILE
NO SCALE
LEGEND
LICENSE GRANTED
BNDRY EXISTING DW ESMT
DOCUMENT DATED:
SEC'Y FILE DOC.
RIMS ITEM NO.
CARD NO.
DRN. PM. S.
APPD.
SHEET 1 OF 1 SHEET
CONDUIT NO 200
LICENSE GRANTED FOR 13kV OH POWER LINE TO XCEL ENERGY
DATE: JUNE 15, 2016
DENVER WATER
SCALE: AS SHOWN
CAD XXXXX–X_PMGT


CROSSING UNDERGROUND 4–06E
NE 1/4 SECTION 23, TOWNSHIP 5 SOUTH, RANGE 68 WEST 6th PM
CITY AND COUNTY OF DENVER
N
SW1/4 SE1/4
SEC 14
Approximate COND NO 200 Sta at Crossing is 1232+75.
POLLOCK
OAK CREEK LAKE
OAKS
PC 1234+40.00
VISTA
RD
NO 200
N89°59'18"E
Point of Terminus
S89°59'18"W
100.00'
S84°42'10"W
460.57'
Point of Beginning
Point of Commencement
E 1/16 Cor Sec 23
5 Rebar
N 1/4 Cor Sec 23
Alum Cap on Iron Pin
BAILEY
HEIGHTS
LAKE DR
CONDUIT
13kV UG
Power Line
NW1/4 NE1/4
SEC 23
BASIS OF BEARINGS:
Bearings are based on the N line of the NE 1/4 of Sec 23 being N89°59'18"E using NAD 83 State Plane Coordinates.
PLAN
SCALE 1" = 100'
℄ CONDUIT NO 200
Existing Roadway
Existing Ground Line
4'-6" Min.
12" Min. above
18" Min. below
PROFILE
NO SCALE
13kV UG
Power Line
enclosed in rigid steel
LEGEND
LICENSE GRANTED
BNDRY EXISTING DW ESMT
DOCUMENT DATED:
SEC'Y FILE DOC.
RIMS ITEM NO.
CARD NO.
DRN.
PM.
S.
APPD.
SHEET 1 OF 1 SHEET
CONDUIT NO 200
LICENSE GRANTED FOR 13kV UG POWER LINE TO XCEL ENERGY
DATE: JUNE 15, 2016
DENVER WATER
SCALE: AS SHOWN
CAD XXXXX–X_PMCT

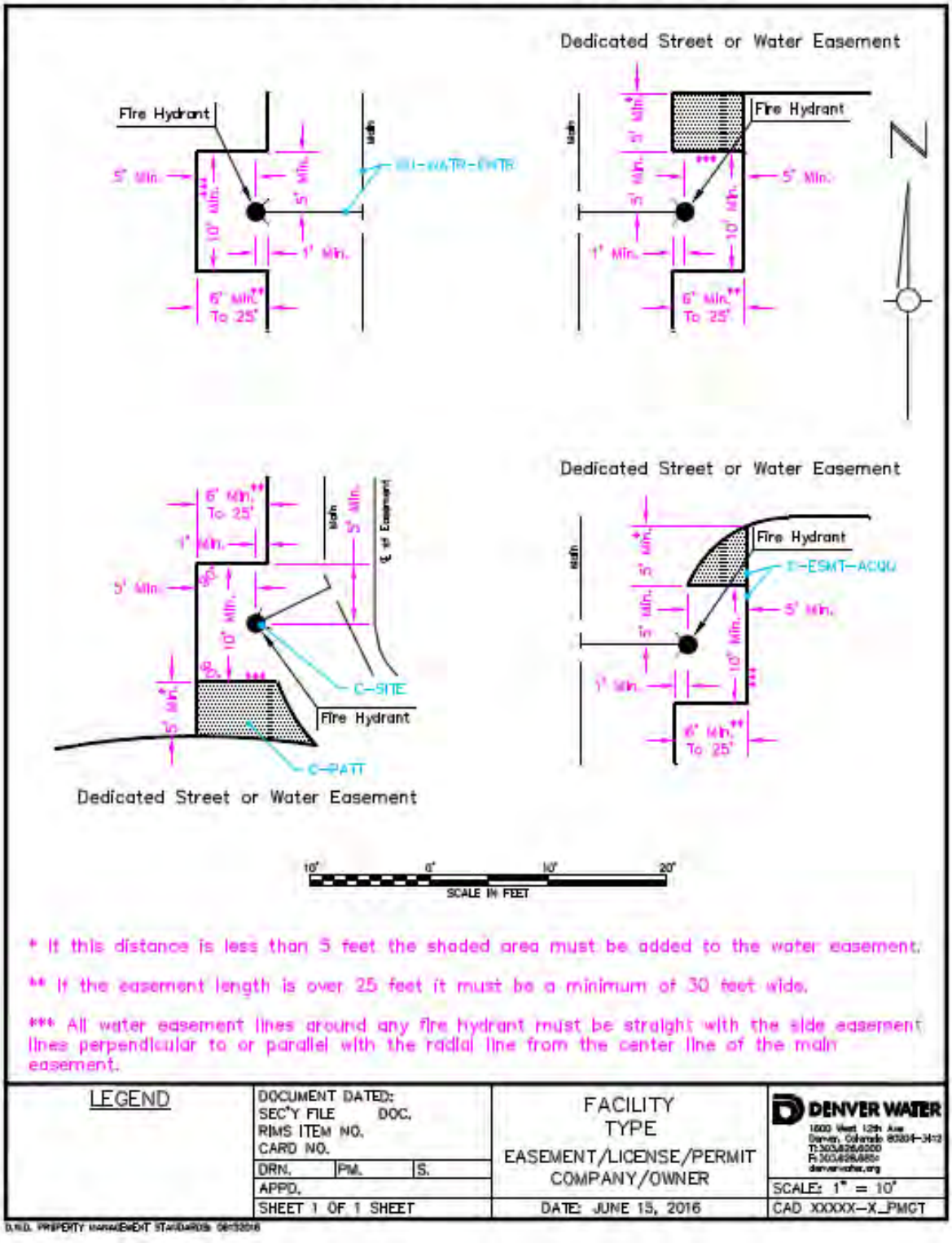

UNDERGROUND DITCH/CANAL CROSSING 4-06F
E 1/2 SECTION 31, TOWNSHIP 4 SOUTH, RANGE 66 WEST 6th PM
---- CITY AND COUNTY OF DENVER ----
N
Approximate HIGH LINE CANAL Sta at Crossing is from 1989+35 to 1990+00.
DARTMOUTH AVE
UNIVERSITY HILLS FILING NO 3
SW1/4 NE1/4 SEC 31
Point of Commencement Center of Sec 31 2 1/2" Alum Cap LS 12345
Point of Terminus
(Beginning Sta)
15" Sanitary Sewer
BLK 39
BLK 38
BLK 44
BLK 53
Point of Beginning
UNIVERSITY HILLS FILING NO 2
NW1/4 SE1/4 SEC 31
S EVELYN WAY
FOREST ST
S 1/4 Cor Sec 31 2 1/2" Alum Cap LS 12345
T 4 S
T 5 S
℄ HIGH LINE CANAL
Headgate No 123 Sta 1992+32.80
BASIS OF BEARINGS: Bearings are based on the W line of the SW 1/4 of Sec 31 between the S 1/4 Cor of Sec 31 and the Center of Sec 31 being N00°24'30"E using NAD 83 State Plane Coordinates.
PLAN
SCALE 1" = 100'
NOTE: Location and construction of the cutoff wall is to be determined by the Board's Inspector. For details see "DITCH OR CANAL CROSSING" DW DR 127 No 35 Sheet 14.
℄ HIGH LINE CANAL
High Water Line
Existing Ground Line
Existing Roadway
3' Min.
Patterned AR-CONC
10" Min. Concrete Cutoff Wall
Undisturbed Ground
1' Min.
Bottom of Excavation
15" Sanitary Sewer
PROFILE
NO SCALE
LEGEND
EASEMENT ACQUIRED
LICENSE GRANTED
ENDRY EXISTING DW PROP
DOCUMENT DATED:
SEC'Y FILE DOC.
RIMS ITEM NO.
CARD NO.
DRN. PM. S.
APPD.
SHEET 1 OF 1 SHEET
FACILITY TYPE
EASEMENT/LICENSE/PERMIT
COMPANY/OWNER
DATE JUNE 15, 2016
DENVER WATER
SCALE: AS SHOWN
CAD XXXXX-X_PMGT


CENTERLINE DESCRIPTION 4-06G
SE 1/4 SECTION 13, TOWNSHIP 5 SOUTH, RANGE 68 WEST 6th PM
SW 1/4 SECTION 18, TOWNSHIP 5 SOUTH, RANGE 67 WEST 6th PM
NW 1/4 SECTION 19, TOWNSHIP 5 SOUTH, RANGE 67 WEST 6th PM
---- CITY AND COUNTY OF DENVER ----
---- ARAPAHOE COUNTY ----
NW 1/4 Cor Sec 18
Brass Cap LS 12345
BASIS OF BEARINGS:
Bearings are based on the W line of the SW 1/4 of Sec 18 between DWD Brass Cap at the SW Cor and a Brass Cap in a Range Box at the NW Corner of Sec 18 being N00°06'48"E using NAD 83 State Plane Coordinates.
SE1/4 SE1/4 SEC 13
SW1/4 SW1/4 SEC 18
UNPLATTED
S COLORADO BLVD
MY
BLK 1
Lot 1
Lot 2
SUB
PT Sta 1549+40.16
Point of Terminus
Sta 1548+85.98
ORCHARD ROAD
Bridge and Roadway
S89°51'12"E
122.92'
Point of Beginning
Approximate HIGH LINE CANAL Sta at Crossing is from 1549+25 to 1548+50.
NW1/4 NW1/4 SEC 19
℄ HIGH LINE CANAL
PC Sta 1546+32.69
Point of Commencement
SW Cor Sec 18
2 1/2" Alum Cap
LS 12345
Δ=03°32'42"
R=833.53'
L=42.86'
Ch=S33°21'58"E
42.88'
11.86'
S89°51'12"E
PROPERTY OF DENVER WATER
SCALE IN FEET
LEGEND
AREA LICENSE GRANTED
BNDRY EXISTING DW ESMT
BNDRY EXISTING DW PROP
DOCUMENT DATED:
SEC'Y FILE DOC:
RIMS ITEM NO.
CARD NO.
DRN.
PM.
S.
APPD.
SHEET 1 OF 1 SHEET
HIGH LINE CANAL
LICENSE GRANTED FOR A BRIDGE AND ROADWAY TO ARAPAHOE COUNTY
DATE: JUNE 15, 2016
DENVER WATER
SCALE: 1" = 60'
CAD XXXXX-X_PMCT

SIMPLIFIED AREA 4–06H



FIRE HYDRANT EASEMENT 4–061



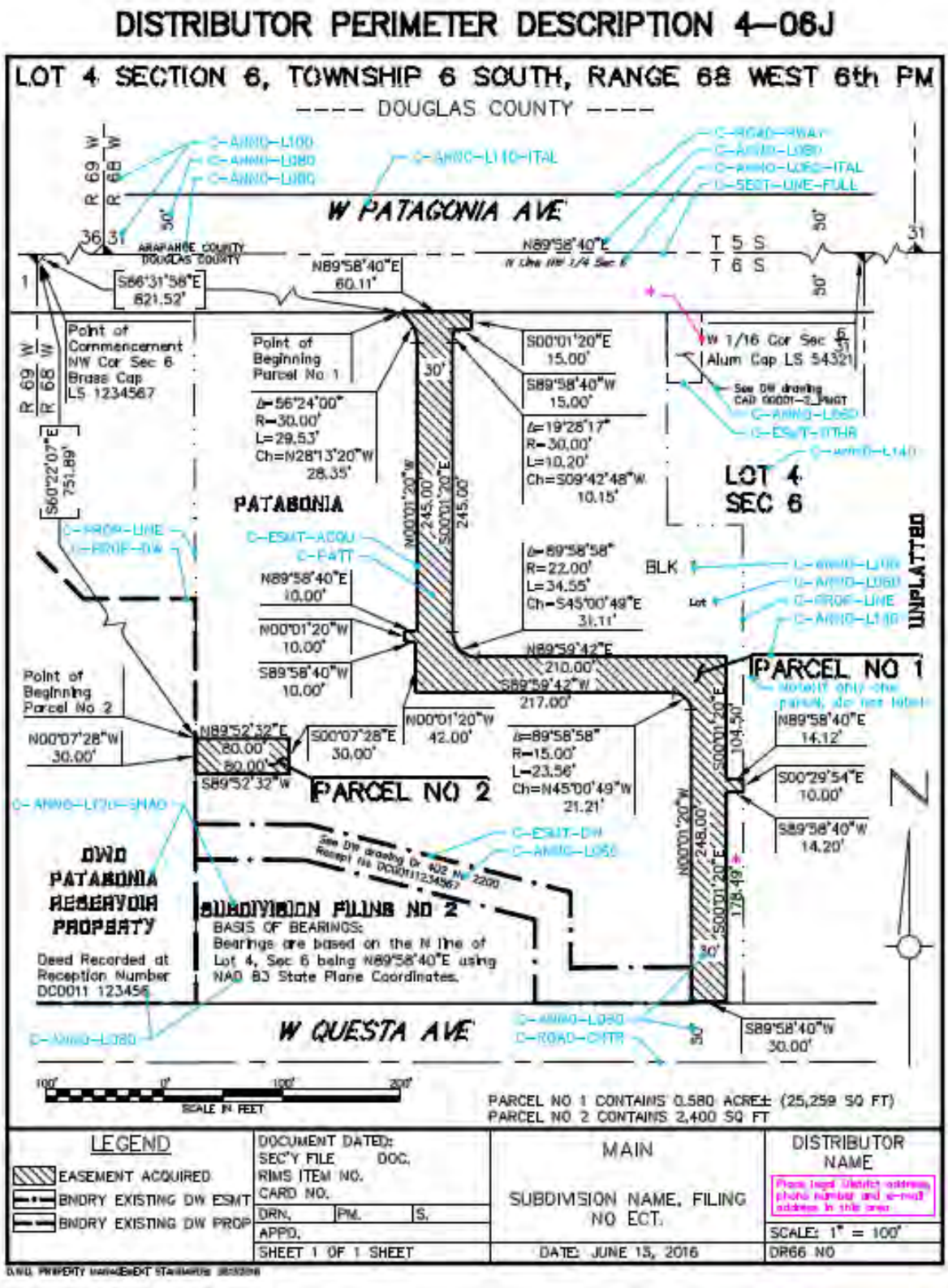
* If this distance is less than 5 feet the shaded area must be added to the water easement.

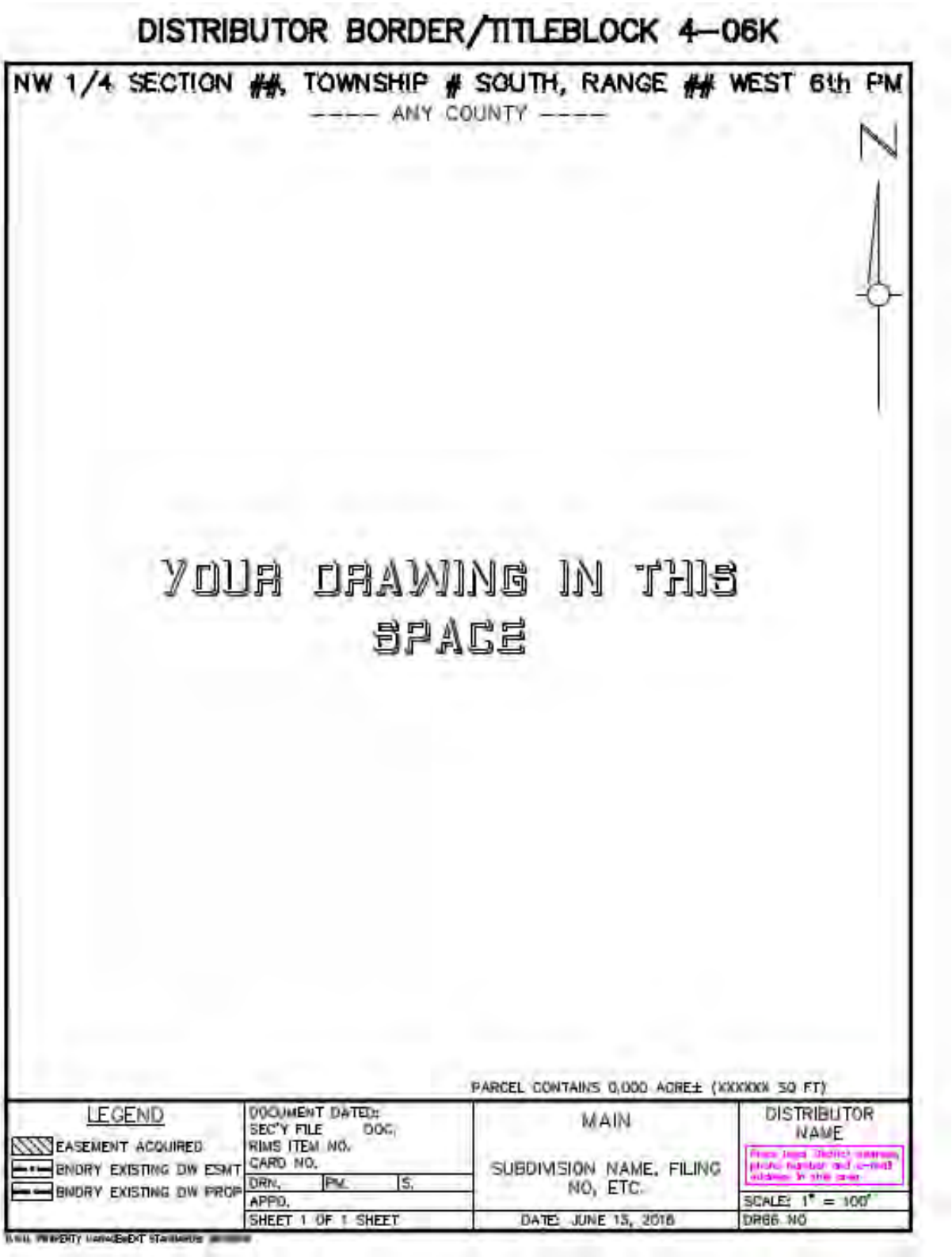
** If the easement length is over 25 feet it must be a minimum of 30 feet wide.

*** All water easement lines around any fire hydrant must be straight with the side easement lines perpendicular to or parallel with the radial line from the center line of the main easement.

LEGEND	DOCUMENT DATED: SEC'Y FILE DOC. RIMS ITEM NO. CARD NO.	FACILITY TYPE EASEMENT/LICENSE/PERMIT COMPANY/OWNER	DENVER WATER 1600 West 12th Ave Denver, Colorado 80204-3412 T: 303.628.6000 F: 303.628.6850 denverwater.org
	DRN. PM. S. APPD. SHEET 1 OF 1 SHEET	DATE: JUNE 15, 2016	SCALE: 1" = 10' CAD XXXXX-X_PMGT

D:\D. PROPERTY mana\EASEMENT STANDARDS 06132016


DISTRIBUTOR PERIMETER DESCRIPTION 4–06J
LOT 4 SECTION 6, TOWNSHIP 6 SOUTH, RANGE 68 WEST 6th PM
---- DOUGLAS COUNTY ----
W PATAGONIA AVE
W QUESTA AVE
ARAPAHOE COUNTY
DOUGLAS COUNTY
N89°58'40"E
60.11'
S86°31'58"E
621.52'
Point of Commencement NW Cor Sec 6 Brass Cap LS 1234567
S60°22'07"E
751.89'
Point of Beginning Parcel No 1
Δ=56°24'00"
R=30.00'
L=29.53'
Ch=N28°13'20"W
28.35'
S00°01'20"E
15.00'
S89°58'40"W
15.00'
Δ=19°28'17"
R=30.00'
L=10.20'
Ch=S09°42'48"W
10.15'
W 1/16 Cor Sec 6
Alum Cap LS 54321
LOT 4
SEC 6
PATAGONIA
N00°01'20"W
245.00'
S00°01'20"E
245.00'
30'
Δ=89°58'58"
R=22.00'
L=34.55'
Ch=S45°00'49"E
31.11'
BLK
Lot
N89°59'42"E
210.00'
S89°59'42"W
217.00'
N89°58'40"E
10.00'
N00°01'20"W
10.00'
S89°58'40"W
10.00'
Point of Beginning Parcel No 2
N00°07'28"W
30.00'
N89°52'32"E
20.00'
80.00'
S89°52'32"W
S00°07'28"E
30.00'
N00°01'20"W
42.00'
PARCEL NO 2
Δ=89°58'58"
R=15.00'
L=23.56'
Ch=N45°00'49"W
21.21'
PARCEL NO 1
N89°58'40"E
14.12'
S00°29'54"E
10.00'
S89°58'40"W
14.20'
S00°01'20"E
104.50'
N00°01'20"W
248.00'
S00°01'20"E
128.49'
DWD PATAGONIA RESERVOIR PROPERTY
Deed Recorded at Reception Number DC0011 123456
SUBDIVISION FILING NO 2
BASIS OF BEARINGS:
Bearings are based on the N line of Lot 4, Sec 6 being N89°58'40"E using NAD 83 State Plane Coordinates.
S89°58'40"W
30.00'
100' 0' 100' 200'
SCALE IN FEET
PARCEL NO 1 CONTAINS 0.580 ACRE± (25,259 SQ FT)
PARCEL NO 2 CONTAINS 2,400 SQ FT
LEGEND
EASEMENT ACQUIRED
BNDRY EXISTING DW ESMT
BNDRY EXISTING DW PROP
DOCUMENT DATED:
SEC'Y FILE DOC.
RIMS ITEM NO.
CARD NO.
DRN. PM. S.
APPD.
SHEET 1 OF 1 SHEET
MAIN
SUBDIVISION NAME, FILING NO ECT.
DATE: JUNE 15, 2016
DISTRIBUTOR NAME
SCALE: 1" = 100'
DR66 NO


DISTRIBUTOR BORDER/TITLEBLOCK 4–06K
NW 1/4 SECTION ##, TOWNSHIP # SOUTH, RANGE ## WEST 6th PM
ANY COUNTY
N
YOUR DRAWING IN THIS SPACE
PARCEL CONTAINS 0.000 ACRE± (XXXXXX SQ FT)
LEGEND
EASEMENT ACQUIRED
BNDRY EXISTING DW ESMT
BNDRY EXISTING DW PROP
DOCUMENT DATED:
SEC'Y FILE DOC.
RIMS ITEM NO.
CARD NO.
DRN.
PM.
S.
APPD.
SHEET 1 OF 1 SHEET
MAIN
SUBDIVISION NAME, FILING NO, ETC.
DATE: JUNE 15, 2016
DISTRIBUTOR NAME
SCALE: 1" = 100'
DRGS NO

Section 5.3

Capital Projects Example

Overview - Section 5.3

This section outlines how Denver Water's Capital Project drawings should appear.

- Survey Control
- Plan & Profile
- Plan, Profile & Sections
- Architectural & Structural Dimensioning
- Mechanical Dimensioning

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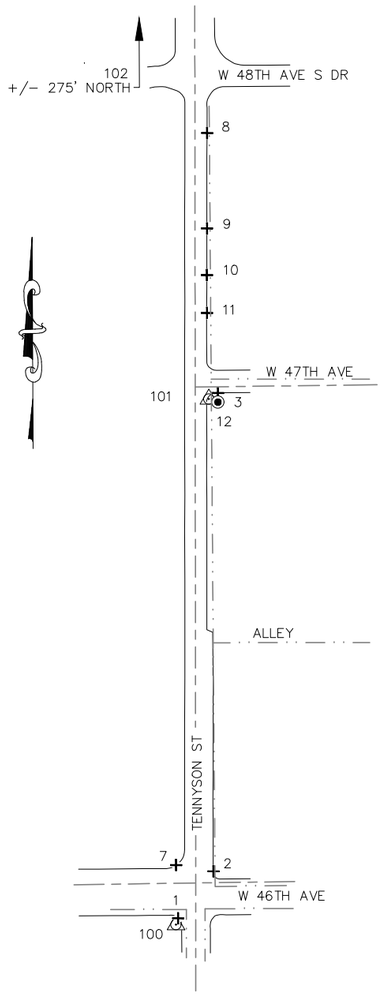
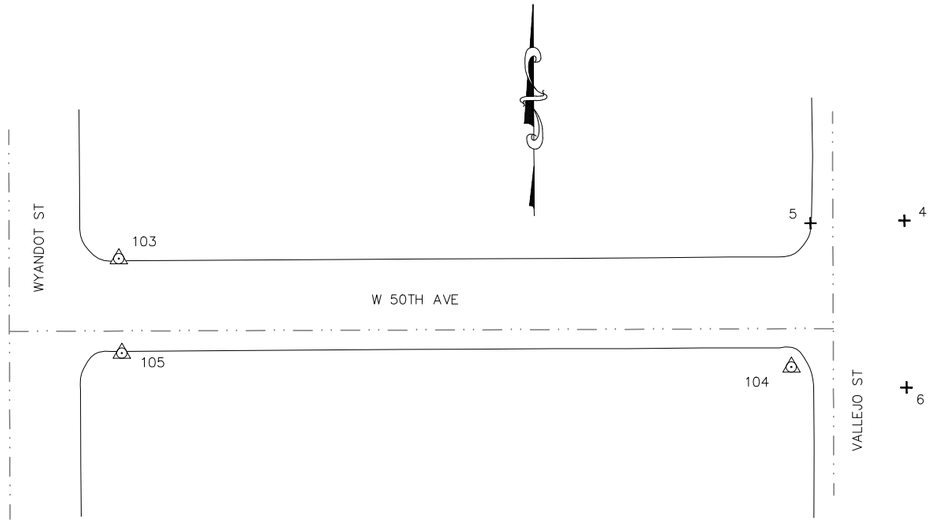


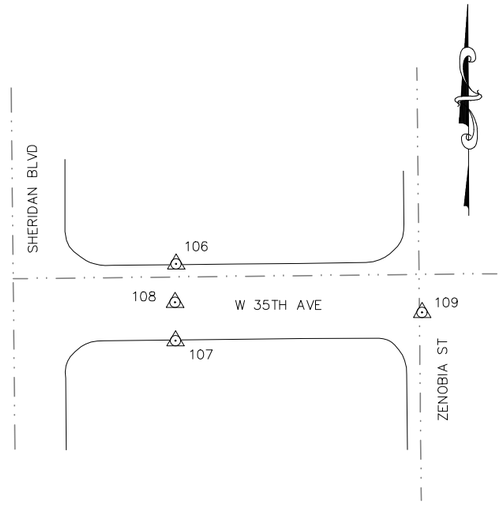
TENNYSON ST & W 47TH AVE

SCALE: 1" = 100'



W 50TH AVE & WYANDOT ST

SCALE: 1" = 30'



W 35TH AVE & SHERIDAN BLVD

SCALE: 1" = 30'

LEGEND:

- CONTROL POINT
- FOUND CHISELED "+"
- FOUND 1 1/2" PLASTIC CAP
- RANGE LINE
- SECTION LINE

FOUND SURVEY MARKERS

POINT	NORTHING	EASTING	DESCRIPTION
1	109364.57	128302.00	FOUND CHISELED CROSS
2	109426.53	128348.67	FOUND CHISELED CROSS
3	110057.70	128354.68	FOUND CHISELED CROSS
4	112098.87	136886.47	FOUND CHISELED CROSS
5	112097.85	136849.29	FOUND CHISELED CROSS
6	112032.83	136887.29	FOUND CHISELED CROSS
7	109434.85	128299.27	FOUND CHISELED CROSS
8	110400.87	128340.25	FOUND CHISELED CROSS
9	110274.90	128340.20	FOUND CHISELED CROSS
10	110213.37	128340.02	FOUND CHISELED CROSS
11	110163.41	128340.06	FOUND CHISELED CROSS
12	110045.69	128354.68	FOUND 1 1/2" PLASTIC CAP STAMPED "MILLER E&S"

SURVEY PROJECT CONTROL

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
100	109356.08	128299.24	5376.91	1/2" SHINER IN SIDEWALK ON THE SOUTHWEST CORNER OF TENNYSON ST AND W 46TH AVE
101	110049.66	128342.62	5367.38	CROWS FOOT CHISELED IN SIDEWALK ON THE SOUTHEAST CORNER OF TENNYSON AND W 47TH AVE
102	110749.07	128303.49	5358.64	1 1/2" ALUMINUM CAP ON THE NORTHWEST SIDE OF TENNYSON ST AND W 48TH AVE
103	112083.80	136575.48	5305.72	CHISELED "X" IN BACK OF CURB ON THE NORTHEAST CORNER OF W 50TH AVE AND WYANDOT ST
104	112040.95	136841.76	5298.37	3\4" COPPER PLUG ON THE SOUTHWEST CORNER OF W 50TH AVE AND VALLEJO ST
105	112046.37	136576.68	5305.76	CHISELED "X" IN BACK OF CURB ON THE SOUTHEAST CORNER OF W 50TH AVE AND WYANDOT ST
106	104110.00	125814.79	5455.35	CHISELED "X" IN BACK OF CURB ON THE NORTH SIDE OF W 35TH AVE BETWEEN SHERIDAN BLVD AND ZENOBIA ST
107	104079.65	125814.54	5455.77	CHISELED "X" IN BACK OF CURB ON THE SOUTH SIDE OF W 35TH AVE BETWEEN SHERIDAN BLVD AND ZENOBIA ST
108	104094.83	125814.35	5455.89	CHISELED "+"IN NORTH EDGE OF MANHOLE RIM LOCATED ALONG 35TH AVE BETWEEN SHERIDAN BLVD AND ZENOBIA ST
109	104090.78	125912.14	5456.23	CHISELED "+"IN NORTH EDGE OF MANHOLE RIM LOCATED AT THE INTERSECTION OF 35TH AVE AND ZENOBIA ST

NOTES:

THIS PROJECT IS ON A MODIFIED COLORADO STATE PLANE CENTRAL ZONE COORDINATE SYSTEM, NAD 83

GRID NAME: DW_METRO_GRID
TRUNCATION NORTH: 1600030
TRUNCATION EAST: 2999880
COMBINED FACTOR: 1.00026
UNITS: US SURVEY FEET

TO CONVERT FROM STATE PLANE COORDINATES TO DW_METRO_GRID COORDINATES:
GRID NORTH = (SP NORTH −1600030)*1.00026
GRID EAST = (SP EAST −2999880)*1.00026

VERTICAL DATUM: THE PUBLISHED ELEVATIONS SHOWN ARE ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
−W 35TH AVE & SHERIDAN BLVD ELEVATIONS ARE BASED ON THE CITY & COUNTY OF DENVER BENCHMARK 110A
−W 50TH AVE & WYANDOT ST ELEVATIONS ARE BASED ON THE CITY & COUNTY OF DENVER BENCHMARK VM_11
−TENNYSON ST & W 47TH AVE ELEVATIONS ARE BASED ON THE CITY & COUNTY OF DENVER BENCHMARK 479B

— INDICATES DRAFTER INPUT REQUIRED

DW−2016 C3D Template.dwt

DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204−3412
T: 303.628.6000
F: 303.628.6851
denverwater.org

CONSULTANT

DENVER WATER ENGINEERING − DESIGN DRAFTING

DRAFTING STANDARDS FOR CAPTIAL PROJECTS

REFERENCE:
CAPITAL PROJECTS
CONSTRUCTION STANDARDS 2014
www.denverwater.org
/DoingBusinesswithUs/EngineeringOverview/CPCS

THIS DRAWING IS BASED ON THE COORDINATE SYSTEM

No	Date	Description
		90% REVIEW
		60% REVIEW
		30% REVIEW

REVISIONS

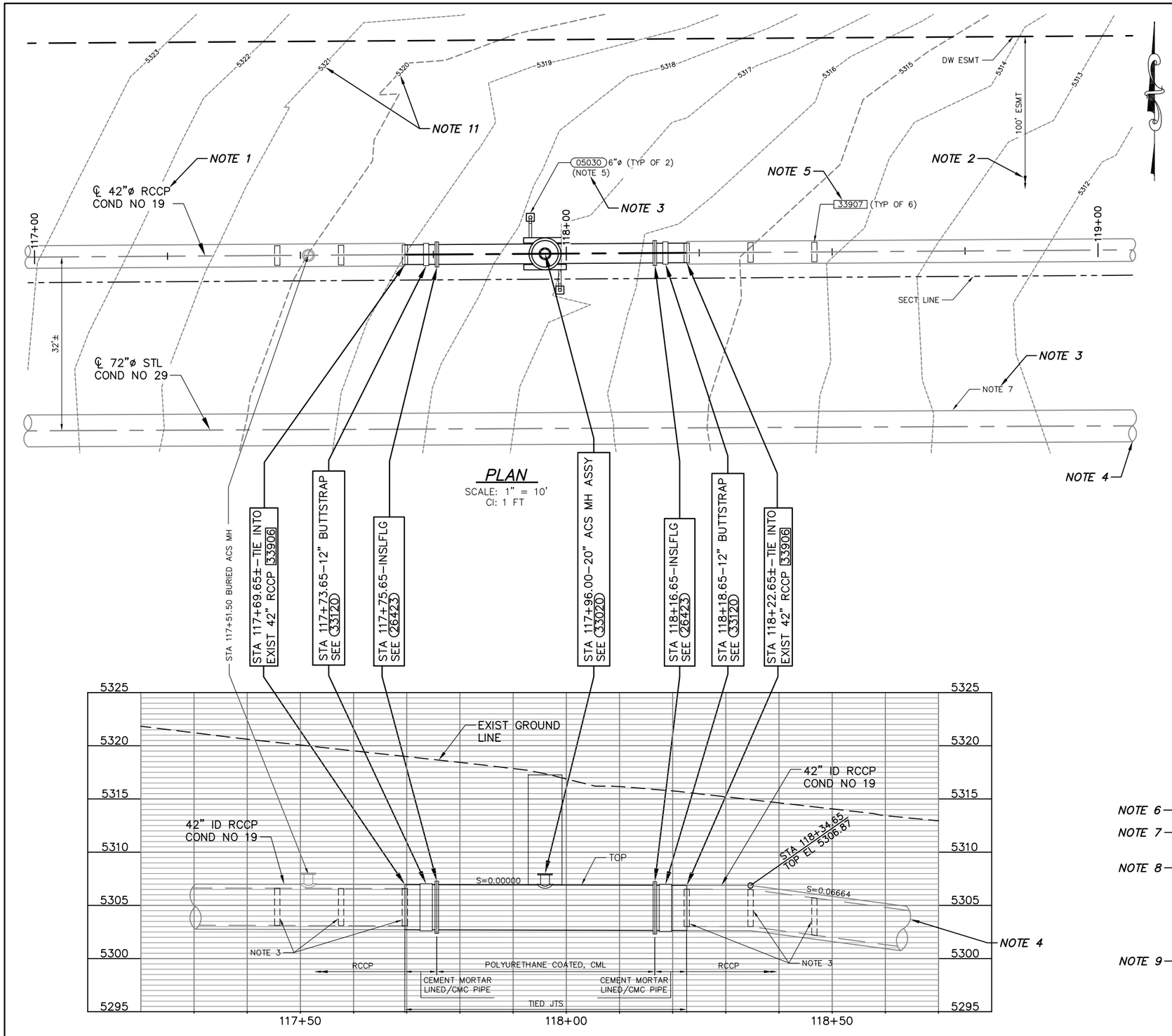
VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PT NO: *"PROVIDED BY DPM"*
DRAWN BY: *"DRAFTER'S LAST NAME"*
CHKD BY: *"SURVEYOR'S LAST NAME"*
CHKD BY: *"ENGINEERING MANAGER LAST NAME"*
APPD BY:
DATE: *"MONTH 4−DIGIT YEAR"*
CONTRACT: *"PROVIDED BY DPM"*
AS−BUILT DATE:
AS−BUILT BY:

DRAWING TITLE

CAPITAL PROJECTS SURVEY CONTROL



PLAN
SCALE: 1" = 10'
CI: 1 FT

PROFILE
SCALE: 1" = 10' HORIZ
1" = 5' VERT

INSTRUCTION NOTES:

1. EXISTING CONDUIT CENTERLINE CALLOUTS USE L140 TEXT. CREATED ON A CORRESPONDING ANNOTATION LAYER, FOR EXAMPLE: "G–ANNO–L140". NEW CONDUIT CENTERLINE CALLOUTS USE L175 TEXT CREATED ON A CORRESPONDING ANNOTATION LAYER.
2. DOUBLE ARROWHEADS TO INDICATE THAT THE DIMENSION CONTINUES AND THE TERMINATING END IS NOT SHOWN.
3. STAND ALONE REFERENCE NOTES DO NOT USE PARENTHESIS. REFERENCE NOTES THAT ACCOMPANY CALLOUTS USE PARENTHESIS.
4. PIPE END BREAK SYMBOL REQUIRED FOR ALL PIPES, THE HALF–HEIGHT SHALL BE ø/2 AND THE WIDTH SHALL BE ø/8.
5. BLOCK NAME IS "CPCS Detail callouts". VISIBILITY STATE IS SET TO "Revised" BECAUSE THE DETAIL IS INCLUDED WITHIN THE SUBJECT PLAN SET (DETAIL NOT INCLUDED IN THIS EXAMPLE DRAWING SET).
6. MULTITEXT OBJECT CREATED ON AN L120 ANNOTATION LAYER, FOR EXAMPLE: "G–ANNO–L120". THE TEXT HEIGHT AND COLOR OF "NOTES:" IS MODIFIED USING THE MULTITEXT EDITOR. THE SETTINGS ARE MODIFIED TO 0.14 AND COLOR PEN 23 RESPECTIVELY. GENERALLY, NOTES ARE PLACED IN THE LOWER RIGHT HAND CORNER OF THE SHEET.
7. THERE ARE TWO CARRIAGE RETURNS FOLLOWING "NOTES:".
8. ONE SPACE INDENT SET BEFORE THE NUMBERED BULLET AND A TWO SPACE INDENT SET AFTER THE NUMBERED BULLET.
9. USE A HYPHEN WHEN DESCRIBING A UNIT OF MEASURE IN NOTES ONLY (NOT KEYED NOTES OR IN PLAN VIEW CALLOUTS)
10. AMPERSAND SHALL ONLY BE USED WHEN THE DRAWING TITLE IS TOO LONG TO OTHERWISE FIT IN THE TITLE BLOCK SPACE.
11. CONTOUR LABELING SHALL USE THE DW TEMPLATE STYLE OF "MAJOR LABELS" AND "MINOR LABELS".
12. DATES IN TITLE BLOCK SHOULD BE ENTERED THRU SSM, IN THE SET MANAGER NOT THE SHEET MANAGER, USE MM/DD/YR FORMAT, DO NOT ADD LEADING ZEROS.

– INDICATES DRAFTER INPUT REQUIRED

NOTE 12

NOTE 6
NOTE 7
NOTE 8

NOTES:

1. ADJUST STARTING AND ENDING STATIONS BASED ON LOCATION OF CONCRETE PIPE JOINTS.
2. PIPE SHALL BE LAID AT EVEN SLOPE BETWEEN TIE–IN POINTS.
3. INSTALL INTERNAL SEALS AT EACH STEEL TO CONCRETE PIPE JOINT AND 2 CONCRETE JOINTS BEYOND (TOTAL = 6). ASSUMED JOINT SPACING IS 12–FEET.
4. DO NOT STOCKPILE EQUIPMENT OR MATERIALS ON CONDUITS NUMBER 19 OR 29.
5. SITE CONTAINS HIGH METHANE LEVELS. MONITOR GAS LEVELS AND USE APPROPRIATE SAFETY PROCEDURES. VENT PIPES ADDED FOR MANHOLE VENTILATION.
6. ENGINEER TO COORDINATE WITH OWNER TO ADD REFERENCE MARKINGS TO VENT POST AFTER IT IS PAINTED.

NOTE 9

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1600 West 12th Ave
Denver, Colorado 80204–3412
T: 303.628.6000
F: 303.628.6851
denverwater.org

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REVISIONS

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CHKD BY: *"ENGINEER'S LAST NAME"*
"ENGINEERING MANAGER LAST NAME"
CHKD BY:
APPD BY:
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CAPITAL PROJECTS CIVIL PLAN AND PROFILE – 1

NOTE 10

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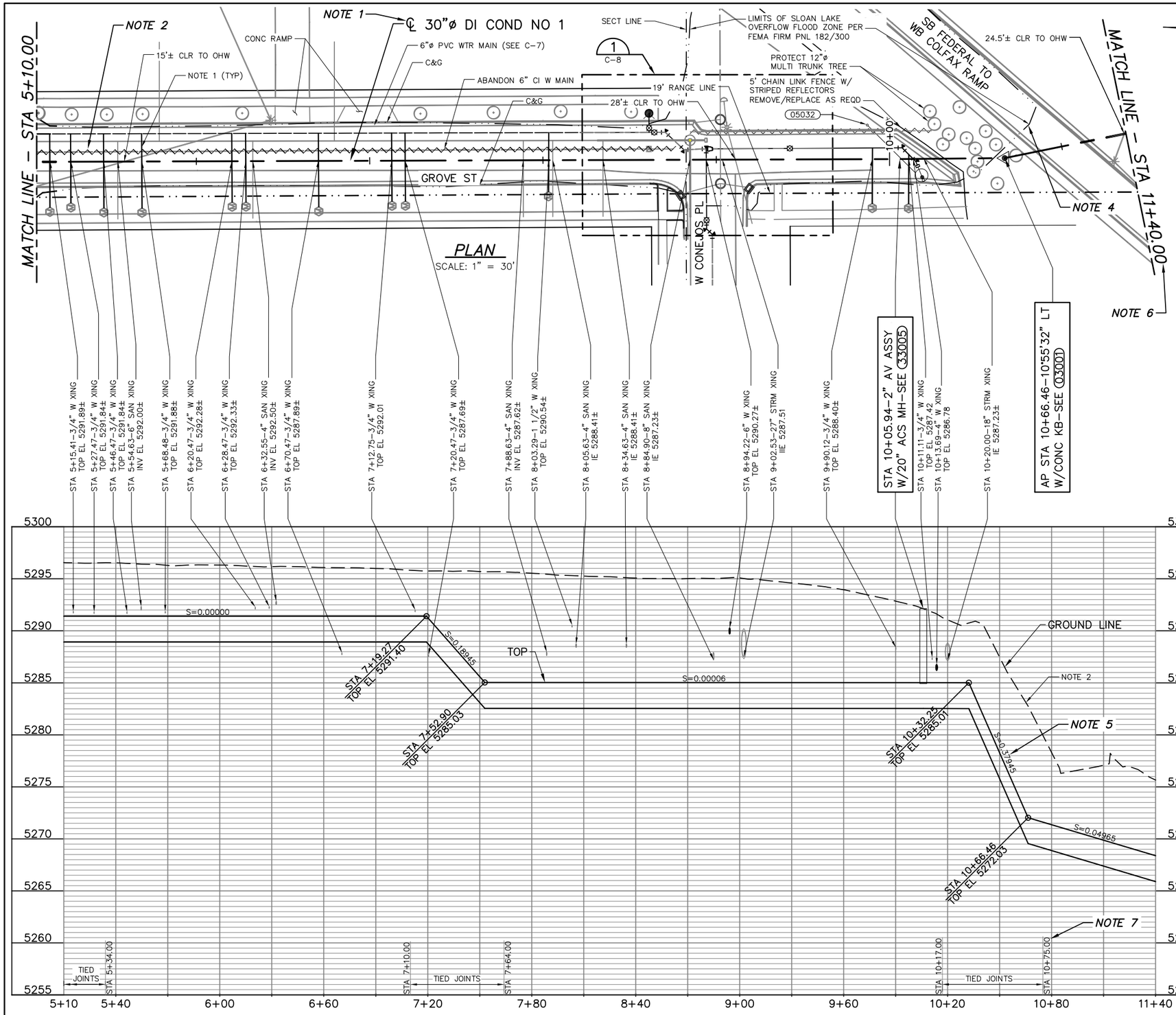

PROFILE

SCALE: 1" = 30' HORIZ
1" = 5' VERT

INSTRUCTION NOTES:

1. NEW CONDUIT INSTALLATION CALLOUT IS A MULTILEADER, STYLE L175 CREATED ON LAYER "C–ANNO–L175", LAYER COLOR PEN 204.
2. "ZIGZAG" HATCH PATTERN OR LINETYPE INDICATES ABANDONED UTILITY PER CPCS (01010). CREATED ON LAYER "G–PATT". NOTE 3
3. BLOCK NAME IS "CPCS Detail callouts". SCALE THE BLOCK BY A FACTOR OF 1.2, WHEN USED IN NOTES (AS SHOWN).
4. FLOOD ZONE LIMITS CREATED ON LAYER "V–FLHA" (SURVEY: FLOOD HAZARD), LINE TYPE "RIVER2", COLOR PEN 133.
5. PIPE LABEL STYLE "Conduit Slope". NO NEGATIVE SLOPES ALLOWED. USE A TEXT OBJECT IN LIEU OF A "Conduit Slope" PIPE LABEL FOR SLOPE LABELS THAT ARE NEGATIVE.
6. BLOCK NAME IS "DW MATCHLINE" RESIDES ON LAYER "C–ANNO–MATC". CREATE MATCH LINES ON A EVEN STATION THAT CORRESPONDS TO THE MAJOR GRID STATION ON THE PROFILE.
7. PROFILE LABEL STYLE "Tied Joints Right".

– *INDICATES DRAFTER INPUT REQUIRED*

NOTES:

1. REPLACE EXISTING SERVICE TO METER PIT WITH COPPER PIPE, SIZE AS SHOWN. EXTEND TO NEW MAIN AS REQUIRED PER DENVER WATER ENGINEERING STANDARD SHEET 54. NEW SERVICES TO EXTEND OVER CONDUIT WITH MINIMUM SEPARATION OF 6–INCHES.
2. SLOPE STABILIZATION WITH EROSION CONTROL BLANKET REQUIRED FOR RESTORATION.
3. SEE DRAWING G–4 FOR REQUIRED CATHODIC PROTECTION.
4. REMOVE VEGETATION ON SLOPE AS NECESSARY.
5. FROM STATION 10+20 TO STATION 15+30, LIMIT WORK AREA TO 50–FEET ON EITHER SIDE OF CENTERLINE OF PIPE.

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Denver, Colorado 80204–3412
T: 303.628.6000
F: 303.628.6851
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CAPITAL PROJECTS CIVIL PLAN AND PROFILE – 2

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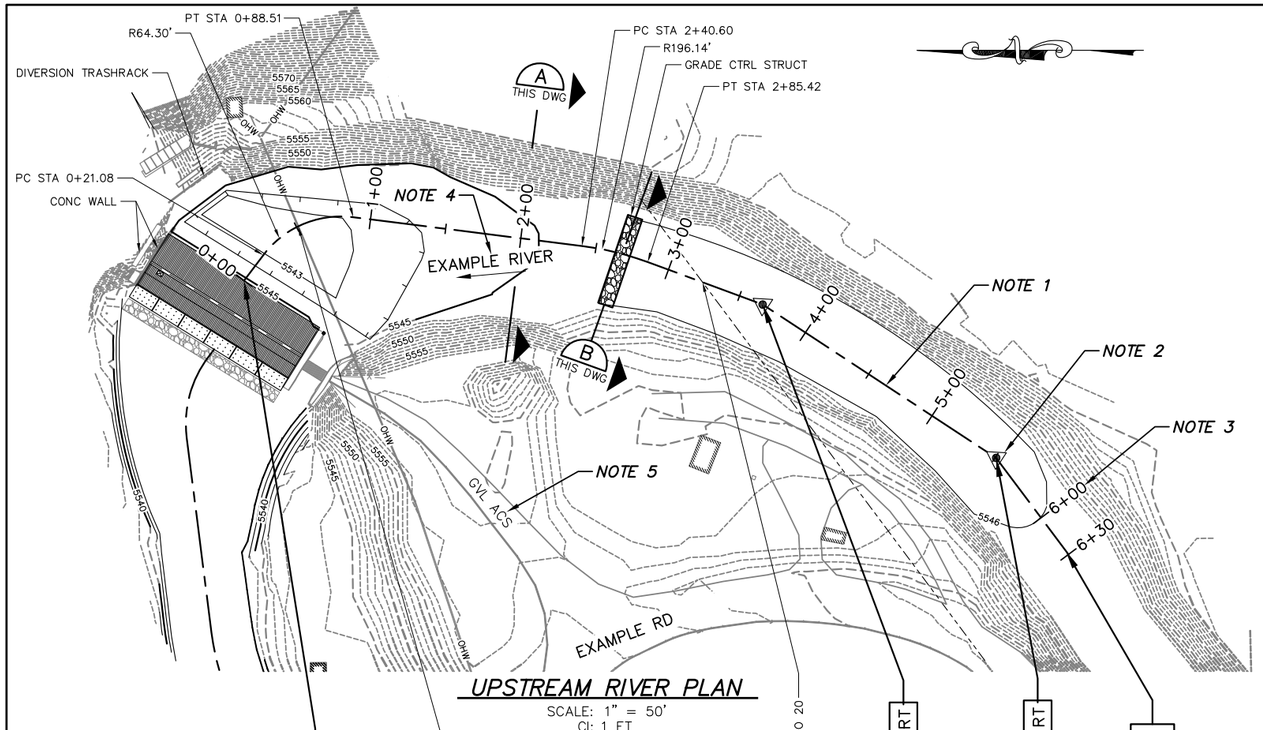
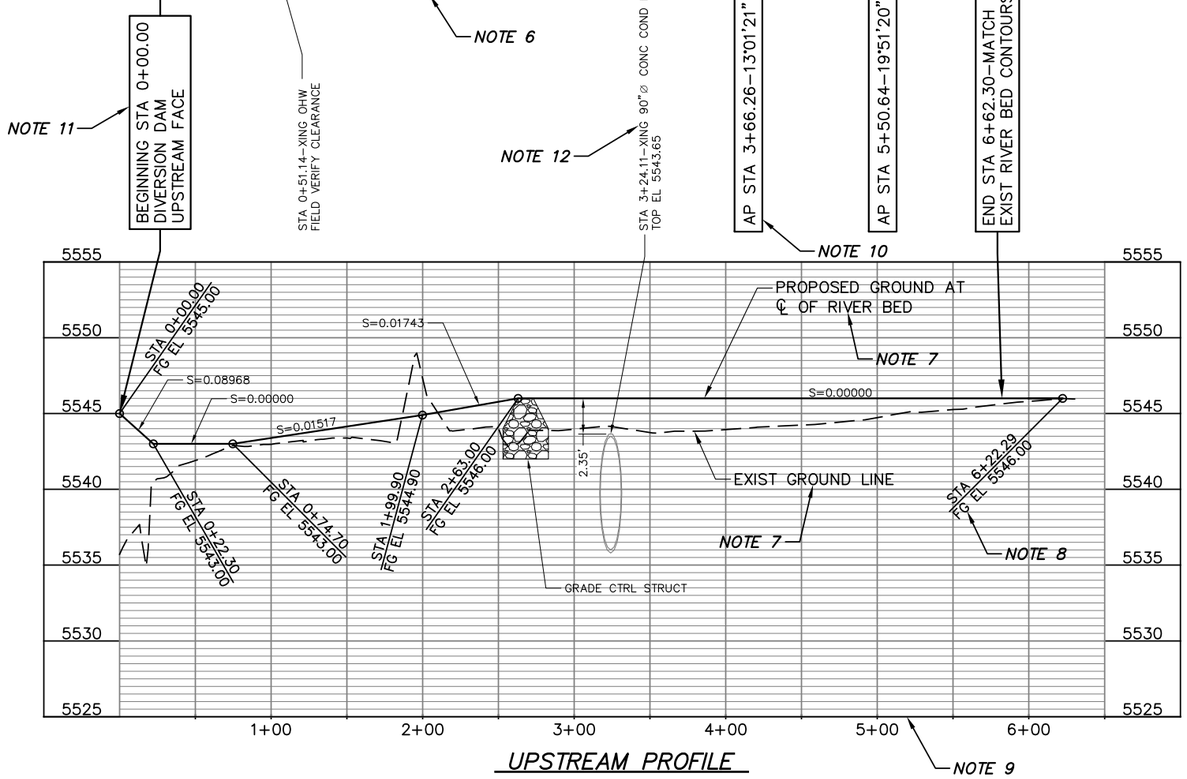


UPSTREAM RIVER PLAN

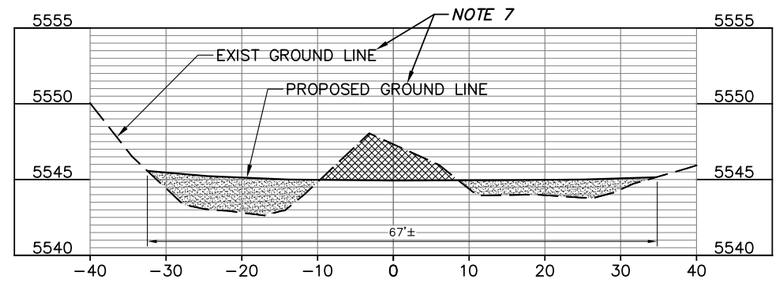
SCALE: 1" = 50'
CI: 1 FT

NOTE 6



UPSTREAM PROFILE

SCALE: 1" = 50' HORIZ
1" = 5' VERT



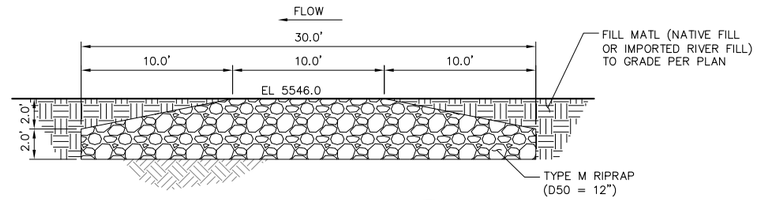
STA 2+00 (A THIS DWG)

SCALE: 1" = 10' HORIZ
1" = 5' VERT

NOTE 13

LEGEND:

- REQUIRED FILL AREA
- REQUIRED EXCAVATION AREA



SECTION (B THIS DWG)

SCALE: 1" = 5'

INSTRUCTION NOTES:

1. CENTERLINE ALIGNMENT DISPLAYED ON LAYER "CU–WATR–CNTR".
2. BLOCK NAME "DW_Bend Conduit", INSERTED AT ANGLE POINTS ALONG THE ALIGNMENT. INSERT THE BLOCK ON LAYER "C–ANNO–MARK" OR "G–ANNO–SYMB".
3. MAJOR STATION LABEL STYLE IS "Perpendicular with Tick". SET THE BACKGROUND MASK TO "TRUE" WHEN STATIONS APPEAR ON TOP OF LINE WORK.
4. "EXAMPLE RIVER" IS A PROPER NOUN FOR THIS EXAMPLE. L140 TEXT STYLE SIZE IS USED FOR ALL PROPER NOUNS IN PLAN VIEW. THE LAYER IS "C–ANNO–L140" WHICH CORRESPONDS TO THE TEXT OBJECT STYLE.
5. TEXT OBJECT STYLE IS L120. THIS SIZE IS USED TO IDENTIFY GENERAL INFORMATION ABOUT THE PLAN THAT IS SIGNIFICANT TO THE PLAN USER BUT NOT SPECIFICALLY RELATED TO THE DESIGN FEATURES. OTHER EXAMPLES OF GENERAL INFORMATION IS "DW ℄", OR "HYDROELECTRIC POWERHOUSE" (NOT INCLUDED IN THIS EXAMPLE PLAN VIEW).
6. THE "CONTOUR INTERVAL" VISIBILITY STATE OF THE BLOCK "PLAN Title" IS TOGGLED ON AND THE CONTOUR INTERVAL FIELD IS POPULATED WITH THE CORRESPONDING PLAN VIEW INTERVAL VALUE, IN THIS CASE "1 FT".
7. EXISTING AND PROPOSED GROUND LINE CALLOUTS ARE CREATED USING L140 MULTILEADER STYLES, ON PROFILES WITH GRID AND SECTIONS WITH GRID. THE CALLOUT IS CREATED ON LAYER "C–ANNO–L140". ADDING "EXISTING" TO "GROUND LINE" IS ONLY REQUIRED WHEN A "PROPOSED" GROUND LINE IS BEING SHOWN WITHIN THE SAME PROFILE THAT THE EXISTING GROUND LINE IS BEING SHOWN.
8. PROFILE VIEW LABEL STYLE "Engineering Profile Labels Pipes [Left]". THIS LABEL IS MOST COMMONLY USED FOR "TOP" (TOP OF PIPE) CALLOUTS. IN THIS CASE THE "Edit Label Text" COMMAND WAS USED TO CHANGE THE DEFAULT "TOP" TO "FG" (FINISH GRADE) WITHIN THE LABEL. THE MARKER STYLE IS SET TO "Profile Marker", WHICH CREATES A CIRCLE AT THE ANCHOR POINT OF THE LABEL.
9. PROFILE VIEW STYLE IS "50 Scale Left to Right". THE PROFILE HORIZONTAL SCALE MUST MATCH THE PLAN VIEW SCALE. MAJOR GRID LINES ARE SPACED AT 1 PER INCH, VERTICALLY AND HORIZONTALLY.
10. PROFILE VIEW LABEL STYLE "Angle Point". THE PLAN VIEW LEADER IS CREATED IN PAPER SPACE ON LAYER "G–ANNO–L175", WITH AN ARROWHEAD SIZE OF 0.25 AND PEN 4 LINE WEIGHT.
11. PROFILE VIEW LABEL STYLE "Beginning" CREATED IN MODEL SPACE. THE PROFILE LEADER IS CREATED IN MODEL SPACE ON LAYER "G–ANNO–L175" WITH AN ARROWHEAD SIZE OF 0.25. THE PLAN VIEW LEADER IS CREATED IN PAPER SPACE ON THE SAME LAYER AS THE PROFILE LEADER.
12. PROFILE VIEW LABEL STYLE "Design Labels [Interference]" USED TO IDENTIFY UTILITIES AND STRUCTURES THAT CROSS THE PROFILE SUBJECT ALIGNMENT. THE PROFILE VIEW LABEL AND THE PROFILE LEADER ARE CREATED IN MODEL SPACE ON LAYER "C–ANNO–DIMS" WITH AN ARROWHEAD SIZE OF 0.125. THE PLAN VIEW LEADER IS CREATED IN PAPER SPACE ON THE SAME LAYER AS THE PROFILE LEADER.
13. ALIGNMENT SAMPLE LINE SECTION TITLE CREATED USING BLOCK NAME "Section or Detail Title – scale". THE HORIZONTAL AND VERTICAL SCALE ARE CREATED USING MULTI–TEXT.

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1600 West 12th Ave
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T: 303.628.6000
F: 303.628.6851
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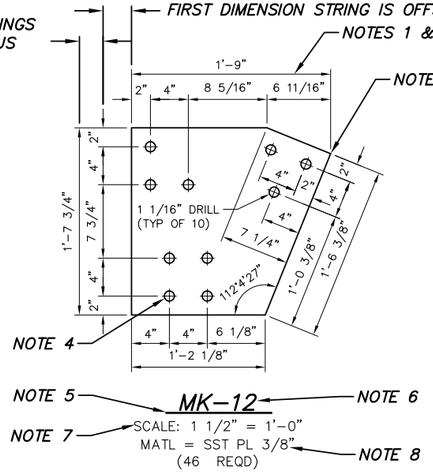
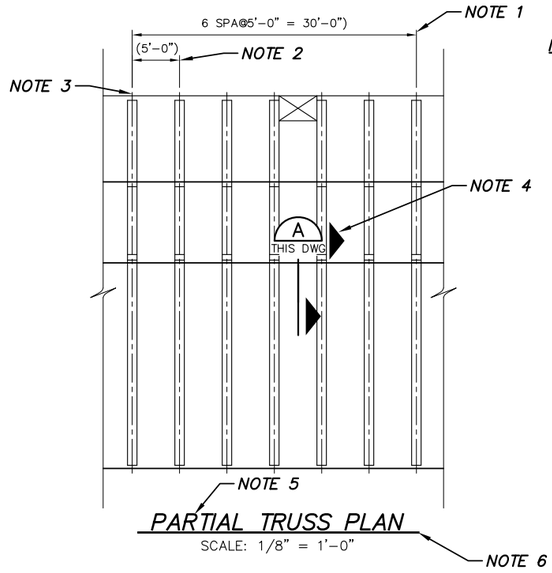
CAPITAL PROJECTS CIVIL PLAN, PROFILE AND SECTIONS

SECOND AND ALL SUCCESSIVE DIMENSION STRINGS ARE OFFSET 5/16" FROM FIRST OR PREVIOUS DIMENSION STRING



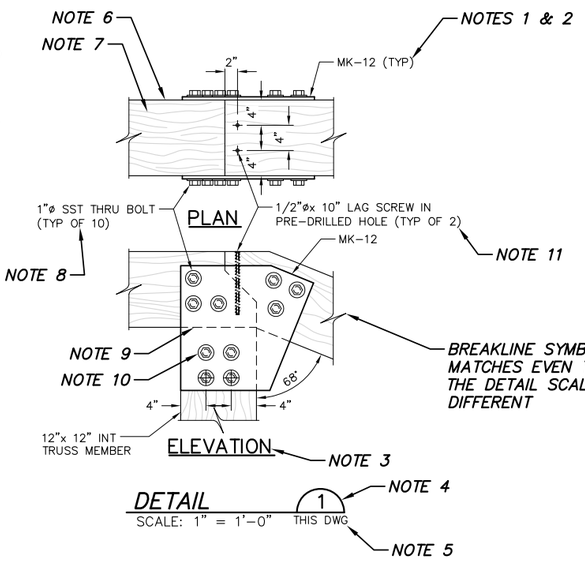
INSTRUCTION NOTES:

1. DIMENSION STYLE USED IS "L100 – nearest 32nd". ALL LINE WORK, TEXT OBJECTS, AND SUBJECT GRAPHICS CREATED IN MODEL SPACE.
2. DIMENSIONING IS CREATED ON LAYER "S–ANNO–DIMS". THE DISCIPLINE DESIGNATION IN THE LAYER NAME VARIES (I.E. "M–ANNO–DIMS").
3. DETAIL SUBJECT GRAPHICS CREATED ON LAYER "S–DETL–METL" (STRUCTURAL: DETAIL: METAL).
4. CIRCLES (DRILLED HOLE) HAS CENTER LINES ALONG THE X AND Y AXES, DRAWN ON LAYER "S–ANNO–DIMS–CNTR", PEN 31, "CENTER4" LINE TYPE. THE CENTERLINES EXTEND PAST THE LIMIT OF THE CIRCLE TO A DISTANCE THAT IS LEGIBLE AND LOGICAL.
5. BLOCK NAME IS "PLAN title". INSERTION UNITS IS "FEET"(2), INSERTED IN PAPER SPACE AND MAY BE MOVED INTO MODEL SPACE THROUGH THE VIEWPORT USING THE "CHSPACE" COMMAND. THE PLAN TITLE HAS 1 LEADING AND 1 TRAILING UNDERLINED SPACE. TO CREATE THE UNDERLINE SPACE, HOLD THE "Alt" KEY AND TYPE "0160".
6. THE DETAIL IS A MARK ("MK") NUMBERED DETAIL, IDENTIFIED IN SEVERAL OTHER DETAILS WITHIN THE PLAN SET BUT NOT ALWAYS SHOWN EXACTLY AS REPRESENTED IN THIS VIEW. MARK NUMBERS, DETAIL NUMBERS, SECTION ALPHABETIC CHARACTERS, AND CPCS NUMBERS SHOULD APPEAR IN ASCENDING ORDER FROM LEFT TO RIGHT AND TOP TO BOTTOM.
7. THE SCALE IS IN ARCHITECTURAL UNITS, FEET AND INCHES.
8. MULTI–TEXT L120 CENTER JUSTIFIED.



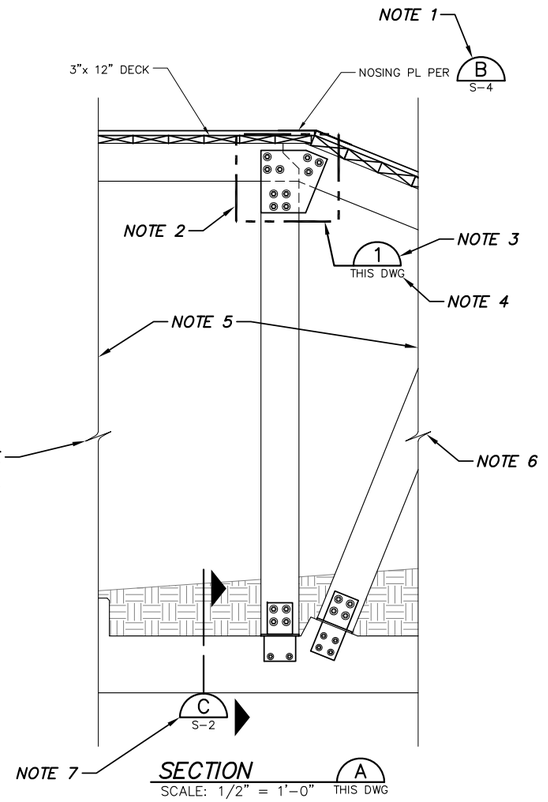
INSTRUCTION NOTES:

1. DIMENSION FORMAT USED WHEN DIMENSIONING A SERIES OF IDENTICAL AND REPEATING DIMENSIONS. IN THIS CASE 6 SPACES AT A DIMENSION OF 5'–0" IS REPEATED. THE TOTAL DISTANCE BEING DIMENSIONED IS 30'–0".
2. THIS DIMENSION IS REQUIRED TO INDICATE THE SUBJECT MATTER OF THE SERIES DIMENSION DISCUSSED IN NOTE 1.
3. A CENTERLINE IS USED TO ESTABLISH THE DIMENSION ORIGIN. THE CENTERLINE IS CREATED ON LAYER "S–ANNO–DIMS–CNTR", PEN 31, "CENTER4" LINE TYPE.
4. BLOCK NAME IS "Section line". INSERTION UNITS IS "FEET"(2), INSERTED IN PAPER SPACE AND MAY BE MOVED INTO MODEL SPACE THROUGH THE VIEWPORT USING THE "CHSPACE" COMMAND. A WIPEOUT POLYLINE FRAME IS USED TO CLEAR THE BACKGROUND LINEWORK. THE WIPEOUT POLYLINE IS CREATED ON LAYER "G–SECT" AND THE "FRAME" TOGGLE SET TO "OFF". SECTIONS ARE ASSIGNED AN ALPHA CHARACTER DESIGNATION, IN THIS CASE SECTION "A".
5. "PARTIAL..." DESIGNATION ADDED BECAUSE THE COMPLETE "TRUSS PLAN" IS IDENTIFIED SOMEWHERE ELSE IN THE PLAN SET (NOT INCLUDED IN THE EXAMPLE DRAWING SET).
6. BLOCK NAME IS "PLAN title". INSERTION UNITS IS "FEET"(2), INSERTED IN PAPER SPACE AND MAY BE MOVED INTO MODEL SPACE THROUGH THE VIEWPORT USING THE "CHSPACE" COMMAND. THE PLAN TITLE HAS 1 LEADING AND 1 TRAILING UNDERLINED SPACE. TO CREATE THE UNDERLINE SPACE, HOLD THE "Alt" KEY AND TYPE "0160".



INSTRUCTION NOTES:

1. THE MULTILEADERS ARE CREATED ON LAYER S–ANNO–L100. THE SIZE OF THE MULTILEADER TEXT DICTATES THE LAYER WHICH THE MULTILEADER IS ASSIGNED TO.
2. "(TYP)" IS INCLUDED IN THE "MK–12" CALL OUT BECAUSE IT APPEARS TWICE IN THE "PLAN" PORTION OF THE DETAIL.
3. L175 MULTITEXT ON LAYER "G–ANNO–L175" WITH NO LEADING OR TRAILING SPACE.
4. BLOCK NAME IS "Section or Detail Title – scale". INSERTION UNITS IS "FEET"(2), INSERTED IN PAPER SPACE AND MAY BE MOVED INTO MODEL SPACE THROUGH THE VIEWPORT USING THE "CHSPACE" COMMAND.
5. "THIS DWG" IS A BLOCK ATTRIBUTE AND DIRECTS THE READER TO THE CORRESPONDING LOCATION WITHIN THE PLAN SET.
6. DETAIL GRAPHIC CREATED ON LAYER "S–DETL–WOOD" (STRUCTURAL: DETAIL: WOOD).
7. DETAIL GRAPHIC CREATED ON LAYER "S–PATT–WOOD". LAYER COLOR SET TO PEN 252 TO INCREASE LINE WEIGHT SCREENING.
8. "(TYP OF 10)" INDICATES THAT THE SUBJECT OBJECT OF THE MULTILEADER, APPEARS 10 TIMES IN THE DETAIL, 2 LEADERS ARE ALLOWED IN THIS INSTANCE BECAUSE THE SUBJECT OBJECT APPEARS IN THE "PLAN" AND "ELEVATION" PORTIONS OF THE DETAIL.
9. DETAIL GRAPHIC CREATED ON LAYER "S–DETL–WOOD–HDLN". LAYER LINE TYPE IS SET TO "HIDDEN2" AND A PEN 1 COLOR.
10. DETAIL GRAPHIC CREATED ON LAYER "S–DETL–HRDW", (STRUCTURAL: DETAIL: HARDWARE).
11. "(TYP OF 2)" ADDED TO CALL OUT BECAUSE THE CALL OUT LEADER POINTS TO DIFFERENT VIEWS OF THE SUBJECT OBJECT BEING IDENTIFIED. IN THE "ELEVATION" VIEW THE THE SUBJECT OBJECT IS SHOWN ONCE, IN THE "PLAN" VIEW THE SUBJECT IS SHOWN TWICE.



INSTRUCTION NOTES:

1. BORDER AND "B" CREATED ON LAYER "G–SECT". "S–4" IS CREATED ON LAYER "G–SECT–TEXT". CALLOUT IDENTIFIES A COMPONENT THAT IS INCLUDED IN A PORTION OF A SECTION OR DETAIL. IN THIS CASE THE "NOSING PL (PLATE)" MATERIAL AND INSTALLATION INFORMATION IS IDENTIFIED IN SECTION "B" ON SHEET S–4 (NOT INCLUDED IN THE EXAMPLE DRAWING SET).
2. POLYLINE CREATED ON LAYER "S–ANNO–MATC", THE LINETYPE GENERATION IS "ENABLED" THROUGH THE PROPERTIES DIALOG BOX. THE GRAPHIC DEFINES THE EXTENTS OF DETAIL 1.
3. BLOCK NAME IS "Detail callout". INSERTION UNITS IS "FEET"(2), INSERTED IN PAPER SPACE AND MAY BE MOVED INTO MODEL SPACE THROUGH THE VIEWPORT USING THE "CHSPACE" COMMAND. DETAILS ARE ASSIGNED A NUMERIC CHARACTER DESIGNATION, IN THIS CASE "1".
4. "THIS DWG" IS A BLOCK ATTRIBUTE AND DIRECTS THE READER TO THE CORRESPONDING LOCATION WITHIN THE PLAN SET.
5. BREAKLINES ON BOTH ENDS OF THE SECTION TO INDICATE THAT THE SUBJECT GRAPHICS CONTINUE BEYOND THE SECTION.
6. ONLY ONE BREAKLINE SYMBOL IS REQUIRED ON A BREAKLINE.
7. BLOCK NAME IS "Section line". INSERTION UNITS IS "FEET"(2), INSERTED IN PAPER SPACE AND MAY BE MOVED INTO MODEL SPACE THROUGH THE VIEWPORT USING THE "CHSPACE" COMMAND. THE SECTION DESIGNATION IS "C" BECAUSE "A" & "B" DESIGNATIONS ARE ALREADY IN USE ON THIS DRAWING.

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T: 303.628.6000
F: 303.628.6851
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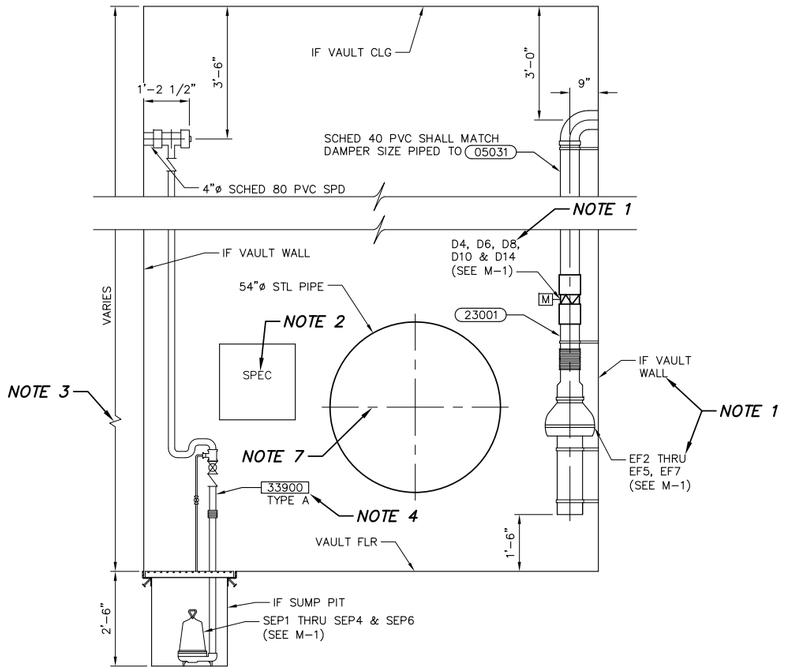
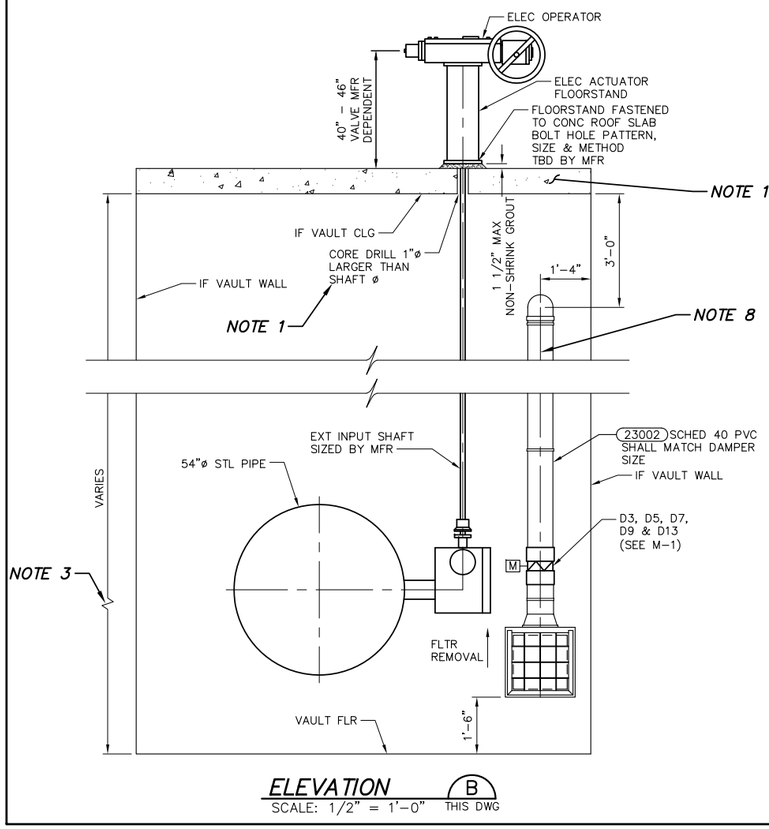
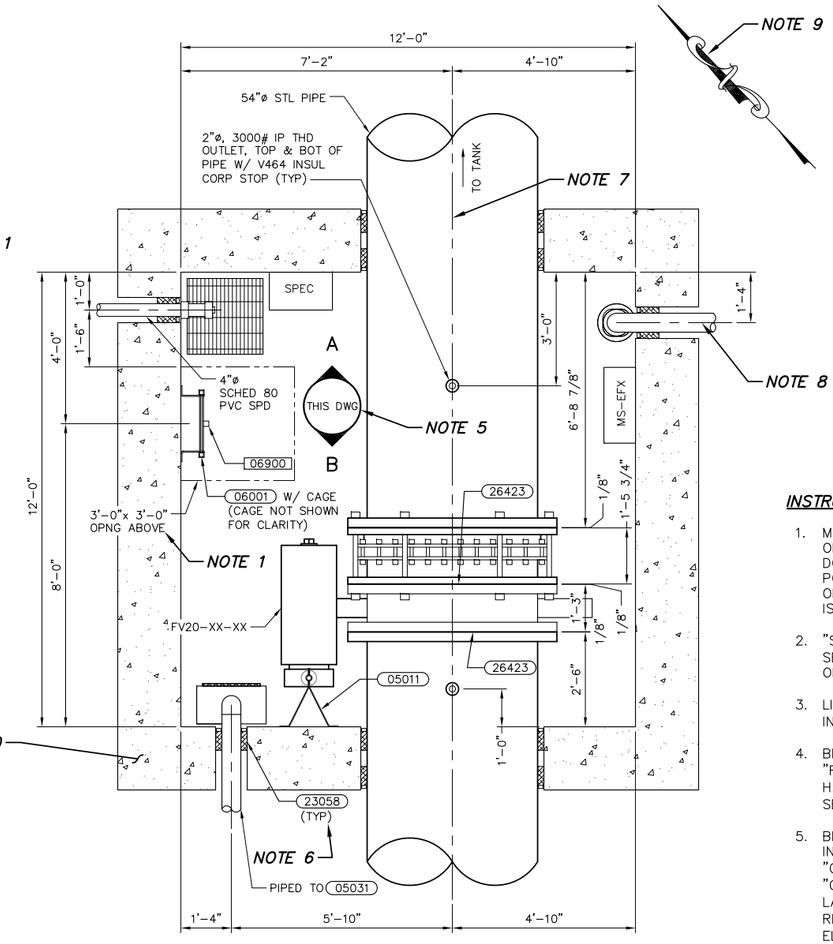
CAPITAL PROJECTS ARCHITECTURAL AND STRUCTURAL DIMENSIONING



ELEVATION A
SCALE: 1/2" = 1'-0" THIS DWG



ELEVATION B
SCALE: 1/2" = 1'-0" THIS DWG



VAULTS NO 1 THRU 3 PLAN
SCALE: 1/2" = 1'-0"

INSTRUCTION NOTES:

1. MULTILEADER STYLE L100, LEFT JUSTIFIED, LEADER ANCHORS TO THE MIDDLE OF THE BOTTOM LINE OF TEXT WHEN LEADER IS POINTING TO THE RIGHT AND DOWN. LEADER ANCHORS TO MIDDLE OF TOP LINE OF TEXT WHEN LEADER IS POINTING TO THE RIGHT AND UP. LEADER ANCHORS TO THE TOP MIDDLE LINE OF TEXT WHEN LEADER IS POINTING TO THE LEFT REGARDLESS IF THE LEADER IS POINTING UP OR DOWN.
2. "SPEC" IS AN ELECTRICAL ENCLOSURE DESIGNATION RELATIVE TO THE PLAN SET. CREATED ON LAYER "E-ANNO-L100" WITH A PEN 1 COLOR. THIS IS THE ONLY TIME PEN 1 IS ACCEPTABLE FOR L100 SIZE TEXT.
3. LINEAR DIMENSION CREATED IN MODEL SPACE ON LAYER "M-ANNO-DIMS", AND INCLUDES A "JOG LINE" BECAUSE THE DIMENSION SPANS ACROSS A BREAKLINE.
4. BLOCK NAME IS "CPCS Detail Callouts", WITH THE VISIBILITY STATE SET TO "Revised". "TYPE A" IS INCLUDED BECAUSE THE DETAIL BEING REFERENCED HAS MULTIPLE CONFIGURATIONS (NOT INCLUDED IN THIS EXAMPLE DRAWING SET).
5. BLOCK NAME IS "Interior Elevation Indicator". INSERTION UNITS IS "FEET"(2), INSERTED IN PAPER SPACE AND MOVED THROUGH THE VIEWPORT USING THE "CHSPACE" COMMAND. "THIS DWG" IS L100 TEXT ON LAYER "G-WALL-ELEV-TEXT", COLOR SET TO PEN 12. "A" AND "B" IS L175 TEXT ON LAYER "G-WALL-ELEV", COLOR SET TO PEN 4. THE BLOCK REFERS THE READER TO ELEVATION "A" AND ELEVATION "B" ON THIS DRAWING. IF THE ELEVATIONS BEING REFERRED TO RESIDE ON A DIFFERENT SHEET, THEN "THIS DWG" WOULD BE REPLACED WITH THE CORRESPONDING SHEET, FOR EXAMPLE "M-3" (NOT INCLUDED IN THIS EXAMPLE SET).
6. "(TYP)" IS A MULTITEXT OBJECT PLACED BELOW OR BESIDE THE CPCS REFERENCE BLOCK WHEN THE DETAIL INDICATED IS SHOWN IN MULTIPLE PLACES WITHIN THE PLAN VIEW.
7. CENTERLINE OF PIPE CREATED ON LAYER "M-WATR-PIPE-CNTR" (MECHANICAL: WATER: PIPE: CENTERLINE), LAYER COLOR PEN 51 AND "CENTER2" LINE TYPE. CENTERLINE OF PIPE REQUIRED IN ELEVATION AND PLAN VIEW FOR DIMENSION ORIGIN ANCHOR POINT.
8. CENTERLINE OF PIPE CREATED ON LAYER "M-MPIP-CNTR" (MECHANICAL: MISCELLANEOUS PIPING: CENTERLINE), LAYER COLOR PEN 51 AND "CENTER2" LINE TYPE. CENTERLINE OF PIPE REQUIRED IN ELEVATION AND PLAN VIEW FOR DIMENSION ORIGIN ANCHOR POINT.
9. NORTH ARROW REQUIRED FOR ALL "PLAN" REPRESENTATIONS, ON LAYER G-ANNO-SYMBOL.
10. HATCH PATTERN PAPER SPACE SIZE MATCHES IN ALL PLACES SHOWN ON SHEET REGARDLESS OF SCALE.

– INDICATES DRAFTER INPUT REQUIRED

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F: 303.628.6851
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CAPITAL PROJECTS MECHANICAL DIMENSIONING

Section 5.4

Capital Projects Electrical Example

Overview - Section 5.4

This section outlines how Denver Water's Capital Project drawings should appear.

- Instrument Control
- Process & Instrumentation Diagram
- Cathodic Protection
- **C**onduit & **C**onductor Schedule
- One-Line Diagram
- Plan View

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FIELD OR AS NOTED

CTRL PNL (LCP–WQB)

BLOCKS USED:

- LA: "EI–CONT–DEVC" DYN BLK: "DIODE"(3)
- LA: "EI–DIAG–CONN" BLK: "ELEC_CONN"
- LA: "EI–CONT–WIRE–SHLD" DYN BLK: "ELEC_LABEL–SHIELD WIRING"(7)
- LA: "EI–CABL–TEXT" DYN BLK: "ELEC_LABEL–CABLE"
- LA: "EI–CONT–DEVC" BLK: "WIRING CONTINUATION"(2)
- LA: "EI–CONT–DEVC" BLK: "ELEC_CIRCUIT BREAKER"
- LA: "EI–CONT–DEVC" DYN BLK: "ELEC_INDICATOR–CONTACT"(2)
- LA: "EI–CONT–DEVC" BLK: "ELEC_LIGHT–INDICATING"
- LA: "EI–CONT–DEVC" BLK: "ELEC_SWT"
- LA: "EI–CONT–DEVC" BLK: "ELEC_GROUND"
- LA: "EI–CONT–DEVC" BLK: "SWITCH_DISCON"
- LA: "EI–CONT–DEVC–TERM" DYN BLK: "ELEC_SCREWS"(3)
- LA: "EI–CONT–DEVC" BLK: "RELAY"
- LA: "EI–CONT–DEVC" DYN BLK: "ELEC_SWT_TEMPERATURE"(2)
- LA: "EI–CONT–DEVC" DYN BLK: "ELEC_TERMINAL BLOCKS"(8)
- LA: "EI–CONT–DEVC" BLK: "ELEC_STRIP HEATER"

LA: "EI–SECT–LINE"

LA: "EI–GRID–REFR" BLK: "ELEC_GRID" "FIND AND REPLACE" *! WITH DWG NUMBER

120VAC, 1ϕ, 60Hz PB2–WQB, CKT 3 [P044]

N, L, GND, SH

801–1, 802–1, CB802 20A, 802–2, 803

ISOLATED GND BUS FOR ALL SHLD WIRES

LA: "EI–ANNO–L140" FONT: "L140"

LA: "EI–ANNO–L175"

FLUOR LIGHT ASSY L1 L2 804–1

LA: "EI–ANNO–L120" FONT: "L120"

SA1 SURGE ARRESTOR AC N GND 806–1, 806–2

LA: "EI–CONT–TEXT" FONT: "L100"

808–1, 808–2

LA: "EI–DIAG–BUSS"

LA: "EI–DIAG–FEED"

CB809 3A 809–1 GFR LAPTOP RECEPTACLE

CR810 NPR 14 13 POWER OK RELAY — NPR 9 5 DI601 (1303)

CB812 3A 812–1 LT812 W POWER ON AND OK

HTR TSTAT CLOSE AT 40°F LOWERING 814–1 400W

FAN TSTAT CLOSE AT 75°F RISING 816–1 816–2 FAN1

UPR CR823 12 4 818–1 CB818 10A 818–2 UPS RECEPTACLE

UPS 120VAC 1000VA

UPR CR823 12 8 CB821 15A 821–1 821–2

CR823 UPR 14 13 UPS POWER OK RELAY — UPR 9 5 DI602 (1305)

LT825 W POWER ON AND OK

CB827 3A 827–1 COMMUNICATIONS RECEPTACLE

CB828 828–1

CB830 1A 830–1 SPARE

CB832 1A 832–1 SPARE

CB834 1A 834–1 PWS1 PWR SPLY 24VDC 5A L+ N– DC OK PE 835–1 835–2

CB836 4A 836–1 + + 13 14 N – 836–3 PHOENIX QUINT POWER

CR837 PSR1 — PRS1 9 5 DI603 (1307) 24VDC POWER SUPPLY NO 1 OK RELAY

CB839 1A 839–1 PWS2 PWR SPLY 24VDC 5A L+ N– DC OK PE 840–1 841–1 + + 13 14 N – 836–3

CR842 PSR2 — PSR2 9 5 DI603 (1307) 24VDC POWER SUPPLY NO 2 OK RELAY

CB844 1A 844–1 DM DIODE MODULE IN 1 OUT 1 IN 2 OUT 2 845–1 844–2 PHOENIX QUINT DIODE 40

818–1, 844–2, 836–3, 808–2

902 + 24VDC – 902

901 L 120VAC N 901

LIT 20–02 L N GND [P101] 828 829 GND

LIT 20–03 GND N L [P102] GND 833 834

LA: "EI–ANNO–L120" FONT: "L120"

LA: "EI–CONT–TEXT" FONT: "L100" NO ABBREVIATIONS IN THIS AREA, EXCEPTION IS DEVICE NAMES

NOTE:

TERMINATIONS SHALL BE PERFORMED BY CONTRACTOR.

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Denver, Colorado 80204–3412
T: 303.628.6000
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CAPITAL PROJECTS ELEC INSTRUMENTATION AND CONTROL AC POWER

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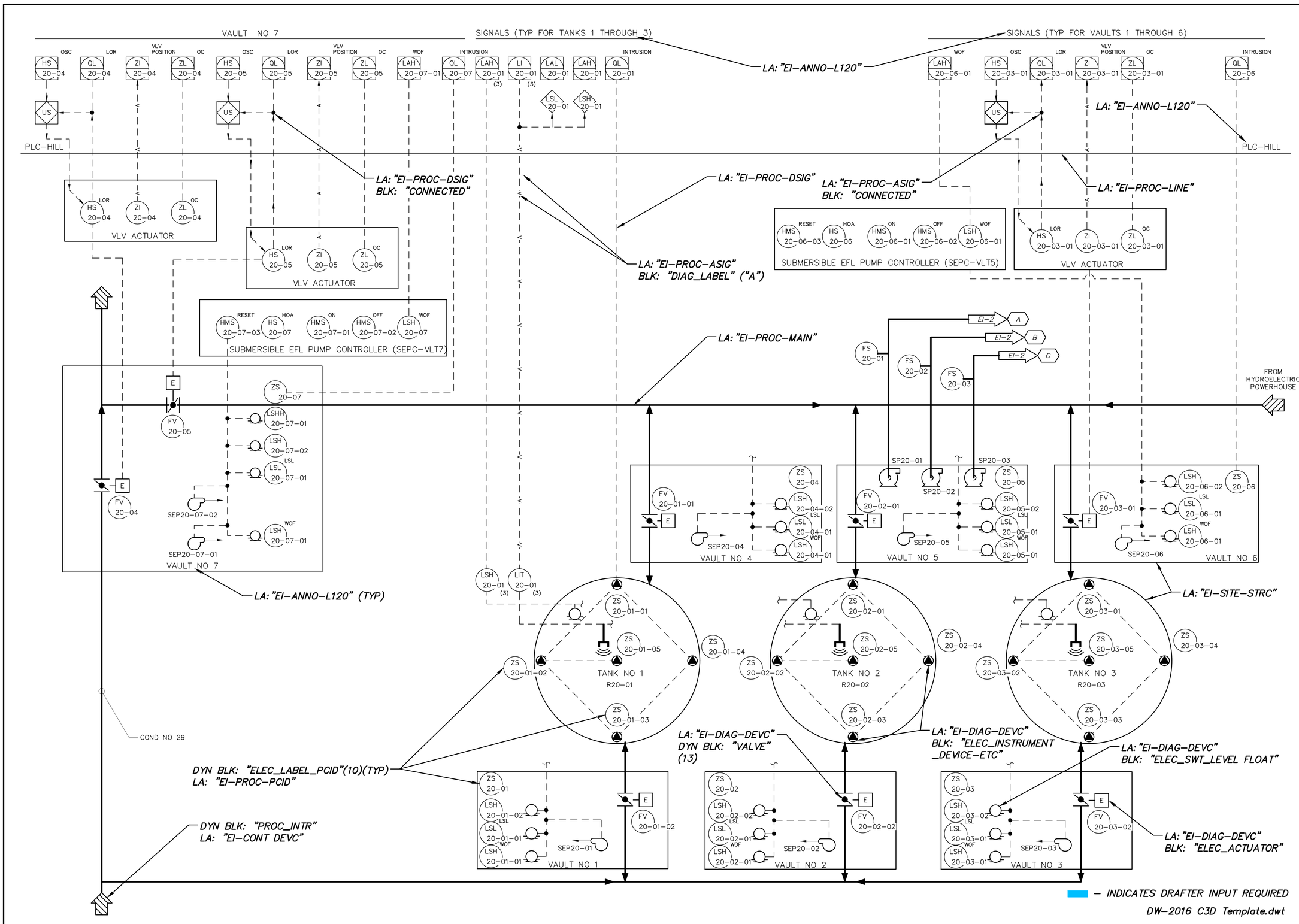

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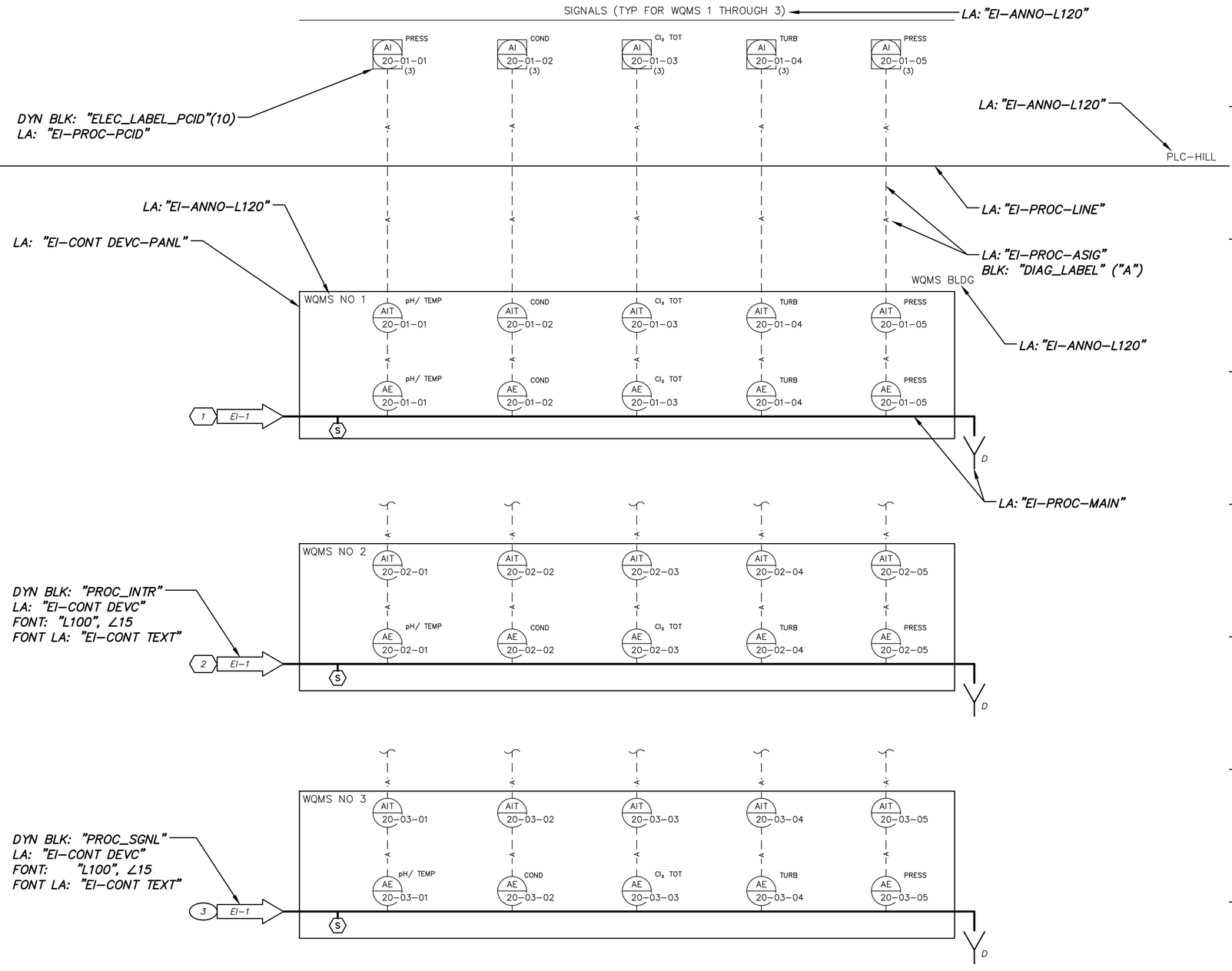
CAPITAL PROJECTS ELEC PROCESS AND INSTRUMENTATION DIAGRAM – 1



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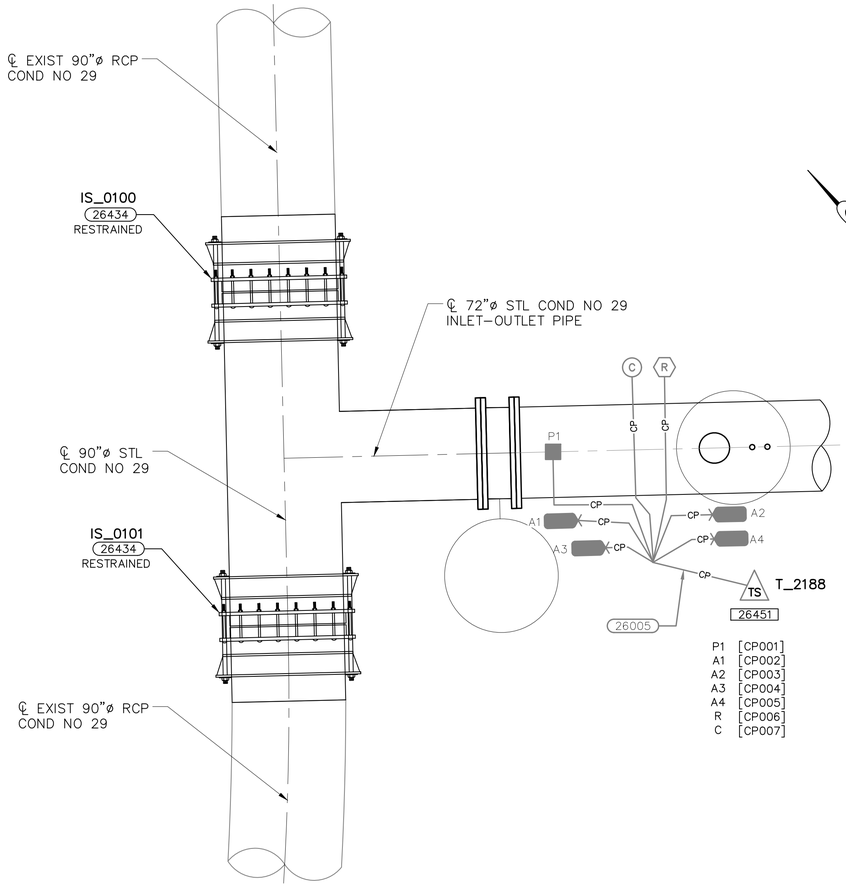
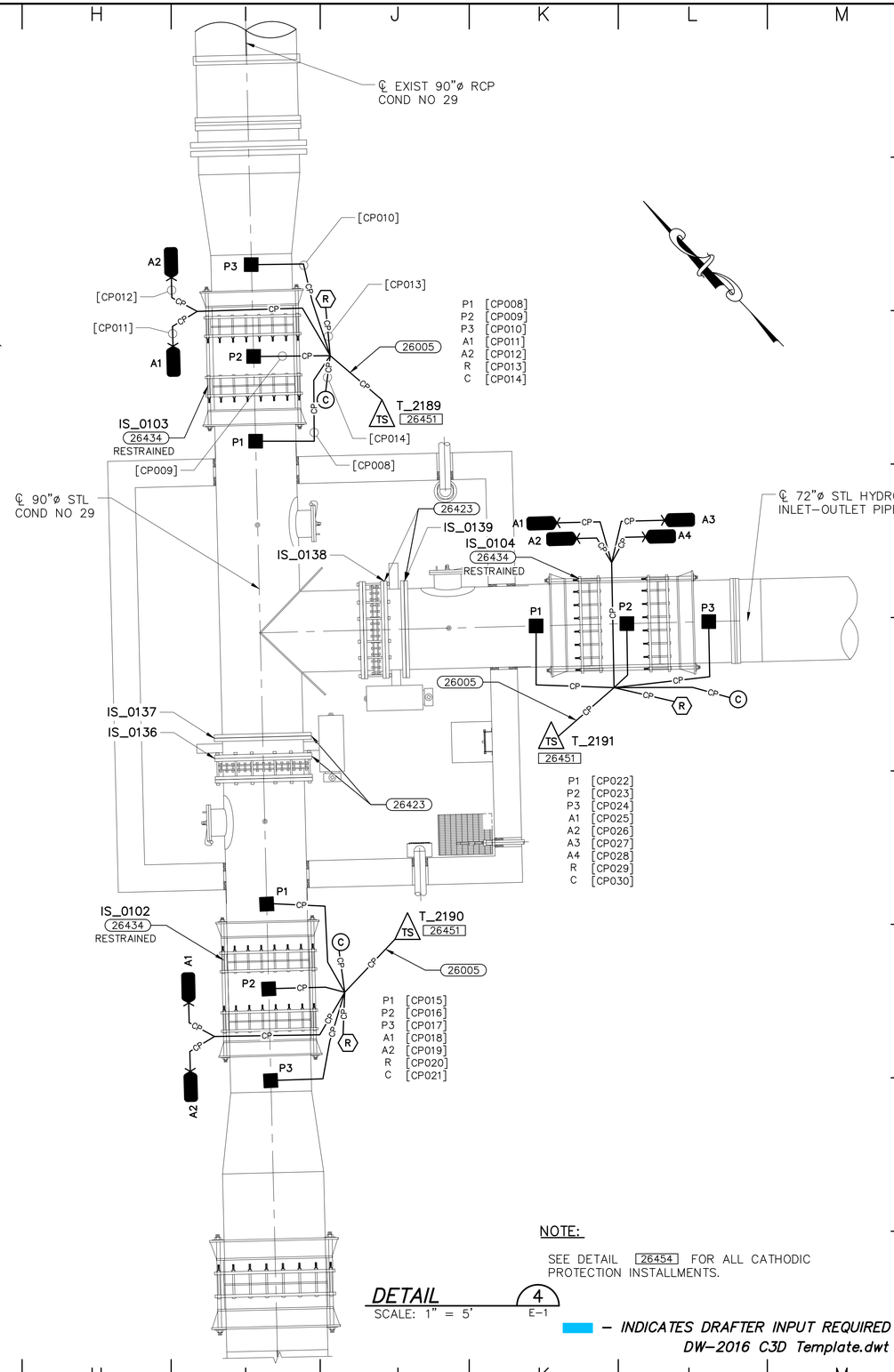
CAPITAL PROJECTS ELEC PROCESS AND INSTRUMENTATION DIAGRAM – 2



DETAIL 3
SCALE: 1" = 5' E–1

BLOCKS USED:

T_xxxx	*TEST STATION (AT GRADE)*
T_xxxx	*TEST STATION (POST)*
	48# MAGNESIUM ANODE
C	*SAMPLE COUPON*
T_xxxx	*TEST STATION IDENTIFICATION NUMBER*
IS_xxxx	*INSULATED FLANGE OR COUPLING IDENTIFICATION NUMBER*
R	*PERMANENT $CuCuSO_4$ REFERENCE ELECTRODE*



NOTE:

SEE DETAIL 26454 FOR ALL CATHODIC PROTECTION INSTALLMENTS.

DETAIL 4
SCALE: 1" = 5' E–1

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CAPITAL PROJECTS
ELEC CATHODIC
PROTECTION

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NOTES:

1 AN "*" INDICATES THAT PARTIAL CONDUIT RUNS MAY BE SHARED BY CONDUCTORS & CABLES. ALL CONDUIT, CONDUCTORS AND CABLE SIZES & TYPES SHALL BE APPROVED BY THE ENGINEER. CONDUIT, CONDUCTOR AND CABLE SIZES, LENGTHS & TYPES ARE ESTIMATED ACCEPTABLE MINIMUMS.

2 P## - REPRESENTS POWER
C## - REPRESENTS CONTROL AND COMMUNICATIONS
A## - ANALOG
L## - LIGHTING & RECEPTACLE
F## - FIBER OPTIC
CP# - CORROSION PROTECTION

3 SHADED ROWS INDICATE EXISTING EQUIPMENT, NOT REQUIRING WORK; ALL UN-SHADED FIELDS INDICATE FINAL CONFIGURATION FOLLOWING WORK

4 PLEASE SEE THE CONDUIT AND CONDUCTORS NOTES SECTION IN SPECIFICATION 26 05 33, RACEWAYS FOR FURTHER DETAILS

POWER

No	CONDUIT		CONDUCTORS & CABLES	SOURCE	LENGTH	DESTINATION	VOLTAGE	COMMENTS
	SIZE	TYPE						
[P119]	1	PVC-RGS	1 MANUFACTURER CABLE	SEPC20-05		SEP20-05	208V	
[P120]	1	PVC-RGS	1 MANUFACTURER CABLE	SEPC20-06		SEP20-06	208V	
[P121]	1	PVC-RGS	2#12, 1#12GND XHHW-2	ECP-WQB		D1	120V	POWER TO DAMPER D2 FROM ECP-WQB
[P122]	1.5"	PVC-RGS	4#1, 1#8GND XHHW-2	TX-WQB		DS-TX-WQB	208V	
[P123]	1.5"	PVC-RGS	4#1, 1#8GND XHHW-2	DS-TX-WQB		PB-WQB	208V	
[P124]	2.0"	PVC-RGS	EMPTY WITH PULL STRING	EXIST EHH1		EHH2		
[P125]	2.0"	PVC-RGS	EMPTY WITH PULL STRING	WQB		EHH7		

CONTROL & COMMUNICATIONS

No	CONDUIT		CONDUCTORS & CABLES	SOURCE	LENGTH	DESTINATION	VOLTAGE	COMMENTS
	SIZE	TYPE						
[C001]	1.5"-0.75"	PVC-RGS	(1) TYPE1(25 #14) -3#14 XHHW-2	LCP-VLT7		LSH20-01		TANK NO 1 VIA VLT4-JBC
[C002]	2"-1"	PVC-RGS	1TYPE 2(25#14) -2#14 XHHW-2	LCP-WQB		LSH20-02		PVC CONDUIT IN DUCTBANK
[C003]	2.5"-1"	PVC-RGS	(2) TYPE1(19#14), (1)TYPE2(25#14) -2#14 XHHW-2	LCP-WQB		LSH20-03		(2) TYPE1 IN SECTION F AND (1) TYPE2 IN SECTION O
[C004]	*[C001]-1"	PVC-RGS	2#14 XHHW-2	LCP-VLT7		ZS20-01-(1-5)		TANK NO 1 VIA VLT4-JBC
[C005]	*[C002]-1"	PVC-RGS	2#14 XHHW-2	LCP-WQB		ZS20-02-(1-5)		TANK NO 2 VIA VLT5-JBC
[C006]	*[C003]-0.1"	PVC-RGS	2#14 XHHW-2	LCP-WQB		ZS20-03-(1-5)		TANK NO 3 VIA VLT6-JBC
[C007]	*[C001]-1"	PVC-RGS	11#14 XHHW-2	LCP-VLT7		FV20-01-01		(VAULT NO 4)
[C008]	1.5"-0.75"	PVC-RGS	11#14 XHHW-2	LCP-VLT7		FV20-01-02		(VAULT NO 1) VIA VLT1-JBP
[C009]	*[C002]-0.75"	PVC-RGS	11#14 XHHW-2	LCP-WQB		FV20-02-01		(VAULT NO 5)
[C010]	*[C003]-2"-0.7	PVC-RGS	(2) TYPE1(19#14) -11#14 XHHW-2	LCP-WQB		FV20-02-02		ONE TO VLT2-JBC AND ONE TO VLT3-JBC
[C011]	*[C003]-0.75"	PVC-RGS	11#14 XHHW-2	LCP-WQB		FV20-03-01		(VAULT NO 6)
[C012]	*[C010]-0.75"	PVC-RGS	11#14 XHHW-2	LCP-WQB		FV20-03-02		(VAULT NO 3)
[C013]	0.75"	PVC-RGS	11#14 XHHW-2	LCP-VLT7		FV20-04		(VAULT NO 7)
[C014]	0.75"	PVC-RGS	11#14 XHHW-2	LCP-VLT7		FV20-05		(VAULT NO 7)
[C015]	2.5"	PVC-RGS	(2) TYPE 2 (25#14)	LCP-WQB		LCP-WQSP		VAULT NO 5
[C016]	*[C008]-0.75"	PVC-RGS	2#14 XHHW-2	LCP-VLT7		SEPC20-01		WOF TO PLC FROM VAULT NO 1
[C017]	*[C010]-0.75"	PVC-RGS	2#14 XHHW-2	LCP-WQB		SEPC20-02		WOF TO PLC FROM VAULT NO 2
[C018]	*[C010]-0.75"	PVC-RGS	2#14 XHHW-2	LCP-WQB		SEPC20-03		WOF TO PLC FROM VAULT NO 3
[C019]	*[C001]-1"	PVC-RGS	2#14 XHHW-2	LCP-VLT7		SEPC20-04		WOF TO PLC FROM VAULT NO 4
[C020]	*[C002]-0.75"	PVC-RGS	2#14 XHHW-2	LCP-WQB		SEPC20-05		WOF TO PLC FROM VAULT NO 5
[C021]	*[C003]-0.75"	PVC-RGS	2#14 XHHW-2	LCP-WQB		SEPC20-06		WOF TO PLC FROM VAULT NO 6
[C022]	0.75"	PVC-RGS	2#14 XHHW-2	LCP-VLT7		SEPC20-07		WOF TO PLC FROM VAULT NO 7
[C023]	*[C008]-0.75"	PVC-RGS	2#14 XHHW-2	LCP-VLT7		ZS20-01		VAULT NO 1 INTRUSION
[C024]	*[C010]-0.75"	PVC-RGS	2#14 XHHW-2	LCP-WQB		ZS20-02		VAULT NO 2 INTRUSION
[C025]	*[C010]-0.75"	PVC-RGS	2#14 XHHW-2	LCP-WQB		ZS20-03		VAULT NO 3 INTRUSION
[C026]	*[C001]-1"	PVC-RGS	2#14 XHHW-2	LCP-VLT7		ZS20-04		VAULT NO 4 INTRUSION
[C027]	*[C002]-0.75"	PVC-RGS	2#14 XHHW-2	LCP-WQB		ZS20-05		VAULT NO 5 INTRUSION
[C028]	*[C003]-0.75"	PVC-RGS	2#14 XHHW-2	LCP-WQB		ZS20-06		VAULT NO 6 INTRUSION
[C029]	0.75"	PVC-RGS	2#14 XHHW-2	LCP-VLT7		ZS20-07		VAULT NO 7 INTRUSION
[C030]	1.0"	PVC-RGS	2#14 XHHW-2	LCP-WQSP		FS20-01		
[C031]	1.0"	PVC-RGS	2#14 XHHW-2	LCP-WQSP		FS20-02		
[C032]	1.0"	PVC-RGS	2#14 XHHW-2	LCP-WQSP		FS20-03		
[C033]	1.0"	PVC-RGS	2#14, 1#14 GND XHHW-2	MS-EF8		ZS20-07		
[C035]	0.75"	PVC-RGS	2#14, 1#14 GND XHHW-2	ECP-VLT5		ZS20-05		
[C036]	0.75"	PVC-RGS	2#14, 1#14 GND XHHW-2	ECP-VLT5		EUH2		
[C037]	1.0"	PVC-RGS	2#14, 1#14 GND XHHW-2	ECP-WQB		EUH1		
[C038]	0.75"	PVC-RGS	2#14, 1#14 GND XHHW-2	SEPC20-01		LSL20-01-01		VAULT NO 1
[C039]	0.75"	PVC-RGS	2#14, 1#14 GND XHHW-2	SEPC20-01		LSH20-01-02		VAULT NO 1
[C040]	0.75"	PVC-RGS	2#14, 1#14 GND XHHW-2	SEPC20-01		LSH20-01-02		VAULT NO 1 (WOF)
[C041]	1.0"	PVC-RGS	2#18 XHHW-2	SCP GATE		GATE OPERATOR		
[C042]	0.75"	RGS	4#18 XHHW-2	SCP WQB		DOOR 1		
[C043]								
[C044]	0.75"	RGS	CAT 5E	PLC IN LCP-WQB		ETHERNET SW IN LCP-WQB		
[C045]	1.0"	PVC-RGS	CAT 5E	LCP-WQB		WQMS NO 1		RJ45 CONNECTORS
[C046]	1.0"	PVC-RGS	CAT 5E	LCP-WQB		WQMS NO 2		RJ45 CONNECTORS
[C047]	1.0"	PVC-RGS	CAT 5E	LCP-WQB		WQMS NO 3		RJ45 CONNECTORS
[C048]	0.75"	PVC-RGS	2#14, 1#14 GND XHHW-2	SEPC20-02		LSL20-02-01		VAULT NO 2
[C049]	0.75"	PVC-RGS	2#14, 1#14 GND XHHW-2	SEPC20-02		LSH20-03-02		VAULT NO 2
[C050]	0.75"	PVC-RGS	2#14, 1#14 GND XHHW-2	SEPC20-02		LSH20-02-02		VAULT NO 2 (WOF)
[C051]	0.75"	PVC-RGS	2#14, 1#14 GND XHHW-2	SEPC20-03		LSL20-03-01		VAULT NO 3
[C052]	0.75"	PVC-RGS	2#14, 1#14 GND XHHW-2	SEPC20-03		LSH20-03-02		VAULT NO 3
[C053]	0.75"	PVC-RGS	2#14, 1#14 GND XHHW-2	SEPC20-03		LSH20-03-02		VAULT NO 3 (WOF)
[C054]	0.75"	PVC-RGS	2#14, 1#14 GND XHHW-2	SEPC20-04		LSL20-04-01		VAULT NO 4
[C055]	0.75"	PVC-RGS	2#14, 1#14 GND XHHW-2	SEPC20-04		LSH20-04-02		VAULT NO 4
[C056]	0.75"	PVC-RGS	2#14, 1#14 GND XHHW-2	SEPC20-04		LSH20-04-02		VAULT NO 4 (WOF)
[C057]	1.0"	PVC-RGS	CAT 5E	SCP-WQB		ETHERNET SW IN LCP-WQB		
[C072]	0.75"	PVC-RGS	MANUFACTURER CABLES	SEPC20-05		LSL20-05-01		VAULT NO 5
[C073]	0.75"	PVC-RGS	MANUFACTURER CABLES	SEPC20-05		LSH20-05-02		VAULT NO 5
[C074]	0.75"	PVC-RGS	MANUFACTURER CABLES	SEPC20-05		LSH20-05-02		VAULT NO 5 (WOF)
[C075]	0.75"	PVC-RGS	MANUFACTURER CABLES	SEPC20-06		LSL20-06-01		VAULT NO 6
[C076]	0.75"	PVC-RGS	MANUFACTURER CABLES	SEPC20-06		LSH20-06-02		VAULT NO 6
[C077]	0.75"	PVC-RGS	MANUFACTURER CABLES	SEPC20-06		LSH20-06-02		VAULT NO 6 (WOF)
[C078]	1.25	PVC-RGS	(4) MANUFACTURER CABLES	SEPC20-07		LSL/LSH/LSHH20-07		VAULT NO 7 SUBMERSIBLE EFL PUMP LEVEL SW
[C079]	0.75	PVC-RGS	6#14, 1#14 GND XHHW-2	SEPC20-07		LCP-VLT7		LSHH AND OVERLOAD ALARMS
[C080]	0.75"	PVC-RGS	(1) MANUFACTURER CABLES	LCP-VLT7		WOF-VLT7		VAULT NO 7 WATER-ON-FLOOR ALARM
[C081]	0.75"	PVC-RGS	CAT 5E	PLC IN LCP-VLT7		ETHERNET SW IN LCP-WQB		
[C082]	1.5"	PVC-RGS	PULL-STRING	EHH9		SECURITY GATE		
[C083]	1.5"	PVC-RGS	PULL-STRING	EHH9		VAULT NO 1		
[C084]	1.5"	PVC-RGS	PULL-STRING	EHH8		VAULT NO 4		
[C085]	2.0"	PVC-RGS	PULL-STRING	EHH8		VAULT NO 7		
[C086]	2	PVC-RGS	PULL-STRING	EHH6		EHH7		
[C087]	2	PVC-RGS	PULL-STRING	EHH8		EHH7		
[C088]	2	PVC-RGS	PULL-STRING	LCP-WQB		EHH7		
[C089]	1.0"	PVC-RGS	2#14, 1#14 GND XHHW-2	MS-EF2		ZS20-01		
[C090]	1.0"	PVC-RGS	2#14, 1#14 GND XHHW-2	MS-EF3		ZS20-02		
[C091]	1.0"	PVC-RGS	2#14, 1#14 GND XHHW-2	MS-EF4		ZS20-03		
[C092]	1.0"	PVC-RGS	2#14, 1#14 GND XHHW-2	MS-EF5		ZS20-04		
[C093]	1.0"	PVC-RGS	2#14, 1#14 GND XHHW-2	MS-EF7		ZS20-06		
[C094]	1.0"	PVC-RGS	CAT 5E	EXIST PLC IN PS		ETHERNET SW IN EXIST PS		

COPY FROM "EXCEL" FILE, HOME TAB: IN PAPER SPACE "PASTE SPECIAL", THEN PICK "PICTURE (ENHANCED METAFILE)". ONCE IN, SCALE BY 15% (1.15). CENTER ON PAGE, MOVE BOTTOM OF SCHEDULE TOWARDS RIGHT EDGE OF PAPER.

LA: "E-ANNO-DIMS" (PEN 1)

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1600 West 12th Ave
Denver, Colorado 80204-3412
T:303.628.6000
F:303.628.6851
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△	M■/R	30% REVIEW

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CAPITAL PROJECTS
ELEC CONDUIT AND
CONDUCTOR
SCHEDULE

EXIST 5kV SWGR IN PS

EXIST 13.2kV SWGR

LA: "E–ANNO–L120"
FONT: "L120"

MAIN

WH

SM–5
80E

65A

125A

2500kVA
13.2–4.16kV

[P003]

[P004]

65A

13.2–480/277V
225kVA

20A2P

300A3P

4.5A

8A

480–120V,
1ϕ, 750kV

[E3(B3)]

AUTO TEL
DIALER

FIRE
PROTECTION PNL

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#4/0 BARE
Cu GND

LA: "E–ANNO–L100"
FONT: "L100" (TYP)

DTC LINE
XCEL FEED LINE #1801
(N FEED FROM POLE
MTD CUTOUTS)

METERING

TRANSFER SW

TO 750kVA
13.2kV–277/480V
TX

TO HYDRO FACILITY
(PWR HOUSE)

TRANSFER SW

TO 2500kVA
13.2–4.16kV
TX (EXIST)

METERING

SULLIVAN LINE
XCEL FEED LINE
#2075
(S FEED FROM POLE
MTD CUTOUTS)

89–1
INTERRUPTING SW
15kV, 600A

LA: "E–ANNO–L100"
MULTILEADER: "L100" (TYP)

87T

3ϕ

(3)CT5
150:5

(3)CT7
150:5

50/
51N

LA: "E–DIAG–COND–SECD"
LA: "E–CONT–DEVC"
BLK: "TRANSFORMER_CURRENT"

LA: "E–DIAG–EQPM"

LA: "E–DIAG–COND–FLOW"

LA: "E–DIAG–COND–MAIN"

VAC BKR
15kV 12000A
500MVA

52–1

GND TX
350kVA 15kV
360A MAX 72A CONT
ZIG–ZAG

LA: "E–CONT–DEVC"
BLK: "TERMINAL BLOCKS"

ALARM

480V FROM MCC

BATTERY
CHARGER
NO 1
75A

ALARM FROM MCC

480V

BATTERY
CHARGER
NO 2
75A

125VDC
BATTERY SYSTEM
320AH
60 CELL

100A

LA: "E–CONT–DEVC"
DYN BLK: "TRANSFORMERS"(10)

LA: "E–DIAG–DECV–FLOW"
USE "LEADERS"

86T

71Q

49T

MPT (MAIN TX)
13.2kVA–4160V
Δ 2500kVA %Z=6.50

LA

100:5
(1)CT8

51N

270C
X

500:5
(3)CT2

HYD PRESS LOW–LOW
HYD OIL LEVEL LOW–LOW
MECH OVERSPEED
ELEC OVERSPEED

89–4

89–3

89–2

2PT
4200–120V

27/59
X

27/59
2

810/
UX
2

810/U

47X

47
3ϕ

80E

80E

0.3E

3A

500R

42C1
a

ETM

VS

V

LA: "EI–CONT–DEVC"
BLK: "CIRCUIT
BREAKER_DRAWOUT
POWER"

87G

3ϕ

FROM 76

42C3

VAC CONTACTOR
5kV 400A
300MVA W/ FUSING

42C2

VAC CONTACTOR
5kV 400A
300MVA W/ FUSING

42C1

VAC CONTACTOR
5kV 450A
350MVA W/ FUSING

51C3
/OL

51C2
/OL

(3)CT4
100:5

(3)CT6–3
500:5

(3)CT3
100:5

(3)CT6–2
500:5

(3)CT1
500:5

(3)CT6–1
500:5

WWH
TD

PFTD

37GT

W

PF

50/51
V

46

32

WH

AS

A

3ϕ

WH
PULSE
OUTPUT
4–20mADC

50/51
VX

46X

2

TDE
0–300 SEC

76

TO
CLOSE 42C3

350kVAR
NO 2 CAP

350kVAR
NO 1 CAP

SC

LA

ZERO SEQUENCE
50:5
1CT

50G

TO PLC

38–1

38–2

38–3

38–4

49–0

49

49W

ANN

LA: "E–ANNO–L120"
FONT: "L120"
USE "MTEXT"

LA: "EI–CONT–DEVC"
DYN BLK: "ELEC_CAPACITORS"(2)

LA: "EI–CONT–DEVC"
BLK: "ELEC_CAP"

12/13

INDUCTION GEN
2000kW.87pf
UNCORRECTED 4160V
1.15 SERVICE FACTOR

500:5
(3)CTG4

38X

49X

LOW PWR TRIP

LOW PWR
37GT

TURB LOW LUBE OIL LEVEL
TURB HIGH LUBE OIL FLOW
TURBINE VIB
WINDING OVERTEMP
JOURNAL & TRUST PAD
BRG OVERTEMP
HIGH LUBE OIL TEMP

LA: "E–ANNO–L100"
FONT: "L100" (TYP)
USE "MTEXT"

LA: "E–CONT–DEVC"
BLK: "ELEC_GENERATOR"

GEN NEUTRAL REACTOR
11kVA 2400V
1360A MAX
125A CONT
.7Ω IMPEDANCE

50GX

LA: "E–CONT–DEVC"
BLK: "ELEC_CONTACT"(2)

LA: "E–CONT–DEVC"
BLK: "ELEC_BRUSHLESS EXCITOR"

86G

\\denverwater.org\Shares\Engcom\McMillen\Example Drafting Standard\00000_DSGN_ELEC_ONE–LINE.dwg ONE–LINE DIAGRAM 10/28/2016 5:41 PM

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1600 West 12th Ave
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T: 303.628.6000
F: 303.628.6851
denverwater.org

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CAPITAL PROJECTS ELEC ONE–LINE DIAGRAM

LA: "E-ANNO-BRKL" USE EXPRESS TOOLS
SIZE: 1/4" (IN PAPERSPACE, "CHSPACE"
THRU TO MODEL

BLOCKS USED:

- LA: "EI-CONT-DEVC"
  DYN BLK: "ELEC_CONDUIT"(2)
- LA: "E-GRND-EQPM"
  BLK: "ELEC_CONN EXOTHERMIC WELD"
- LA: "E-GRND-EQPM"
  BLK: "ELEC_GROUND ROD"
- LA: "E-GRND-EQPM"
  BLK: "ELEC_GROUND PIGTAIL OR LOOP"
- 26061 — LA: "G-ANNO-SYMB"
  DYN BLK: "CPCS DETAIL CALLOUTS"(4)
- K / E-29 — LA: "G-SECT"
  DYN BLK: "SECTION LINE"(4)
- E-11 / B — LA: "G-ANNO-SYMB"
  DYN BLK: "INTERIOR ELEVATION INDICATOR"(4)
- M — LA: "E-CONT-DEVC"
  DYN BLK: "ELEC_ACTUATOR"(11)
- WP — LA: "E-CONT-DEVC"
  DYN BLK: "ELEC_RECEPTACLE"(4)

USE OF THE WORD GROUND:
BARE Cu GND IS DIFFERENT
THAN BELOW GROUND LINE

LA: "E-GRND"

XREF'D BASE MAP
LA: "G-ANNO-REFR"

26264
4 TOTAL, MIN 30" BELOW
GROUND LINE

BOND TO VAULT NO 5
GND GRID

#4/0 AWG BARE Cu GND
RING, 3' BELOW GROUND
LINE

26265 (TYP)
26262 (TYP)
LA: "E-ELEC-DUCT"
26050
26269 (TYP)
26262
26061 (TYP)
LA: "E-ELEC-COND-HIDD"
LA: "E-ELEC-COND"
LA: "E-ANNO-L100"
FONT: "L100" (TYP)
26061 (TYP)
26050

OSTAT/H1
EF1/D2
WP
[P108]
[P105]
[P044]
LCP-WQB
[P037][P040][P041]
SCP-WQB
[P046]
[P042][P043]
[P072]
TANK NO 3 WTR QUALITY PNL
[P074]
[P073]
PB-WQB
DP-WQB
TANK NO 1 WTR QUALITY PNL
TANK NO 2 WTR QUALITY PNL
[P121]
[P034]
[P122]
TX-WQB
EUH1
D1
[P035]
[P123]
[P033]
[P055]
3'-0" MIN
DS-TX-WQB
[P036][P038]
[P039][P076]
(NOTE 1)

POWER AND GROUNDING PLAN

SCALE: 3/4" = 1'-0"

NOTE:

[P036], [P038], [P039], AND [P076] 2-INCH CONDUITS FROM DP-WQB TO PB-WQB VIA T-CONDULET.

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T: 303.628.6000
F: 303.628.6851
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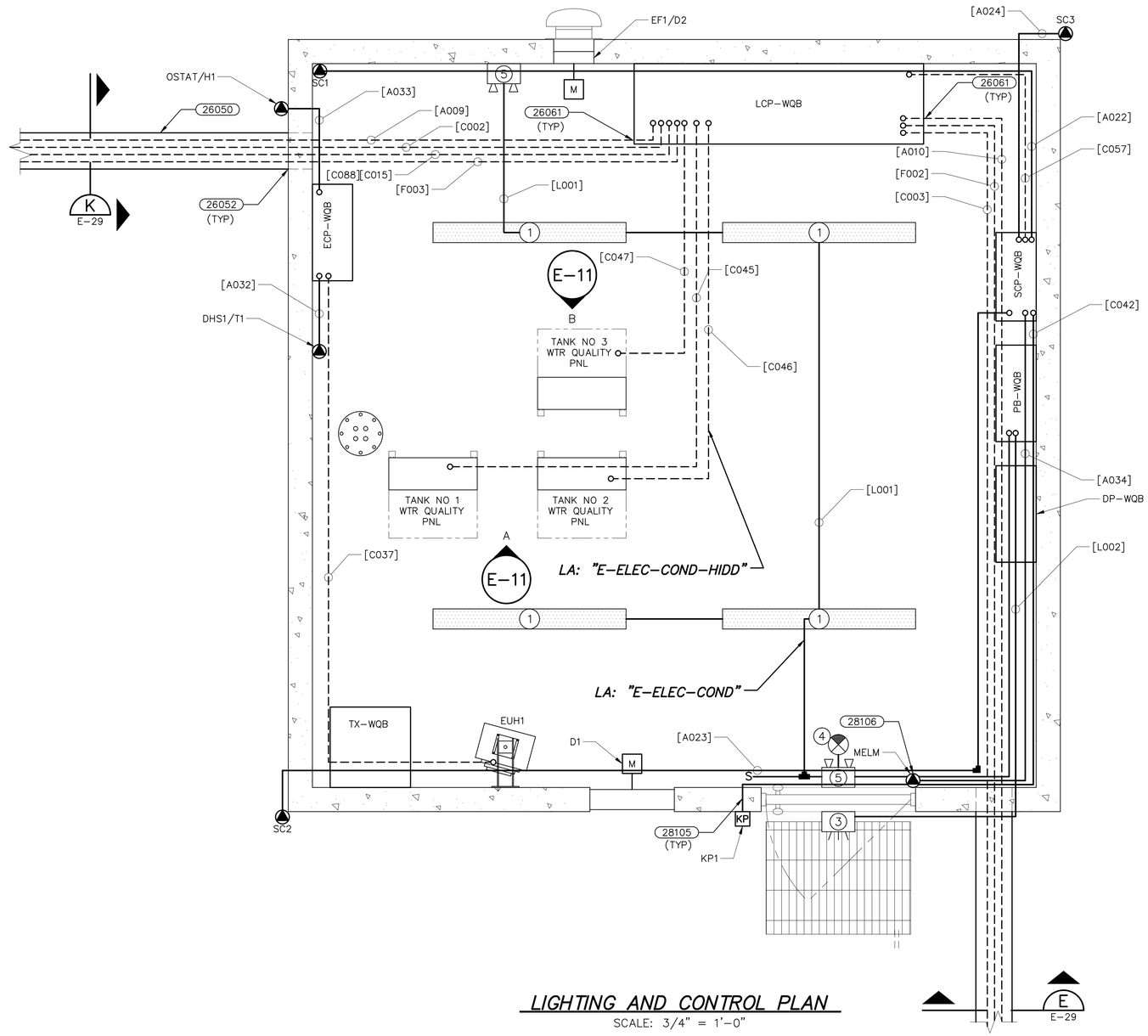
CAPITAL PROJECTS_ELEC PLAN VIEW – POWER & GROUNDING

BLOCKS USED:

- LA: "E-CONT-DEVC"
  DYN BLK: "DIAGONAL-CONNECTION"(3)
- LA: "E-CONT-DEVC"
  BLK: "ELEC_INSTRUMENT-DEVICE-ETC"
- KP — LA: "E-CONT-DEVC"
  BLK: "ELEC_KEYPAD"



LIGHTING AND CONTROL PLAN

SCALE: 3/4" = 1'-0"

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F: 303.628.6851
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CAPITAL PROJECTS_ELEC PLAN VIEW – LIGHTING & CONTROL

Section 6.0

Project Startup

Table of Contents: Section 6.0

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Overview - Section 6.0

Denver Water's CAD Standards establish the minimum requirements on projects prepared by and for Denver Water.

Review this section to determine where files should be saved, and what they should be named within Denver Water's Engineering Division. It is important to understand the type of project being worked on before referring to the specific sections of the CAD Standards. However, a basic fundamental for every project is properly saving data.

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Section 6.1

File Management

Overview - Section 6.1

Within Engineering, each project folder has a set of subfolders that allow the company to share all project-related data in one location. With information housed in one location, Engineers, Admin staff, and CAD Technicians are able to share data with ease. Use the following as a guide to understand a typical project folder structure.

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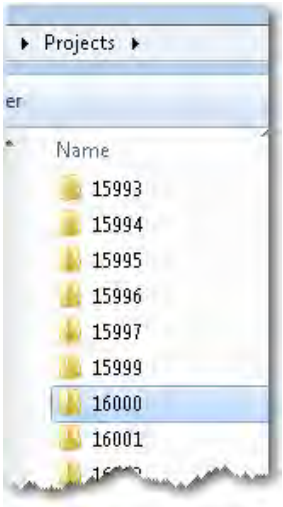
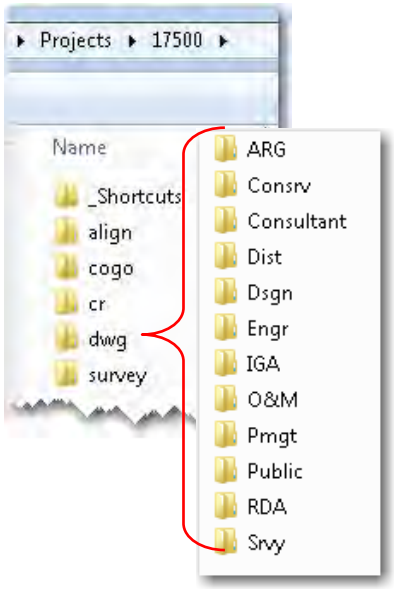
Folder Structure (Internal Use Only)

The project number is assigned through the Project Tracker application and is used to organize the Project's folder structure located on Engineering's server. The numbered folder is considered the "Top Tier" folder for each project:



Located beneath each top tier folder is a substructure that allows the users to properly save data based on their scope of duty. Most data will be saved beneath the *dwg* folders within the appropriate folder:



NOTE: Each subfolder is assigned a specific set of privileges and permissions, if you are missing permissions that are assigned to your group, please open a CAD Helpdesk ticket via Workfront.

Subfolder Definitions

ARG – Project correspondence concerning the Asset Recording Group.

Consrv – Project correspondence concerning the Conservation group.

Consultant – Project design drawings, anything concerning them from external contractors.

Dist – Project design drawings, anything concerning them related to Distribution Engineering.

Dsgn – Project design drawings, anything concerning them related to Design Drafting.

Engr – Project correspondence concerning design.

IGA (Intergovernmental Agencies) - Project correspondence with other government agencies.

O&M – Project correspondence concerning Operations and Maintenance.

Pmgt – Project drawings concerning Easements and Licenses for Property Management.

Public – Project correspondence concerning public.

RDA –As-Built record drawings or any correspondence concerning them.

Srvy – Any drawings or correspondence concerning Survey.

Section 6.2

Naming Conventions

Overview - Section 6.2

To maintain good organization it is important to properly name not only files but also the data located within the files. Each section within Engineering shall follow the same basic naming conventions for CAD related data.

Naming CAD Files

Although all files should be properly placed in their corresponding subfolder, [see *Section 6.1 – File Management*] additional information about what is contained in a particular CAD file can be quickly accomplished by the way that it is named.

Each CAD file shall be named with the PT Number first (PTNO), followed by the group who did the work (DIST, DSGN, PMGT, SRVY). Depending on which group did the work, a brief description of what's in the file may be applicable (BASE for survey files or Civil for Design Drafting/Capital Project work, etc.). Following are a few examples of properly named CAD files:

- ***15000_DIST.dwg*** → *typical Distribution drawing*
- ***16000_SRVY_BASE.dwg*** → *typical Survey drawing for City Pipe projects*
- ***17000_DSGN_G1-G3.dwg*** → *typical Design Drafting drawing for multiple sheets*
- ***18000_PMGT.dwg*** → *typical Property Management drawing*

NOTE: It is important to name files properly at the beginning of a project so that any references in files do not get broken later in the project if the CAD file does get renamed. And always use all CAPS.

Civil 3D Data

The data located within the CAD files shall be named appropriately. It is very useful to name the Civil 3D objects within a drawing as descriptive as possible for usage with Data Shortcuts/References or with later uses such as creating As-Builts. Typical features that should follow a standard naming convention are as follows:

- Alignments
- Pipe Networks
- Surfaces

Sheet Sets

Sheet Sets are saved as .dst files and the names should closely resemble the naming conventions for CAD files. Each .dst file should be named with the PT Number first (PTNO), followed by the group who did the work (DIST, DSGN, PMGT, SRVY), followed by SSM (Sheet Set Manager):

- ***14000_DIST_SSM.dst*** → *typical Distribution drawing Sheet Set*

In Design Drafting the file name should also include the milestone submittal for PDF files, which may resemble the following:

- ***15000_DSGN_SSM-30.pdf*** → *typical Design Drafting PDF 30% Design Sheet Set*
- ***16000_DSGN_SSM-60.pdf*** → *typical Design Drafting PDF 60% Design Sheet Set*
- ***17000_DSGN_SSM-90.pdf*** → *typical Design Drafting PDF 90% Design Sheet Set*
- ***18000_DSGN_SSM-FFC.pdf*** → *typical Design Drafting PDF Final For Construction Sheet Set*

In some cases it is necessary to add a bit more description to the Sheet Set name, which may resemble the following:

- ***19000_DSGN_Conduit_Lining_Repair.dst*** → *non-typical Design Drafting Sheet Set*

Section 7.0

Sheet Set Manager

Table of Contents: Section 7.0

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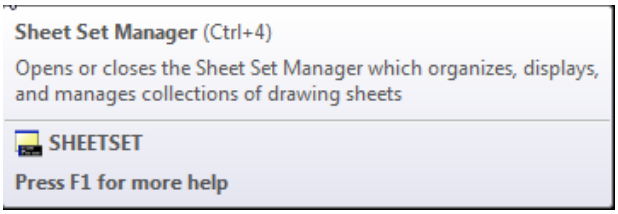
Overview - Section 7.0

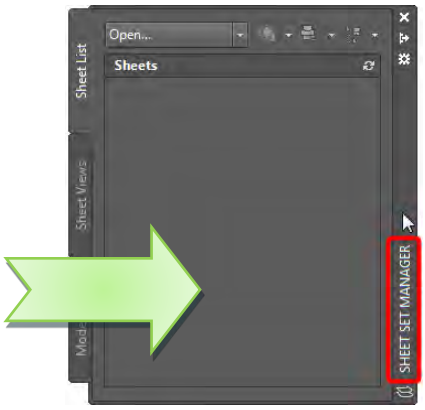
Sheet Set Manager (SSM) is a powerful tool that will ensure consistency with every sheet in every plan set by allowing the End-User to organize, display, edit, and manage drawings all in one location. As a Denver Water Standard, drawings and projects are created using SSM.

Creating a New Sheet Set

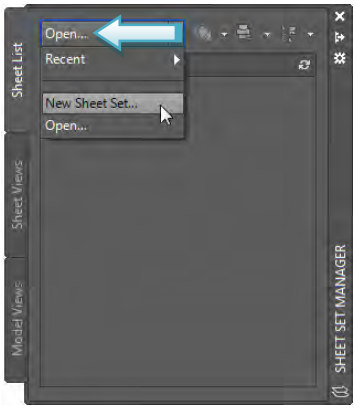
After launching AutoCAD, open the SSM by navigating to the Home tab on the ribbon and selecting the *Palettes* panel pull-down menu, be sure that an existing project is open:

In the expanded *Palettes* panel, click the *Sheet Set Manager* icon (resembles a rolled set of plans); this will launch the SSM Palette:



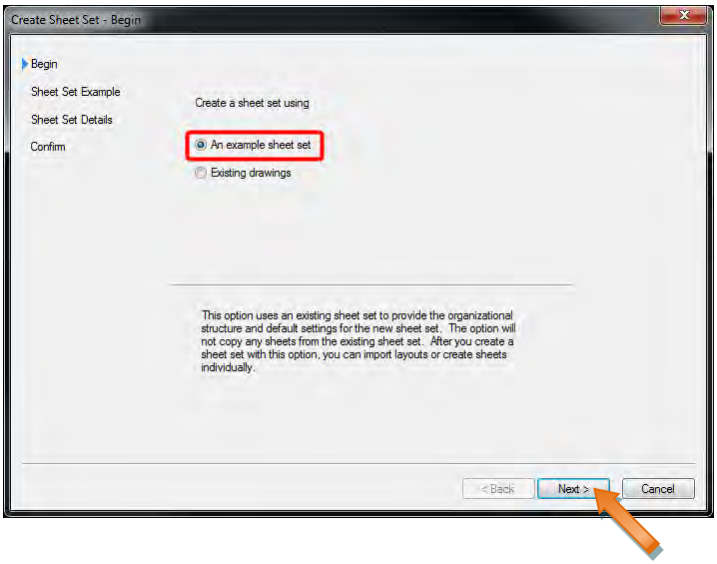


To create a new *Sheet Set*, select the *Open…* pull-down menu and choose *New Sheet Set…*:



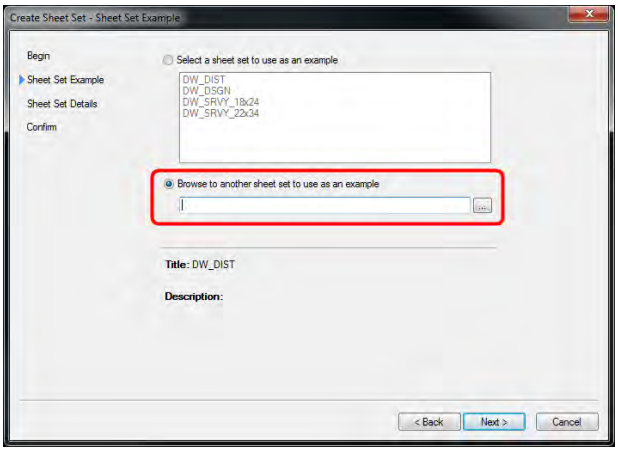
NOTE: An existing Sheet Set can be opened from this location as well.

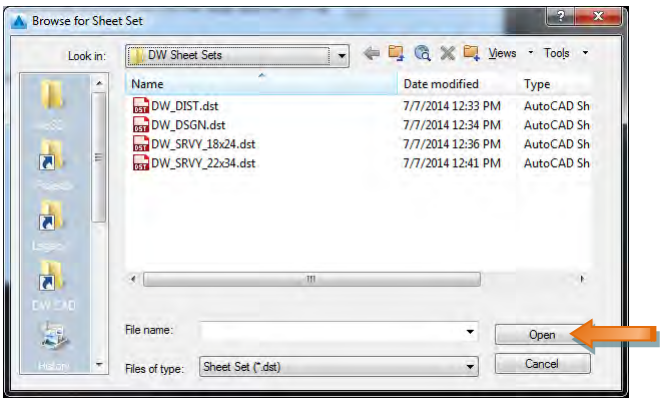
The *Create Sheet Set – Begin* dialog box will appear. To create a new Sheet Set linked to DW's title blocks, choose the *An example sheet set* option the click <Next>:



NOTE: Each .dst file has slightly different Custom Properties. Use only the approved .dst's with DW title blocks.

The *Create Sheet Set – Sheet Set Example* pop-up window will appear. Choose the *Browse to another sheet set to use as an example* option.





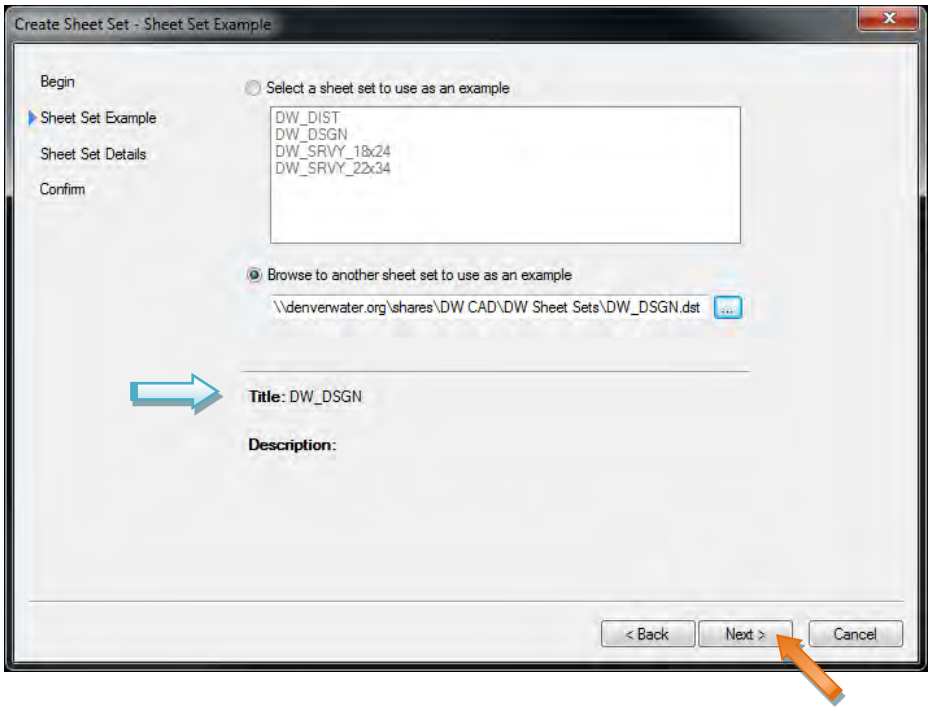
Internal Tip: Pathing

Example Sheet Sets can be found here: *\\denverwater.org\shares\DW CAD\DW Sheet Sets*

Always use full server paths.

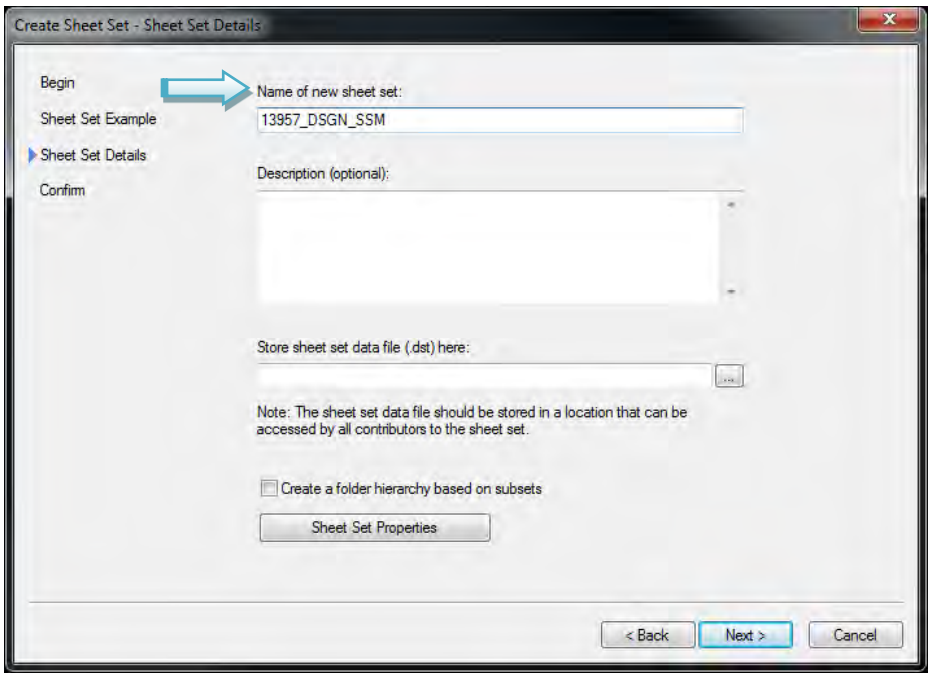
Using the ellipsis button browse to the network location where the template Sheet Set files (.dst) are saved; choose the appropriate .dst file from the list and click <Open>:

The *Create Sheet Set – Sheet Set Example* pop-up window will reappear (notice that the *Title* has been populated with the previously chosen .dst), click <Next>:



The *Create Sheet Set – Sheet Set Details* pop-up window will appear. The following is a break-down of each step to take from this window.

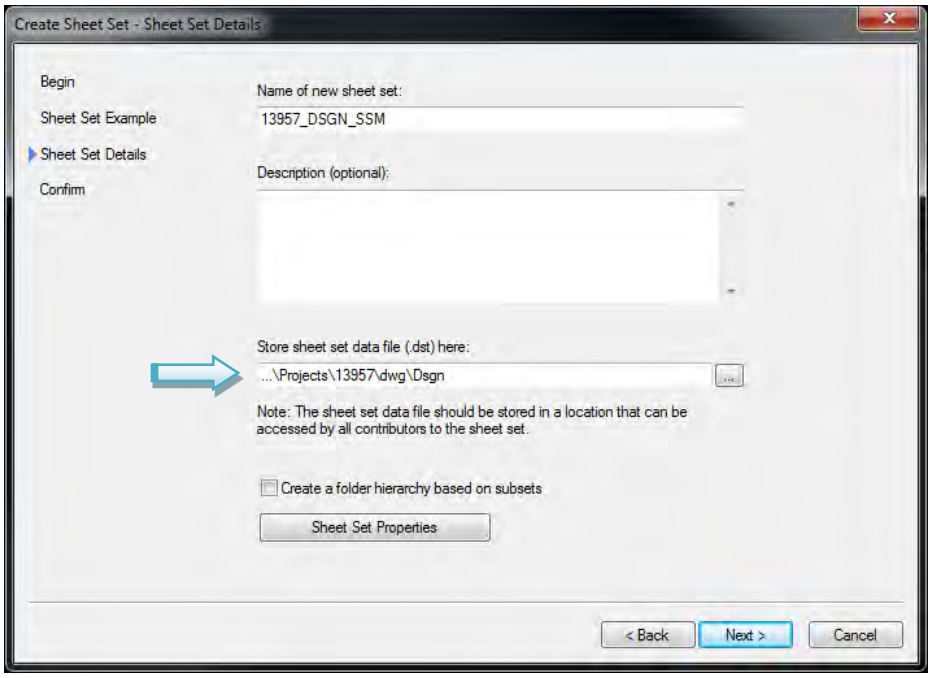
Name of new sheet set: [see *Section 6.2 – Naming Conventions*] for proper naming format:



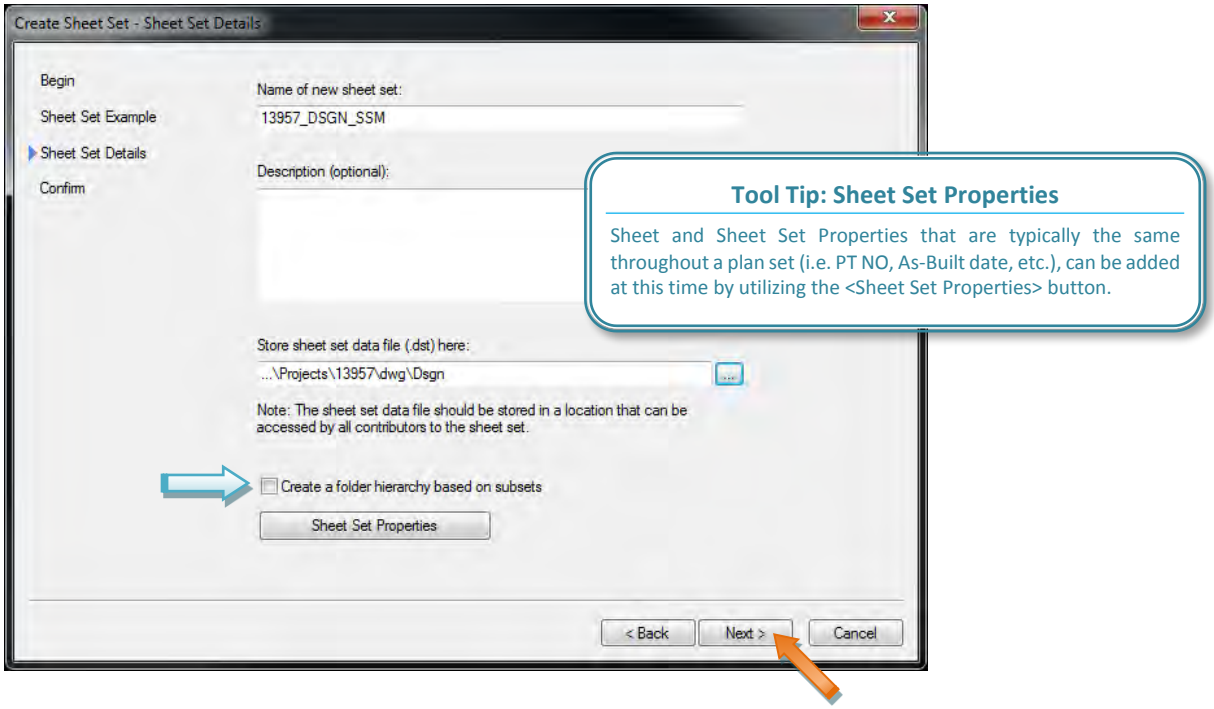
Description (optional): this is to be filled out at the end-user's discretion.

Store sheet set data file (.dst) here: each group working on a project will have a .dst file that will reside in their respective folder [see *Section 6.1 – File Management*].

Using the ellipsis button  , browse to the network project location where the .dst file will be saved (this example shows a Design Drafting project):

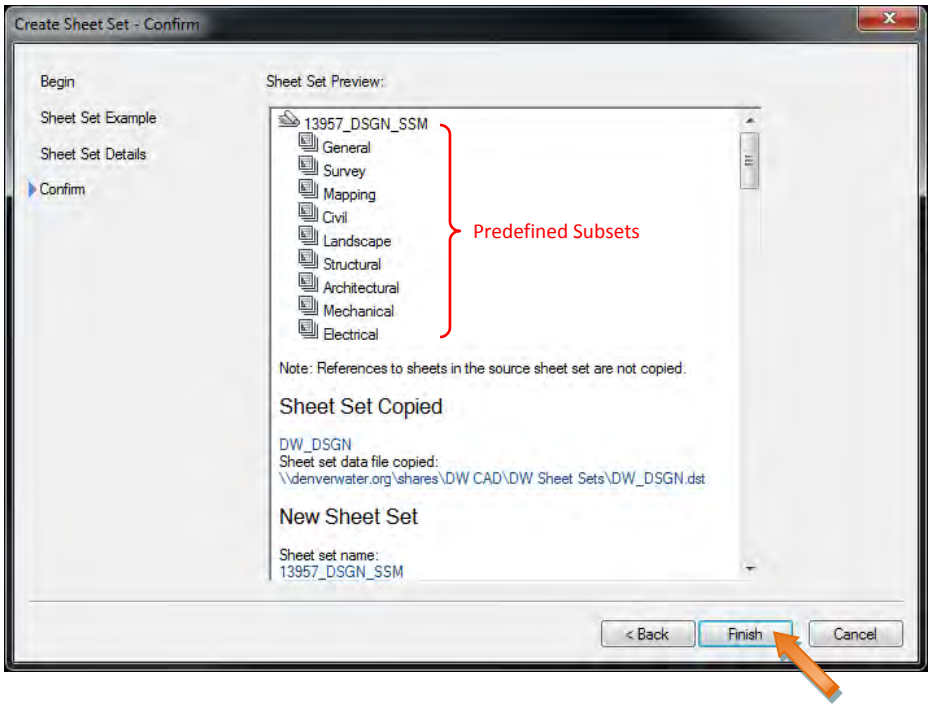


The *Create Sheet Set – Sheet Set Details* pop-up window should resemble the example below, click <Next>:

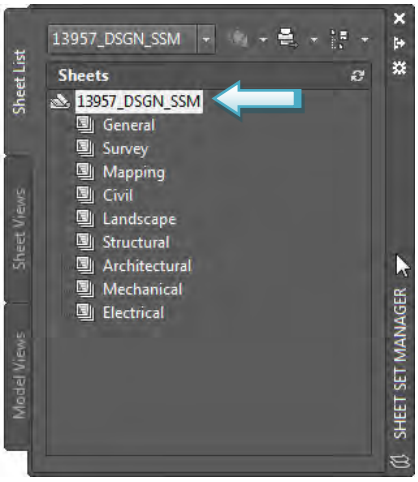


NOTE: Always uncheck the *Create a folder hierarchy based on subsets* option.

The *Create Sheet Set – Confirm* pop-up window will display a list of information pertaining to the newly created Sheet Set. The order of the predefined Subsets, contained within each of DW's .dst's, are based on the National CAD Standards V5 (NCS); review all information, then click <Finish>:

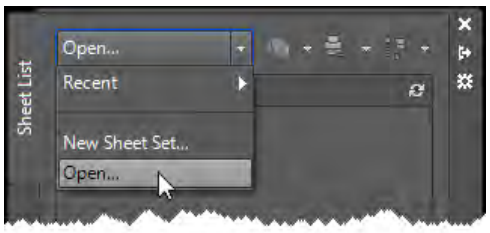


The SSM Palette will now resemble the example below, note the newly created .dst name is now displayed:



Opening and Closing Sheet Sets

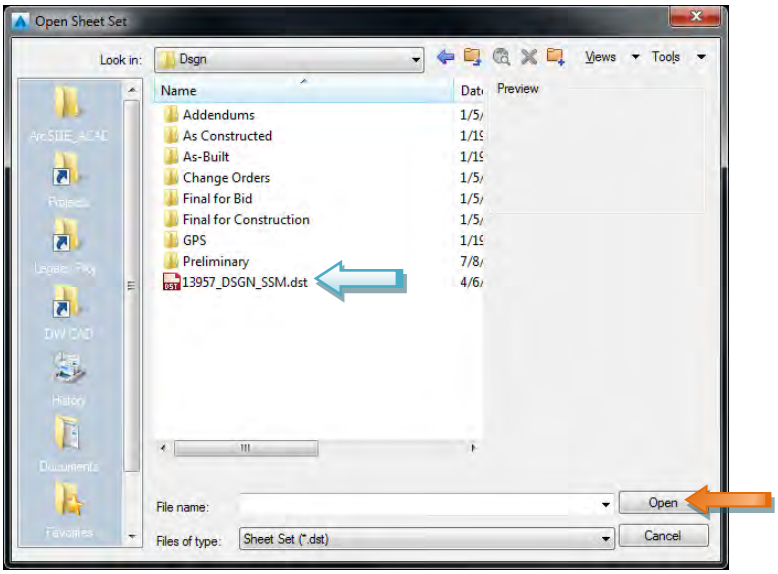
Sheet Sets (.dst) and drawings (.dwg) exist independently of one another, meaning one may be opened without the other being open. To open a .dst, click the *Open…* pull-down menu and select *Open…* from the list:



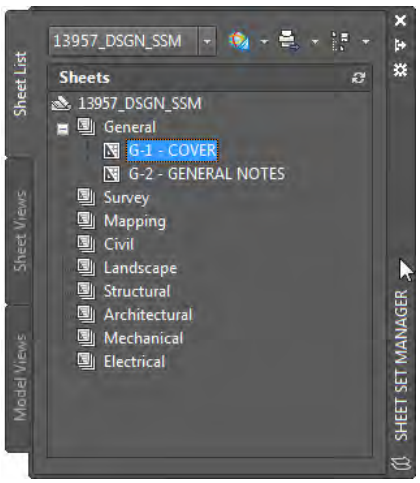
Tool Tip: Opening

Simply opening a Sheet Set does not automatically open any related drawings. Alternately, opening the drawings related to a Sheet Set does automatically open the Sheet Set (seen in the SSM Palette).

The *Open Sheet Set* pop-up window will appear, browse to the appropriate project folder and select the .dst, then click <Open>:

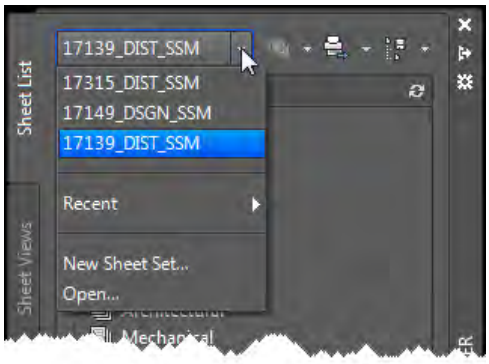


The selected .dst will now be open, listing all sheets that have been added up to this point. Keep in mind that a .dwg has not been opened yet. Double-click the desired sheet to open the .dwg:



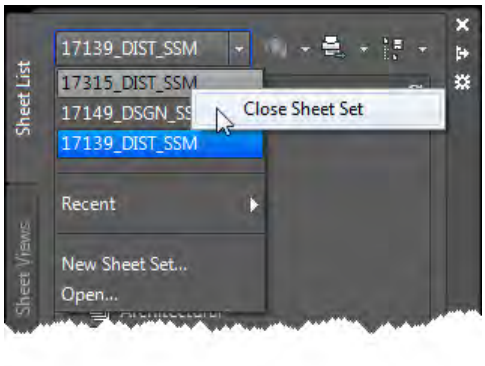
NOTE: Predefined subsets not in use can be removed, it is easy to add them again later if necessary. Please keep the Sheet Set tidy, in the correct order and current.

It is important to remember that multiple .dst's can be open at once. To view the list of currently open .dst's, click the *Open* pull-down menu:



Closing Sheet sets

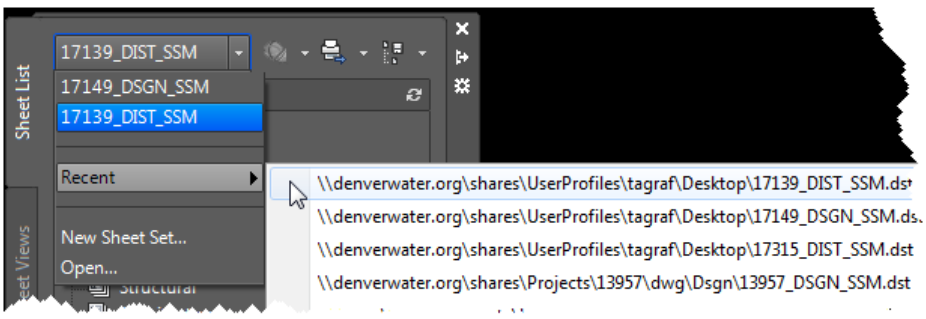
From the *Open* pull-down menu, right-click on the desired Sheet Set's name, and choose *Close Sheet Set*:



NOTE: Closing the SSM Palette does NOT close opened Sheet Sets. The Sheet Set highlighted in blue is the active one.

Recent Sheet Sets

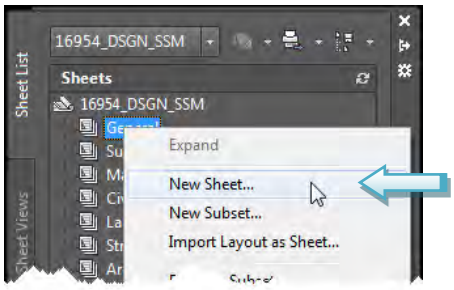
The SSM Palette retains a list of the 10 most recently opened .dst files; instead of using the browsing method select Recent from the Open pull-down menu, and then choose a .dst from the list:



New Drawings (Creating New Sheets)

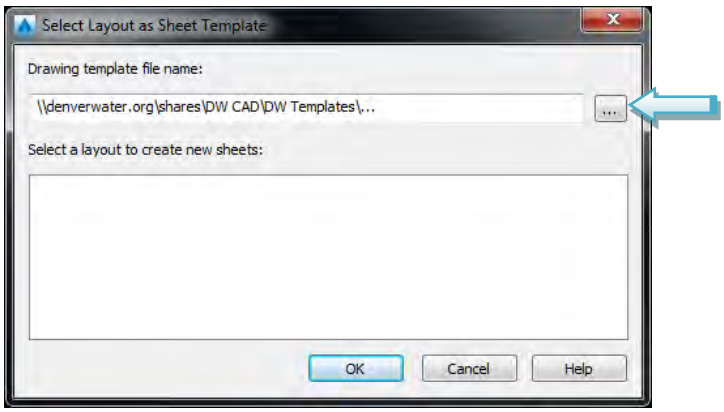
All new sheets and drawings shall be created using the following method.

In the SSM Palette, right-click on the desired subset (General, Survey, Mapping, Civil, etc.) and select *New Sheet…*:

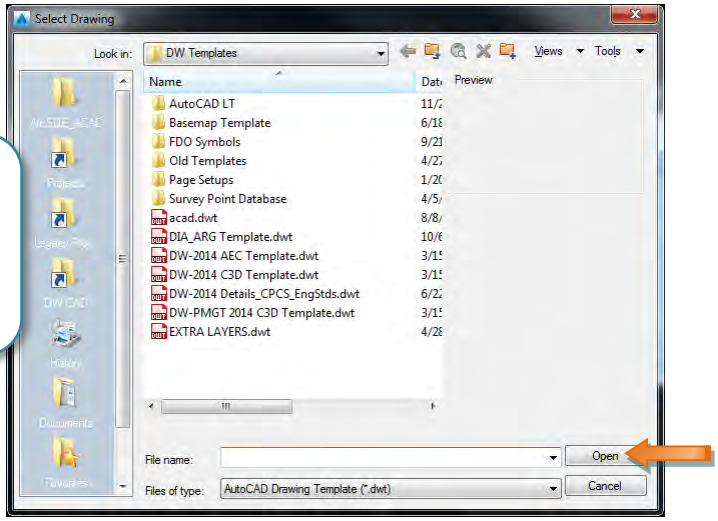


Selecting a Template

If the *DW_DSGN.dst* was initially picked to create the Sheet Set, the *Select Layout as Sheet Template* pop-up window will appear. Using the ellipses button, browse to the network location where the drawing templates are stored (*DW CAD\DW Templates*):



In the *Select Drawing* dialog box choose the appropriate drawing template, based on the scope of work [see *Section 10.0 – DWT's Drawing Templates*]. Click <Open>:

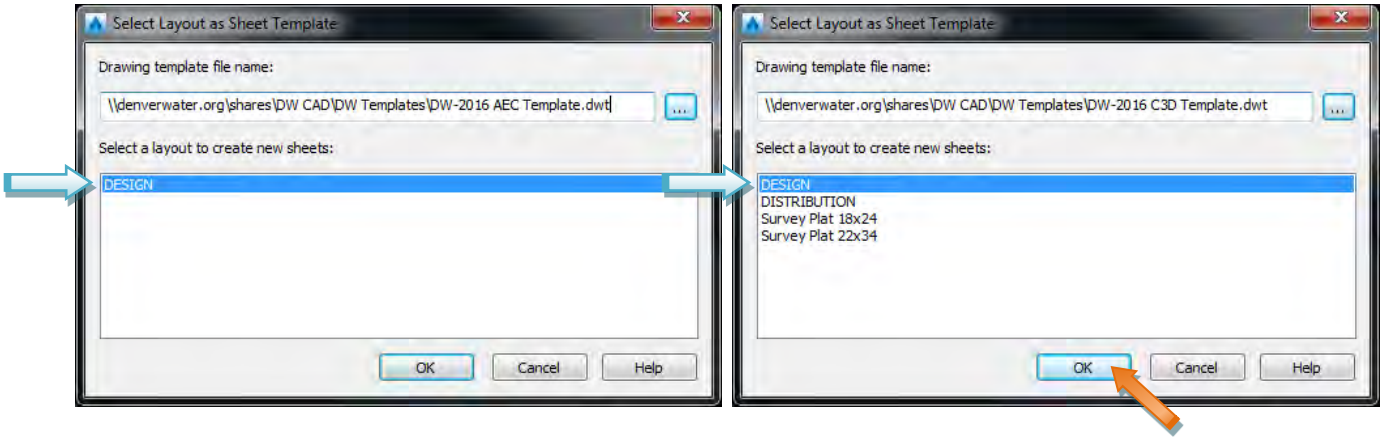


Internal Tip: Choosing A Template

Only one of 2 templates will be picked in this step:

- DW-2016 AEC Template.dwt
- DW-2016 C3D Template.dwt

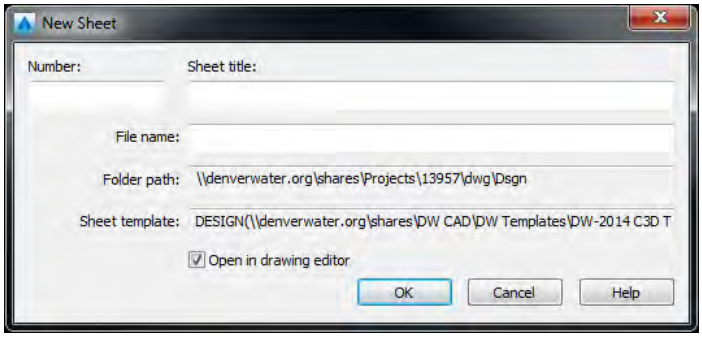
The *Select Layout as Sheet Template* pop-up window will reappear, always choose the DESIGN layout in the *Select a layout to create new sheets* list (for both templates), click <OK>:



The *New Sheet* pop-up window will appear. Complete the *Number*, *Sheet title*, and *File name* fields; see Explanation of New Sheet dialog below.

Tool Tip: "File"

Anytime the word "file" is used it typically refers to the creation of something with an extension (.dwg, .dst, .dwf, etc.)



Explanation of New Sheet dialog:

Number

Applies to most title blocks for Capital Projects; this is specific to each subset. For example, General sheets will be G-1, G-2, G-3, etc., Civil sheets will be C-1, C-2, C-3, etc.

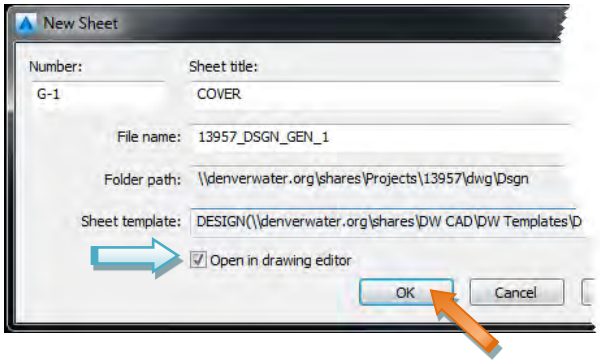
Sheet title

Specifies the drawing title within the title block:

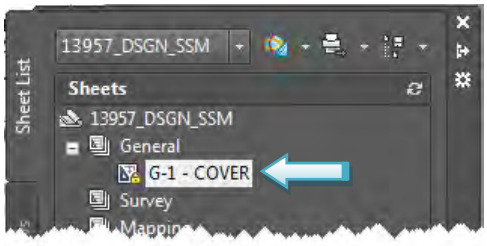
File name
Specifies the name of the new AutoCAD drawing (.dwg) and names the layout tab in the new drawing. By default, the *File name* is a combination of the *Number* and *Sheet title* fields. The end-user shall change the *File name* to reflect proper naming convention [see *Section 6.2 – Naming Conventions*]:

NOTE: To change the layout name see *page 7.0-15, Using Rename & Renumber*.

The *New Sheet* pop-up window should resemble the example below. Make sure *Open in drawing editor* is checked, and then click <OK>:



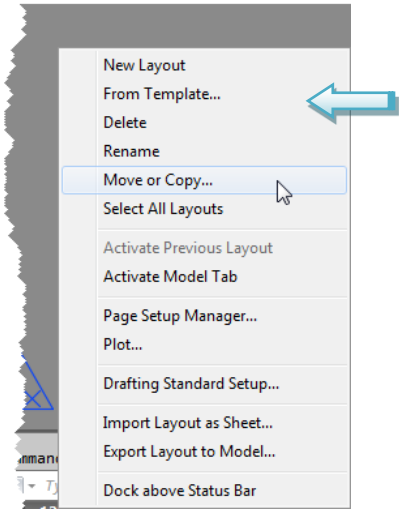
The *New Sheet* will now appear in the SSM Palette:



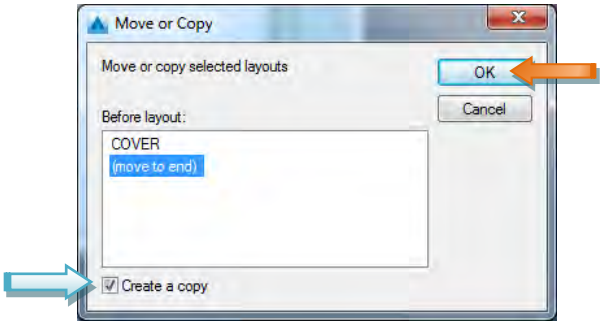
Adding multiple tabs (Sheets)

Most projects will require multiple sheets (Paper Space layout tabs). Generally, drawings (.dwg) will be created and named based on the discipline. Utilize multiple layout tabs within a single drawing to group accordingly. In order to keep file sizes manageable, limit layout tabs to 10 or less per drawing. If more tabs are needed, create a new drawing.

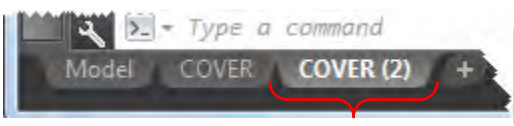
To create an additional layout tab, right-click on the existing layout tab and select *Move or Copy…*:



In the *Move or Copy* pop-up window, highlight the desired order from the *Before layout* list - *(move to end)* is typical - and make sure the *Create a copy* box is checked, then click <OK>:



The new layout tab is a copy of the original. The new layout tab will have the same name as the copied layout with a number in parentheses added at the end:



Newly created Layout tab

Tool Tip: Renaming Layouts

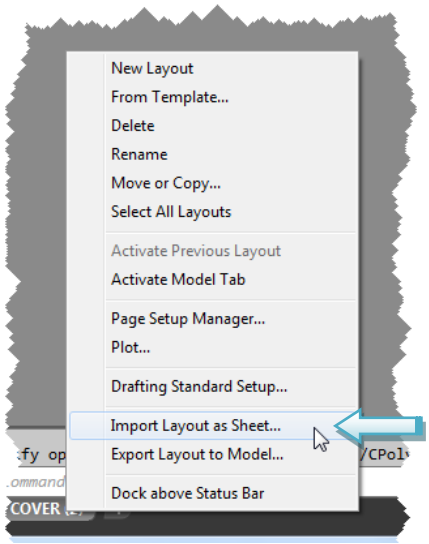
Simply double-click a Layout to rename it prior to adding it to *Sheet Set*.

NOTE: The new layout will need to be renamed and added to the Sheet Set; subsequent steps will outline this process.

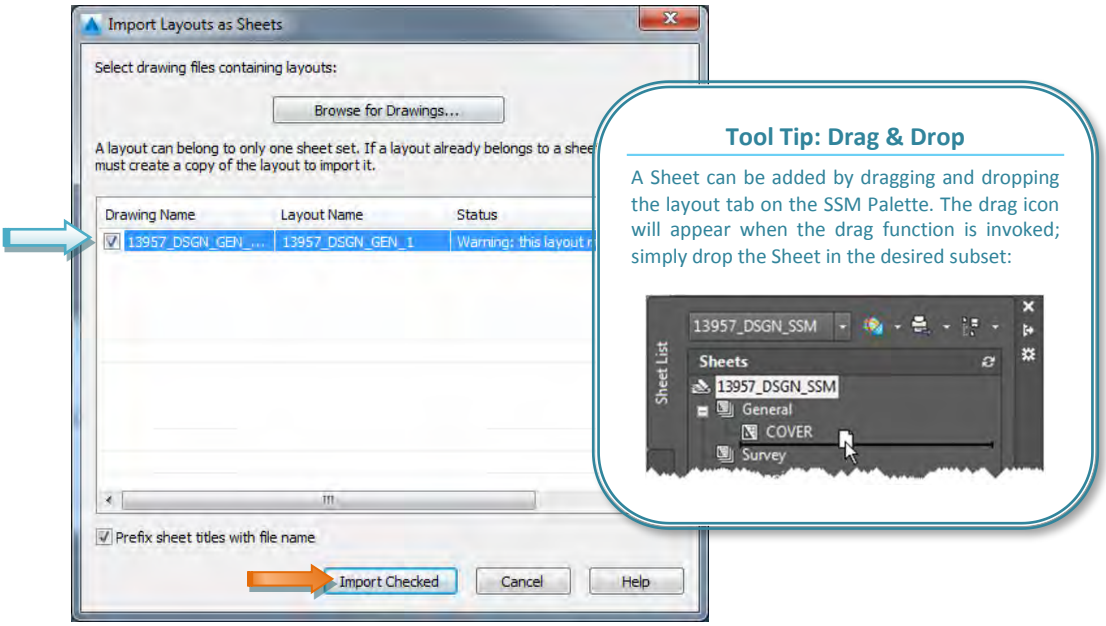
Adding Sheets to a Sheet Set

The opened drawing must be saved before proceeding.

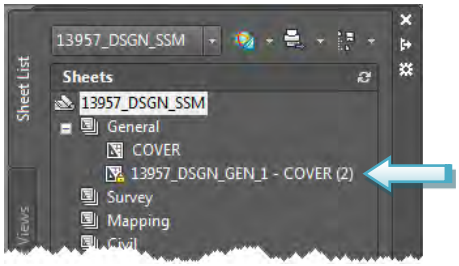
To add a Sheet (layout tab) to a Sheet Set, right-click on the desired layout tab and select *Import Layout as Sheet…*:



The *Import Layouts as Sheets* pop-up window will appear. From the provided list, select the desired Layout(s), click <Import Checked>:



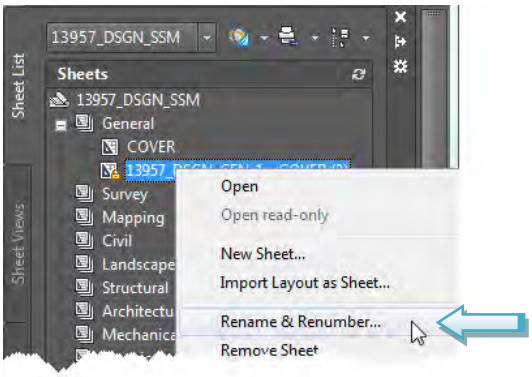
The layout will now be added to the active *Sheet Set*:



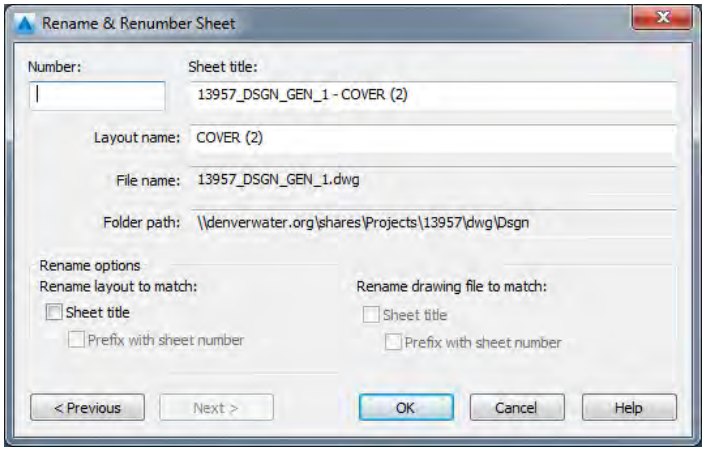
Using Rename & Renumber

Once new sheets have been added to the *Sheet Set*, they will need to be renamed and renumbered based on previous sheets.

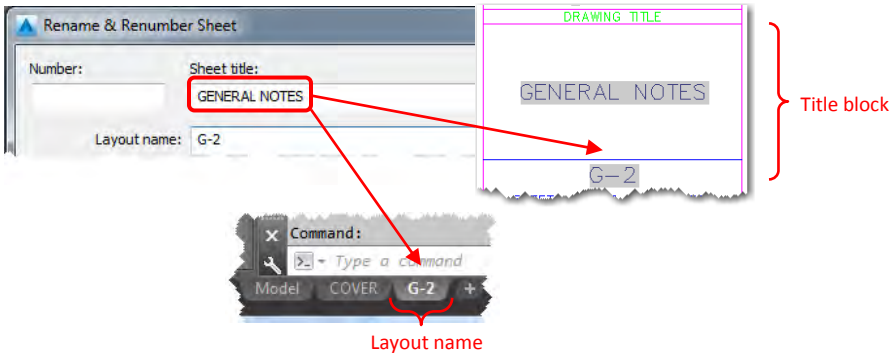
In the SSM Palette, right-click on the desired Sheet and select *Rename & Renumber…*:



The *Rename & Renumber Sheet* pop-up window will appear; it will resemble the *New Sheet* dialog box from previous steps. [See *page 7.0-11 - Explanation of New Sheet dialog*]:

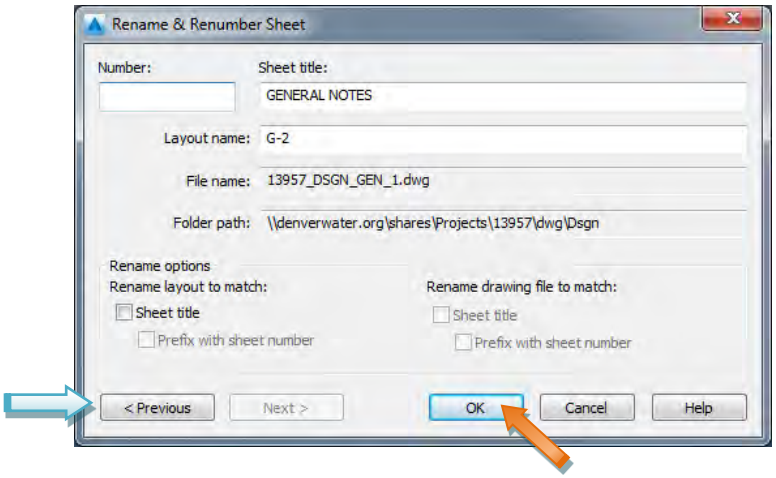


After filling in the *Number* and *Sheet title* fields, the Layout name will need to be defined:

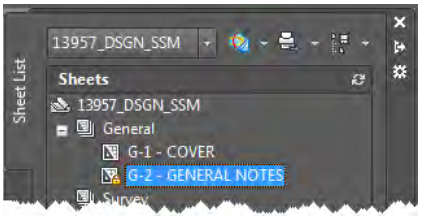


NOTE: Run the REGEN command after updating Sheet Set Properties in order for them to display.

If multiple sheets are to be updated, utilize the <Previous> and <Next> buttons. Click <OK> once editing is finished:



The updated sheet will now appear in the SSM Palette:

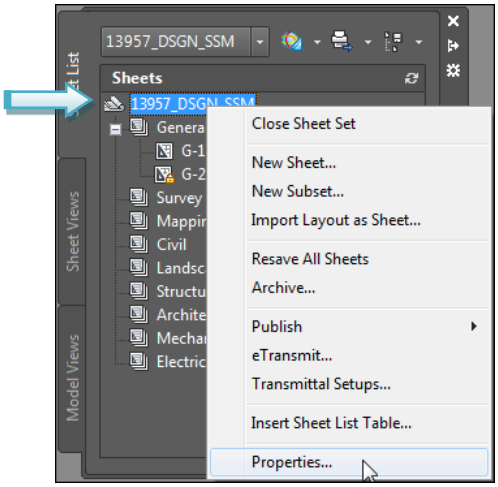


Editing Custom Properties

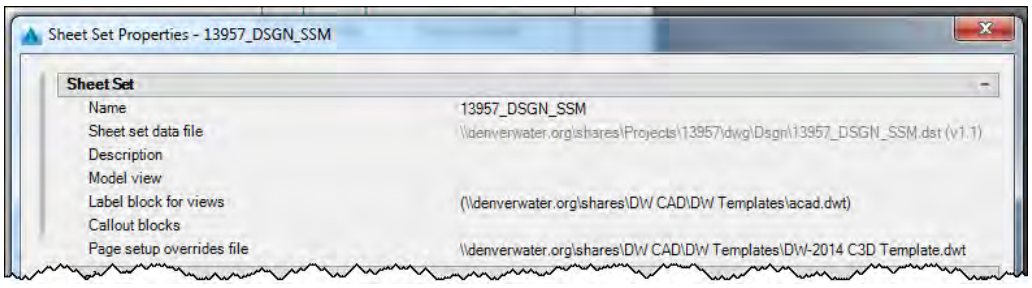
There are two types of custom properties, Sheet and Sheet *Set*. Be mindful of which custom property is being edited; Sheet custom properties are on a sheet-by-sheet basis, Sheet *Set* custom properties are applied to entire sheet set.

Custom properties in the predefined .dst files have been designed to update the title block information within the drawings created using the newest 2016 DW templates. Fields are used to allow the linking of title blocks and Sheet Sets, these fields are easily spotted by the gray "highlight" behind the text:

To access the custom Sheet *Set* Properties, right-click on the Sheet Set name on the SSM Palette, select *Properties…*:

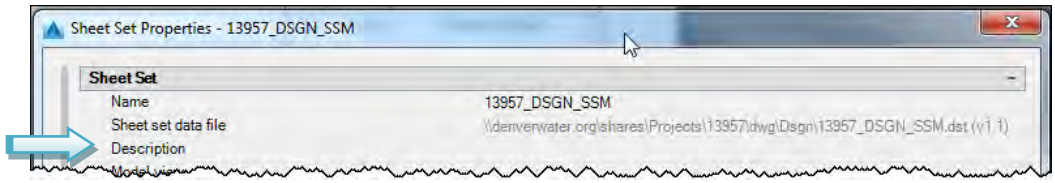


The *Sheet Set Properties – {DST NAME}* pop-up window will appear:

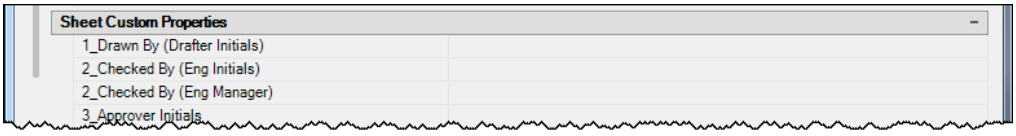


Sheet Set Properties

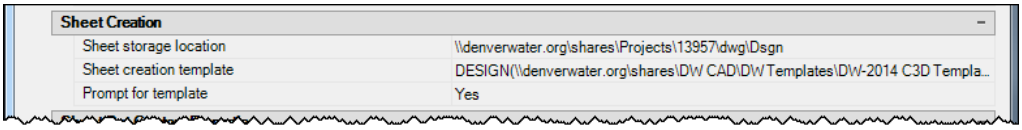
Sheet Set
This section will likely be filled in already. The Description can be added at this time if it hasn't already been added (optional):



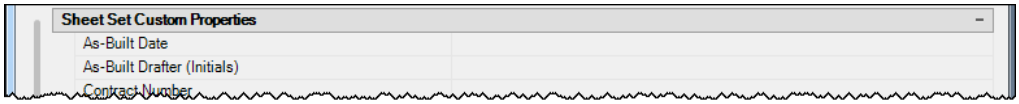
Sheet Custom Properties
These are sheet-by-sheet default settings and will only apply to new sheets; if there are existing sheets in the Sheet Set they will not update. Use this location to update information that will remain the same each time a new sheet is created, otherwise edit these properties per sheet:



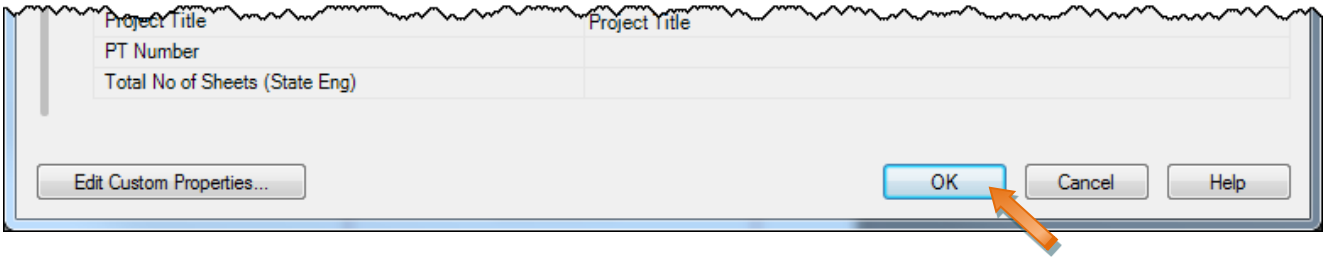
Sheet Creation
Sheet storage location → where the user can define where the Sheet Set is located if it has not been done already. Sheet creation template → does not need to be changed; it specifies the layout tab to be used from the AutoCAD template drawing:



Sheet Set Custom Properties (project information)
This section contains the global settings for the entire sheet set; fill in all applicable fields. All fields have been linked to the title blocks:



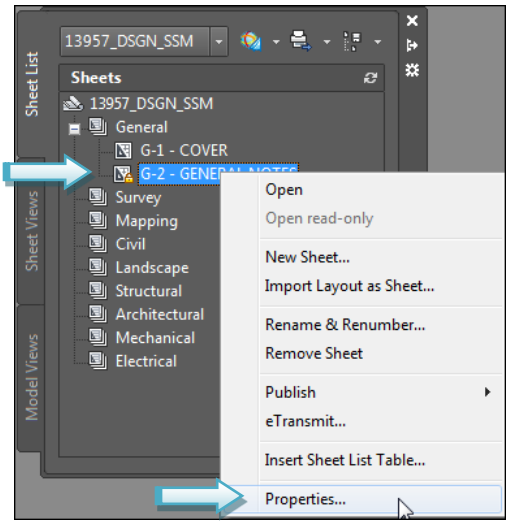
Once all fields have been updated, click <OK>:



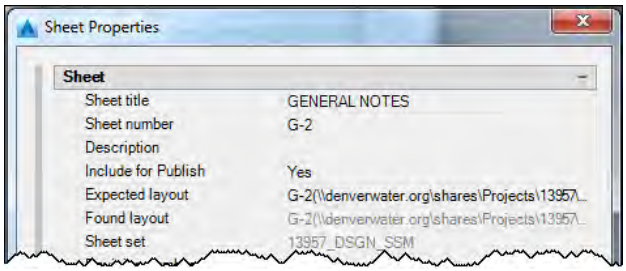
Sheet Properties

As stated previously, there are two types of custom properties: Sheet and *Sheet Set*.

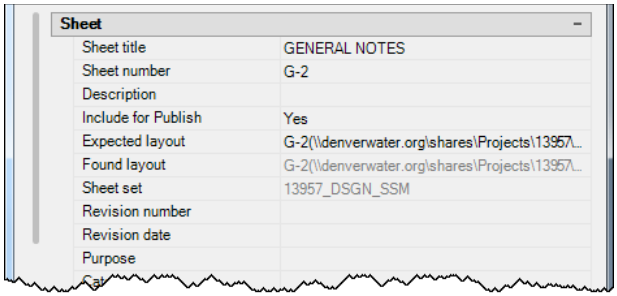
To access the Sheet Properties, on the SSM Palette, right-click on the Sheet name and select *Properties…*:



The *Sheet Properties* pop-up window will appear:



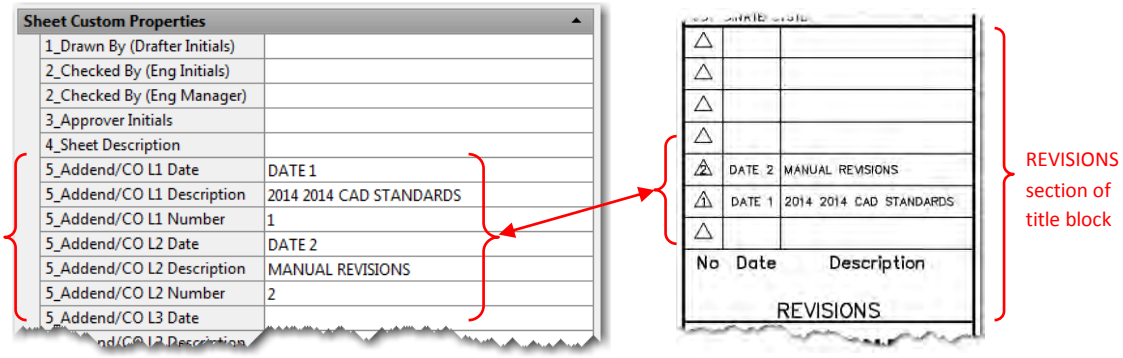
Sheet
Information in this section should not need to be revised, only reviewed:



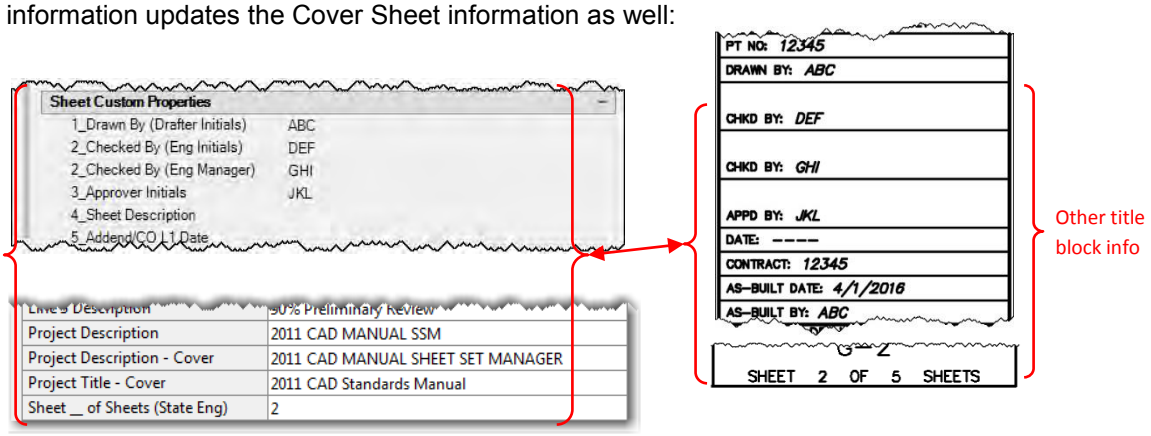
Sheet Custom Properties

Each custom property correlates with a section of the title block. Read on for an overview of each set of the custom properties. The examples given here may be slightly different based on the .dst chosen.

Addend/CO Date, *Description*, and *Number* will update the REVISIONS section of most DW title blocks. Revisions are ordered from bottom to top within the revisions block and should only be filled in after a project has been through review:



The remainder of information shall be filled out as a project progresses and information becomes relevant, some information updates the Cover Sheet information as well:

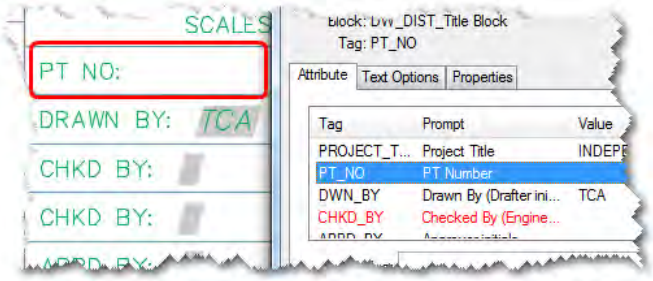


NOTE: *Drawing Number* and *Drawing Title* are automatically created when a *Rename & Renumber* is performed for layout tabs; there is no need to fill in these values here.

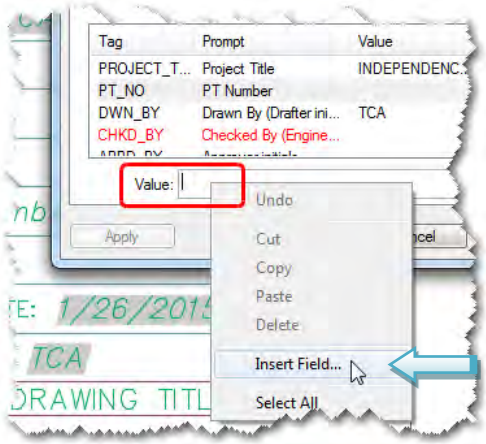
Troubleshooting Fields

If by chance a field does get "broken" or comes up missing, it will need to be manually added back, this will be an exception to double-click editing the title block.

In this example the *PT NO:* field was removed; to add it back, double-click on the title block to launch the *Enhanced Attribute Editor*:

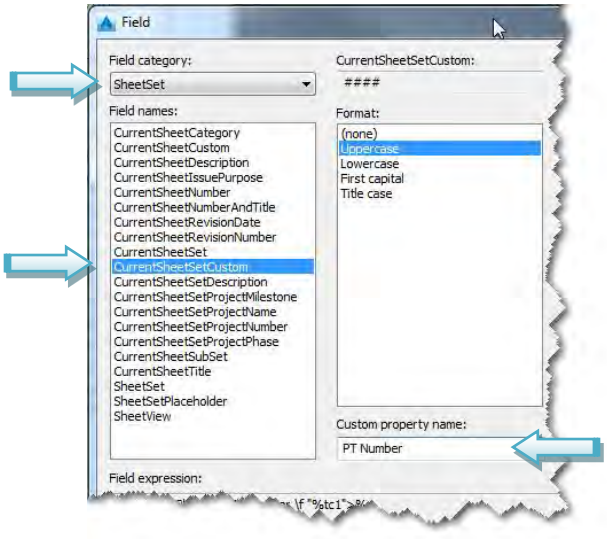


Right-click in the *Value* line and select *Insert Field…*:



The *Field* pop-up will appear, choose the appropriate settings to add the desired field back. This example shows how to restore a Sheet Set field for the PT NO; the following settings have been modified:

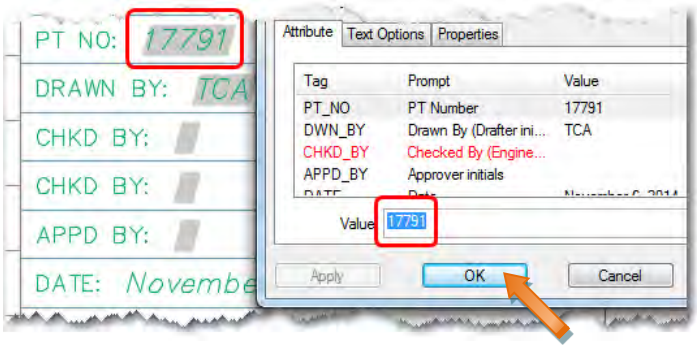
- **Field category:** *SheetSet*
- **Field names:** *CurrentSheetSetCustom*
- **Custom property name:** *PT Number*



Tip: Field names

Choose either *CurrentSheetCustom* or *CurrentSheetSetCustom* depending on which type of property needs to be restored.

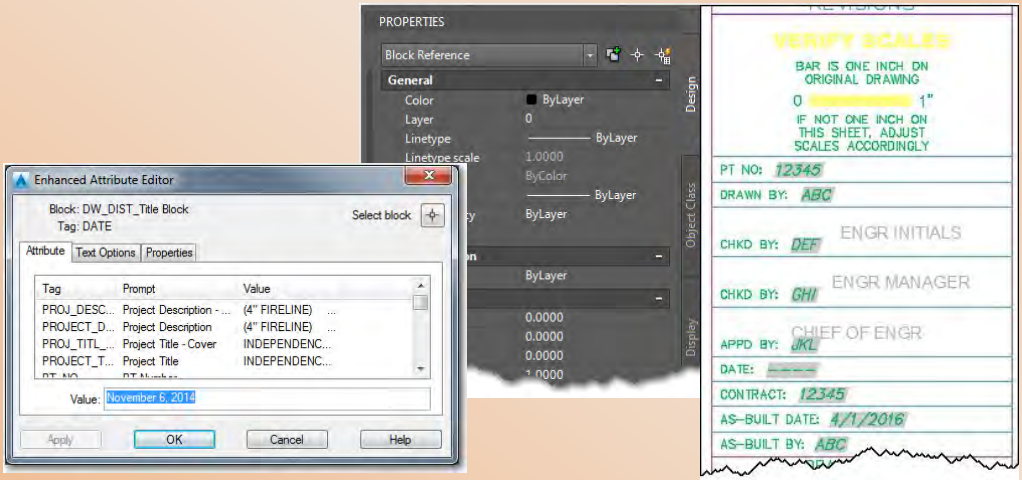
The restored field (PT NO in this example) will now appear in the title block (not current) and *Attribute Editor*; click <OK> once finished:



ATTENTION

In order to maintain the connection to the Sheet Set Properties, the fields must remain; keep these two rules in mind when modifying the title block:

- DO NOT modify the Title Block by double-clicking into the Attribute Editor
- DO NOT use the Properties palette to modify the Title Block attributes



Section 7.1

Archiving with Sheet Set Manager

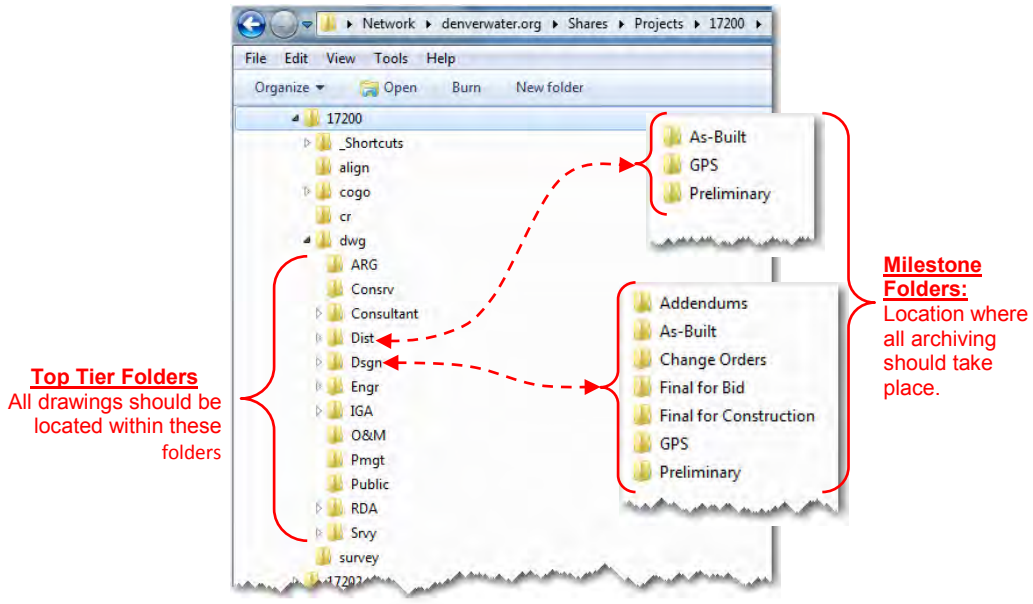
Overview - Section 7.1

Projects shall be archived to maintain a snapshot in time at every project milestone. In **Design Drafting**, a milestone is considered *Preliminary*, *30%*, *60%*, or *90%* reviews, *Final for Bid*, *Final for Construction*, or *As-Built*. In **Distribution Drafting**, a milestone is considered the point when a project goes to Construction (Preliminary/Proposed) and then to As-Built. In the past, drawings have been moved from folder to folder or a "Save-As" was performed as a project progressed. Now with the use of Sheet Set Manager (SSM) this is no longer the case.

Drawing and File Location

Project drawings created with SSM should reside in the top tier folder for each group; in the same location as the Sheet Set [see *Section 7.0 – Sheet Set Manager*]. The archived files, which will be .zip files, will be placed in the folders that correspond with each milestone.

For example, all Design Drafting drawings should be located in the *Dsgn* folder; and all Distribution drawings in the *Dist* folder. The archived files will be placed in the proper subfolders indicating each milestone:



NOTE: If folders are missing within the project folder, please contact TSS to get them added.

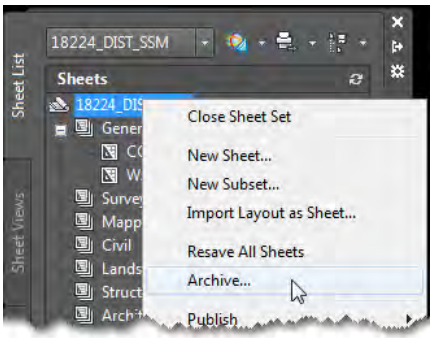
Naming Files

All files shall follow the proper naming conventions [see *Section 6.2 – Naming Conventions*]. Archived file names will contain the description of the milestone:

- ***15053_DSGN_SSM_30.zip*** → Example of archived file name for Design Drafting Preliminary 30% submittal
- ***15053_DIST_SSM_PRE.zip*** → Example of archived file name for Distribution Preliminary/Proposed design

ARCHIVE

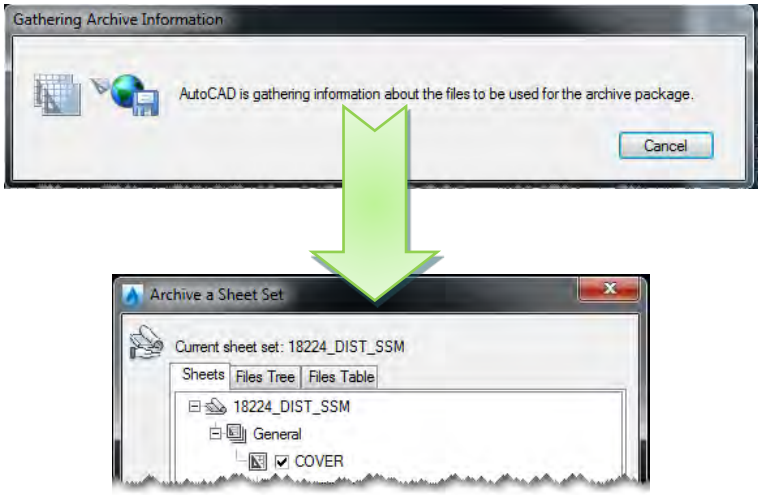
In the SSM, right-click on the Sheet Set name and select *Archive*…:



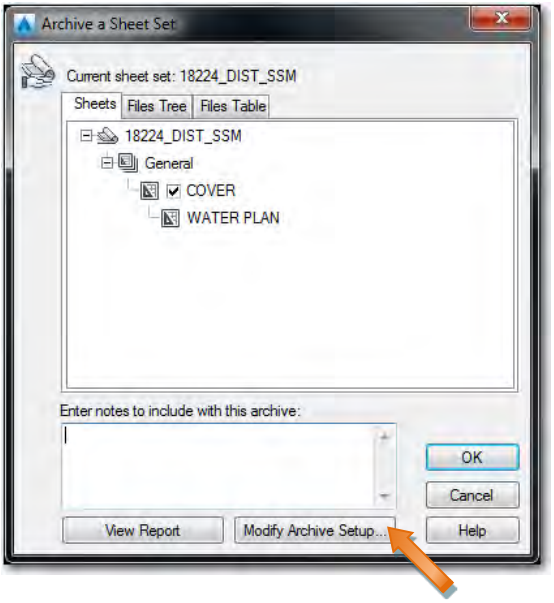
Tool Tip: Save Files

All OPEN files must be saved before an Archive can be performed.

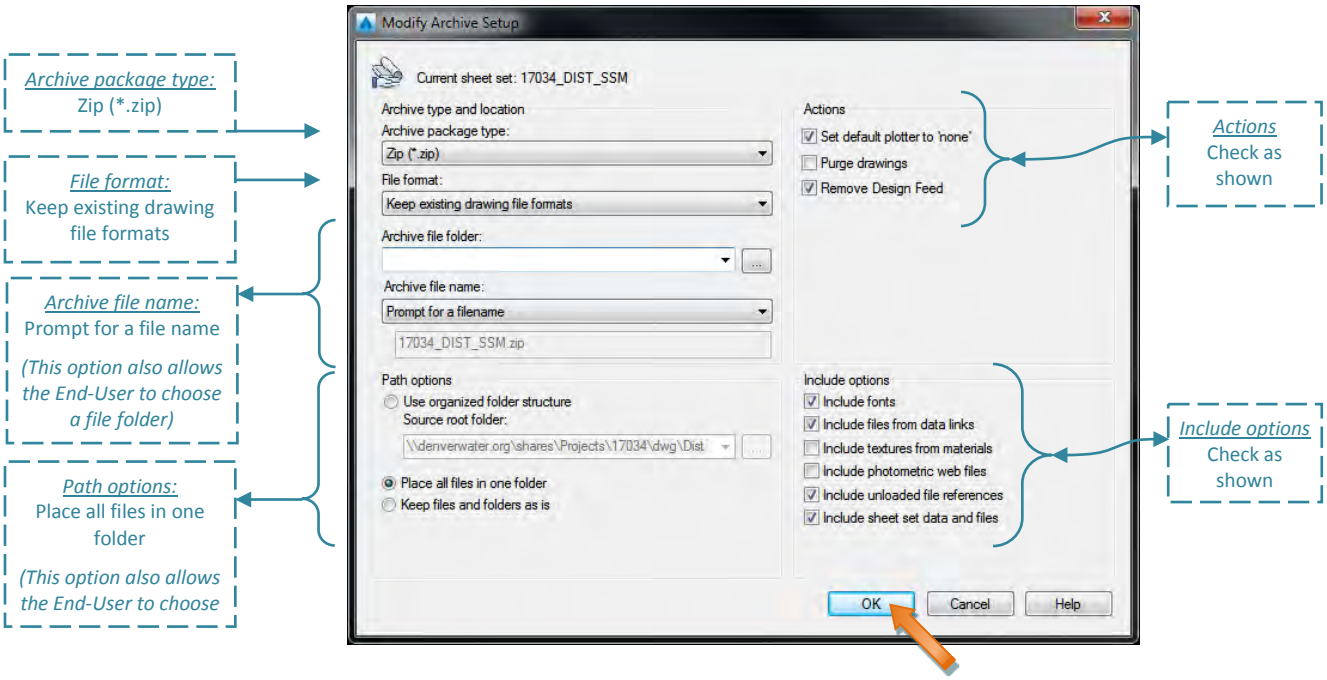
The *Gathering Archive Information* pop-up window will briefly appear, followed by the *Archive a Sheet Set* pop-up window:



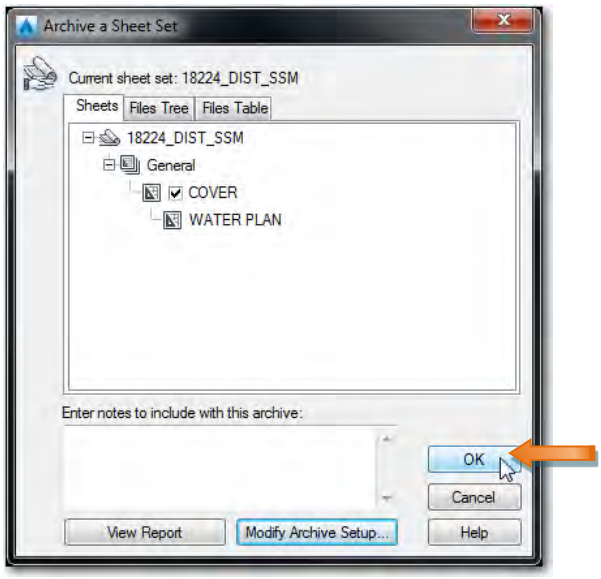
Once all information has been reviewed, click the <Modify Archive Setup…> button:



The *Modify Archive Setup* pop-up window will appear; review and make sure all settings follow the example below, click <OK> once finished:

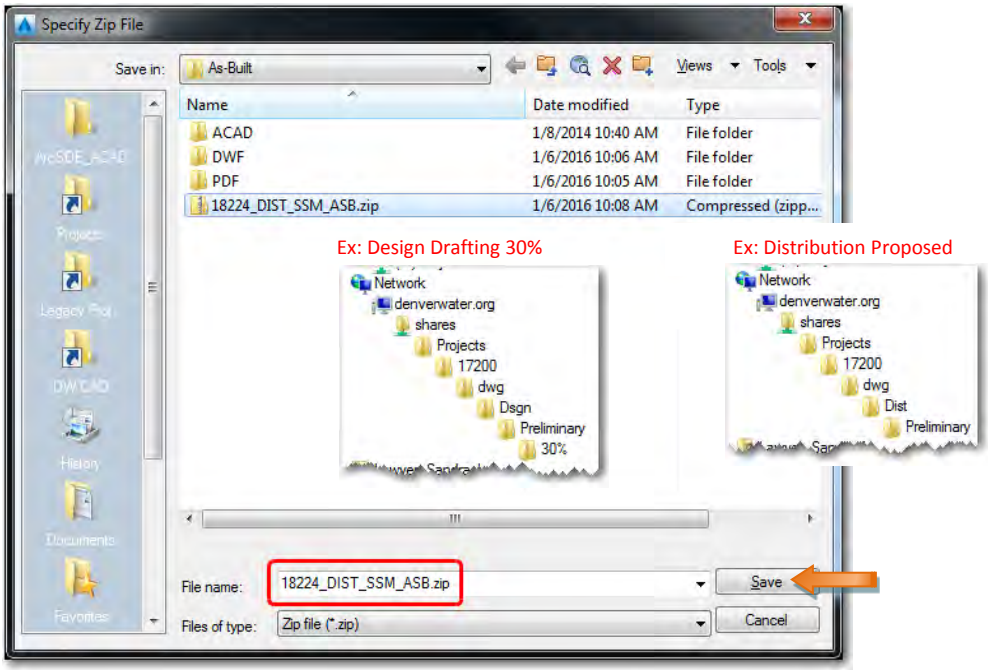


The *Archive a Sheet Set* dialog box will reappear, click <OK>:



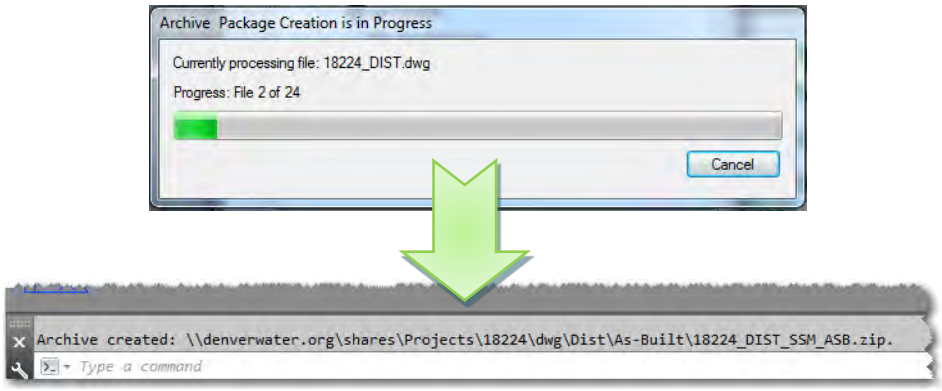
NOTE: Drawing must be saved and all templates must be closed in order to save the Archived Sheet Set.

The *Specify Zip File* pop-up window will appear; navigate to the proper location for archiving based on the current milestone, name the .zip file appropriately, and click <Save>:



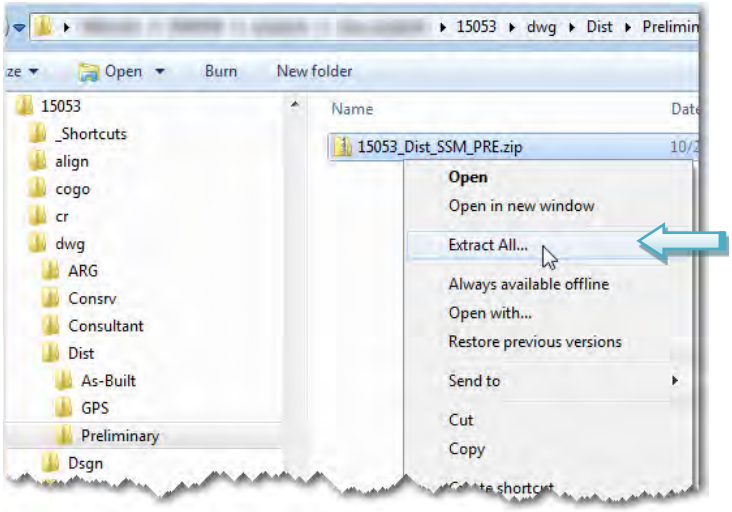
NOTE: See *Section 6.1 – File Management* and *Section 6.2 – Naming Conventions*.

The *Archive Package Creation is in Progress* pop-up will appear; wait a few seconds for this to finish and review the *Command Line*, which will show the status of the archived package:

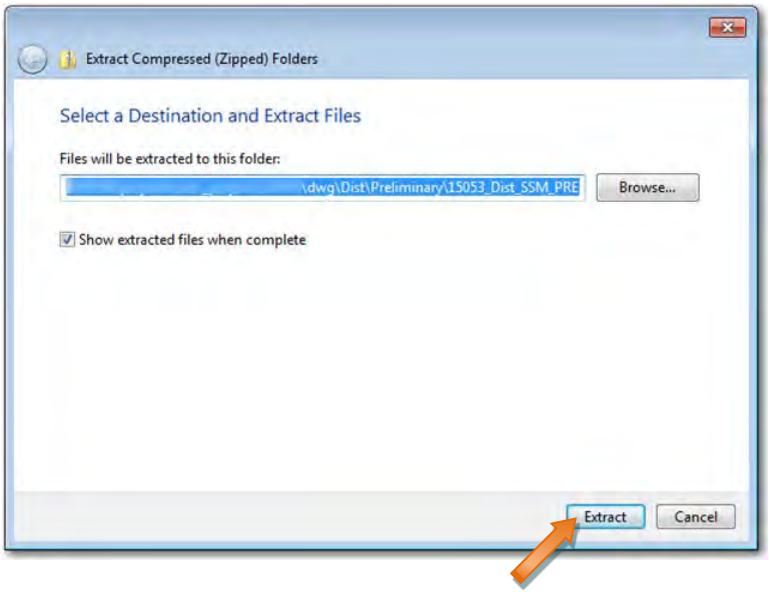


Extracting Data

In some cases, information from a previous milestone may need to be utilized. Using *Windows Explorer*, right-click on the desired .zip file and choose *Extract All…*:

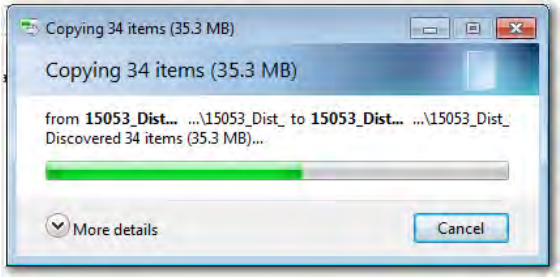


The *Extract Compress (Zipped) Folders* pop-up window will appear. By default, the *Files to be extracted to this folder* location will be the same location as zip file. To accept this location, click <Extract>:

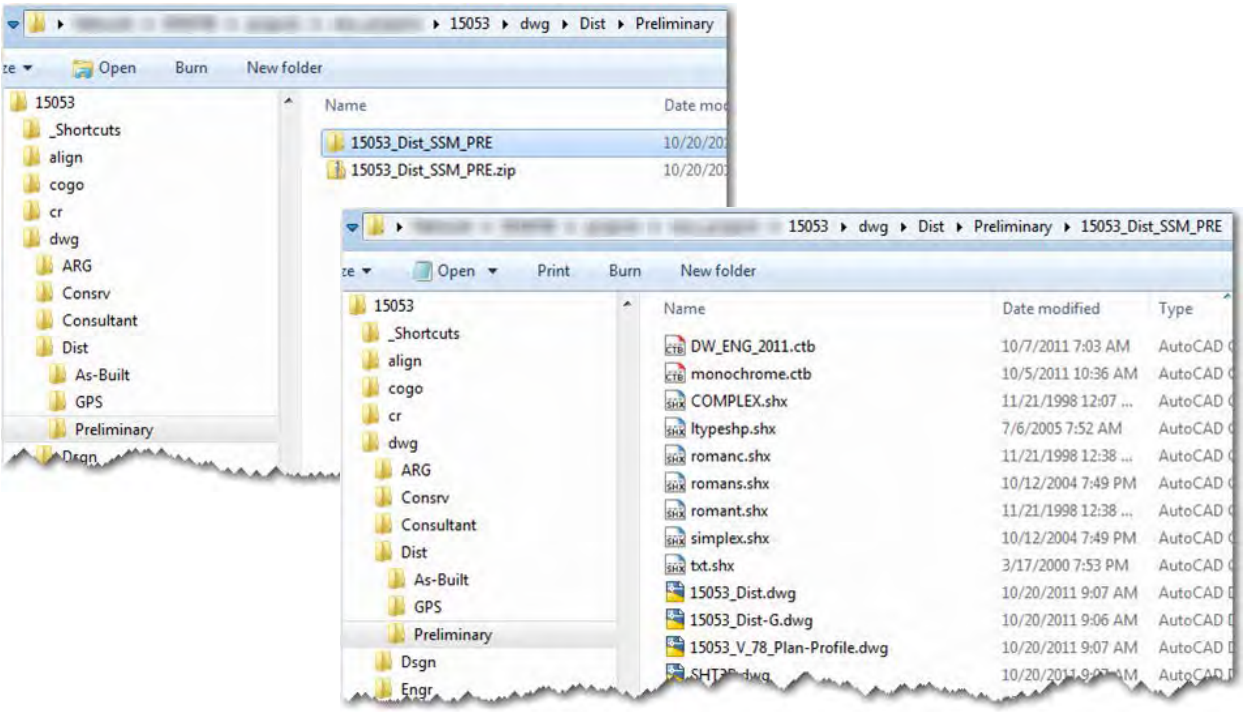


NOTE: Do NOT extract files into the top tier folders!

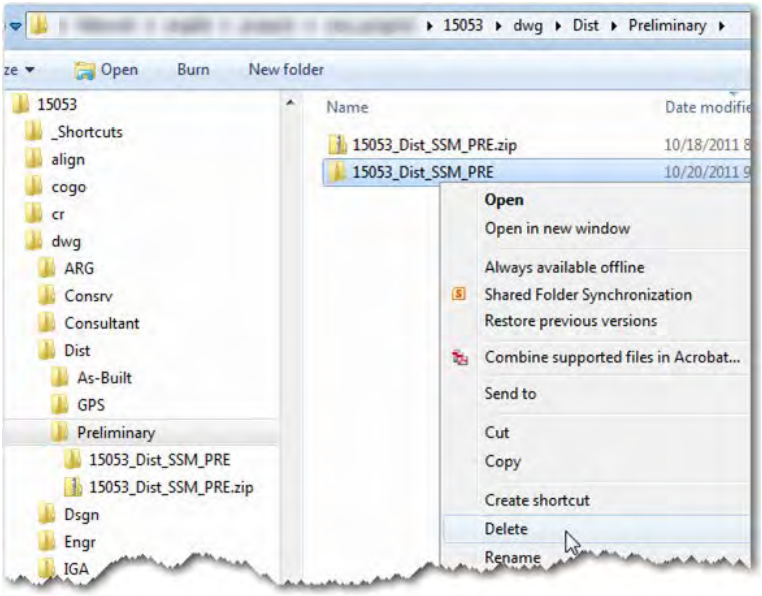
A pop-up will appear showing the files being copied to the specified location:



A new folder will be created with the same name as the .zip file. Located within that folder are all the files that were archived:



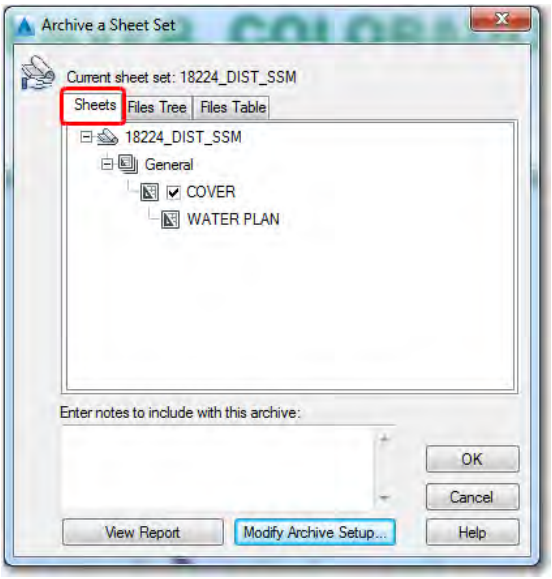
Once all the information needed has been acquired from the unzipped file, please be sure to delete the unzipped folder. Do **NOT** delete the .zip file:



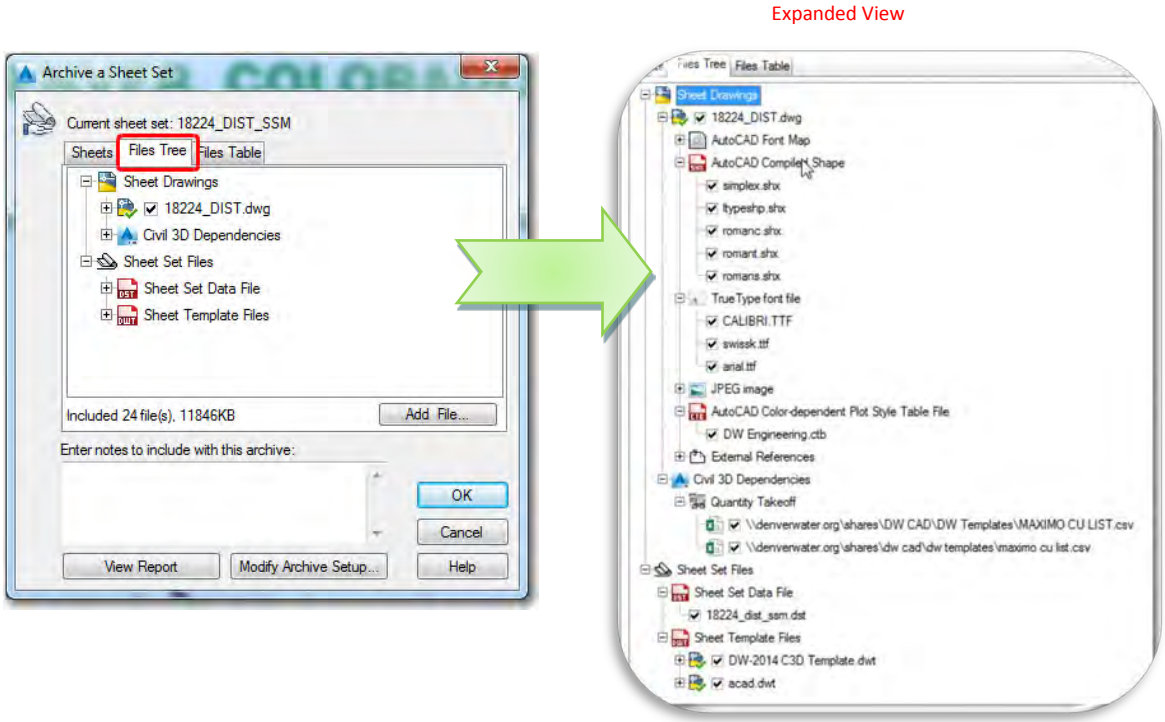
Reviewing Archive Data

The dialog box has three tabs that can be used to review the options for archiving.

Sheets tab
List the sheets to be included in the archive package based on the subset organization:

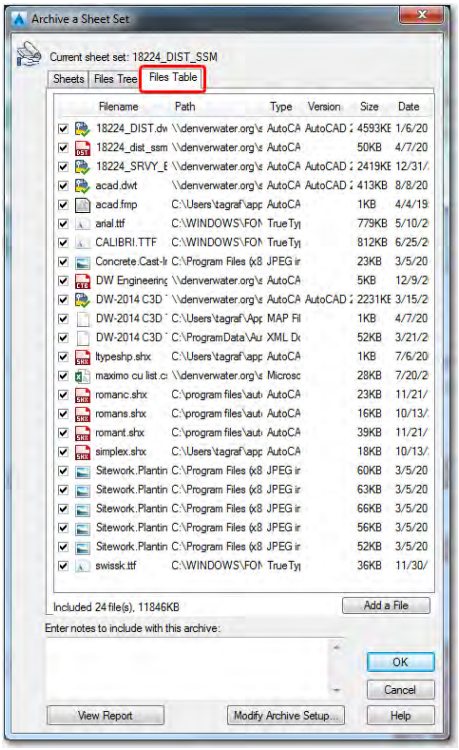


Files Tree tab
List all files to be included in the archive package in a hierarchical tree format. By default, any files associated with a drawing are also listed (such as XREF's, plot styles, and fonts). Additional files can be added or removed as desired:



Files Table tab

List all files to be included in the archive package in a table format. By default, any files associated with a drawing are also listed (such as XREF's, plot styles, and fonts). Files can be added or removed as desired:



Tool Tip: Add Files

Additional files can be added to an Archive package by utilizing the <Add File...> in the *Files Tree* tab, or the <Add a File> button in the *Files Table* tab.

Section 8.0

Utilizing GIS Data via FDO Connections

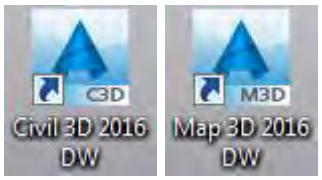
Table of Contents: Section 8.0

Overview - Section 8.0

Within Denver Water AutoCAD Civil 3D is the primary application used to complete most work; however, AutoCAD Map 3D is the application used for pulling the GIS data into a drawing as actual AutoCAD objects, instead of "links". In order for Denver Water's GIS information to be accessed in AutoCAD the following FDO steps must be utilized.

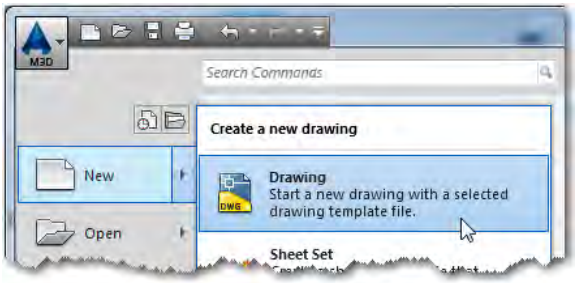
Choosing an Application

The proper AutoCAD application must be chosen depending on the way the GIS data is intended to be used. If the data is for reference only, then Civil 3D is sufficient; if the data will be included as part of a project drawing, such as a base plan, then Map 3D must be used (Civil 3D cannot export GIS data properly for base map use):

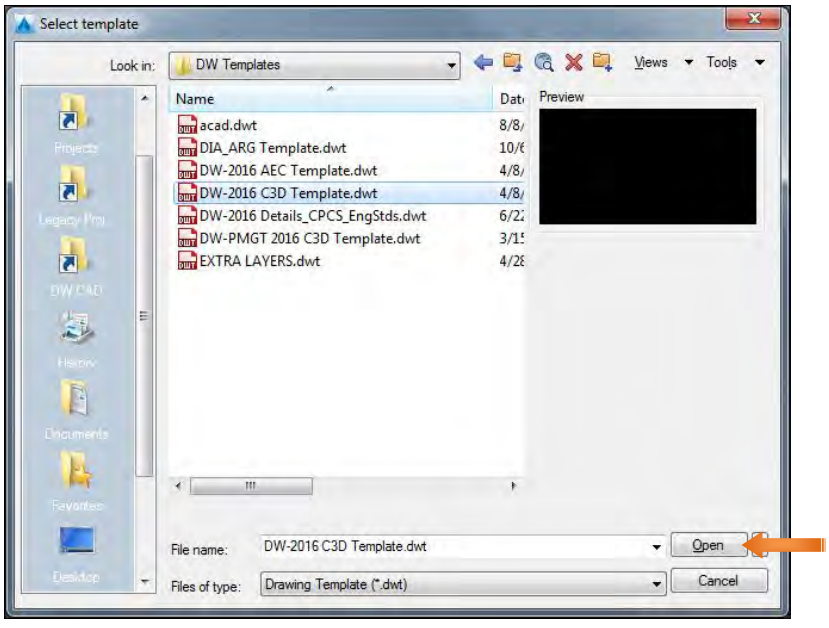


Creating a Base Drawing Using Map 3D

In AutoCAD Map 3D, create a new drawing by clicking the Application Menu pull-down, selecting New, and then Drawing:



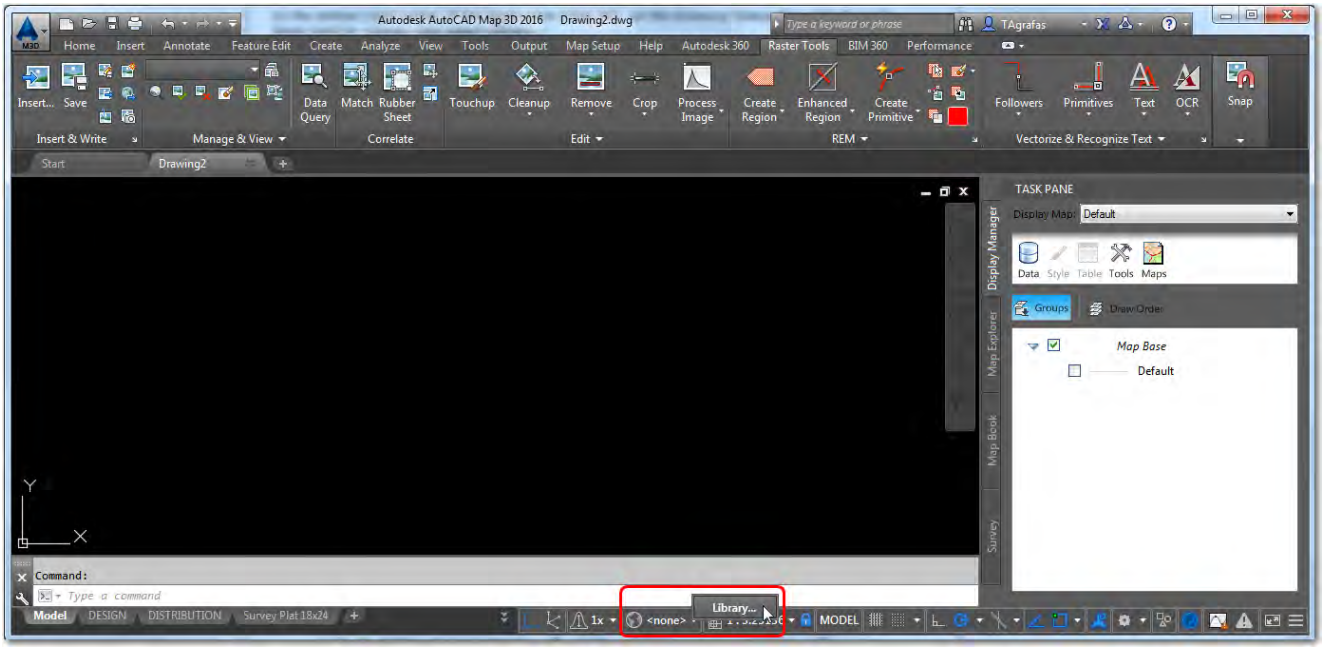
The Select template pop-up window will appear, choose the DW-2016 C3D Template.dwt and click <Open>:



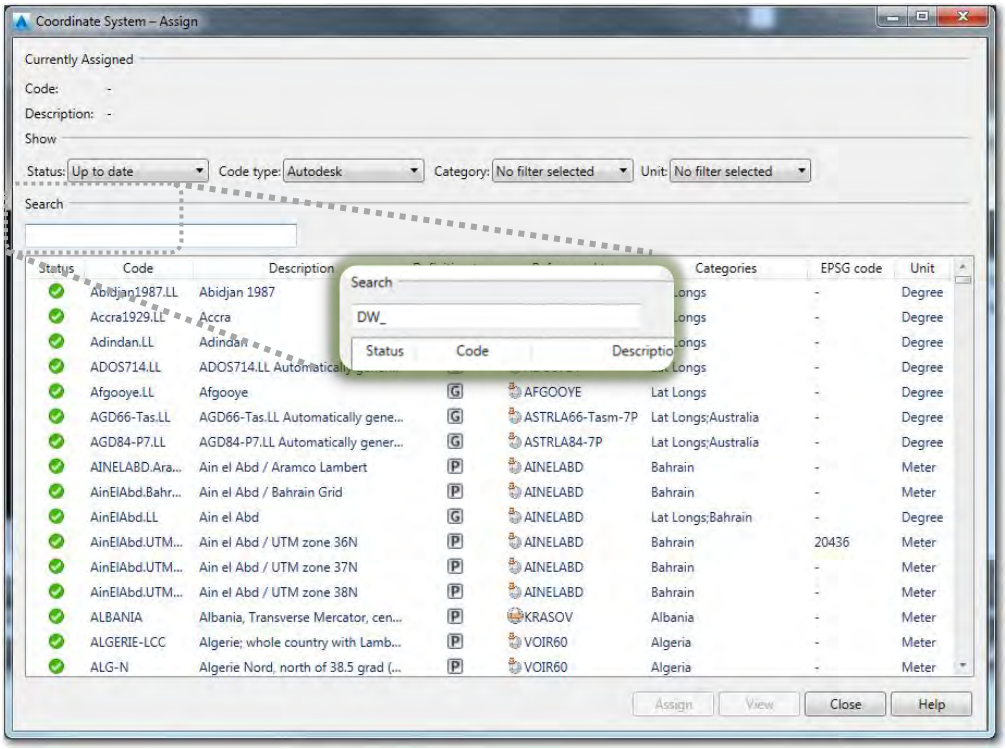
Set Coordinate System

Drawings shall be created using predefined coordinate systems. New drawings DO NOT have the coordinate systems preset. This must be done before anything is drawn in Model Space.

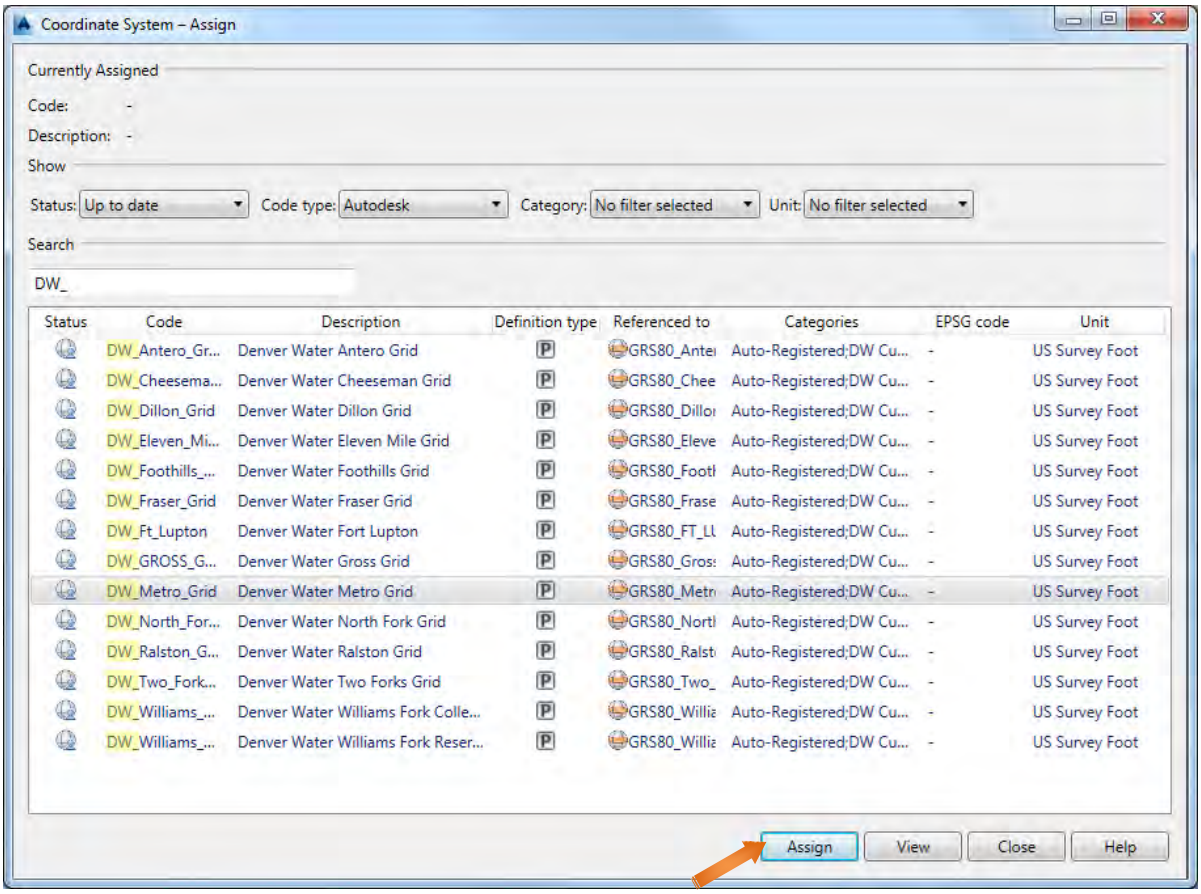
In the bottom right corner of the Application (Map 3D), on the Drawing Status Bar, click the pull-down next to <none> and select Library…:



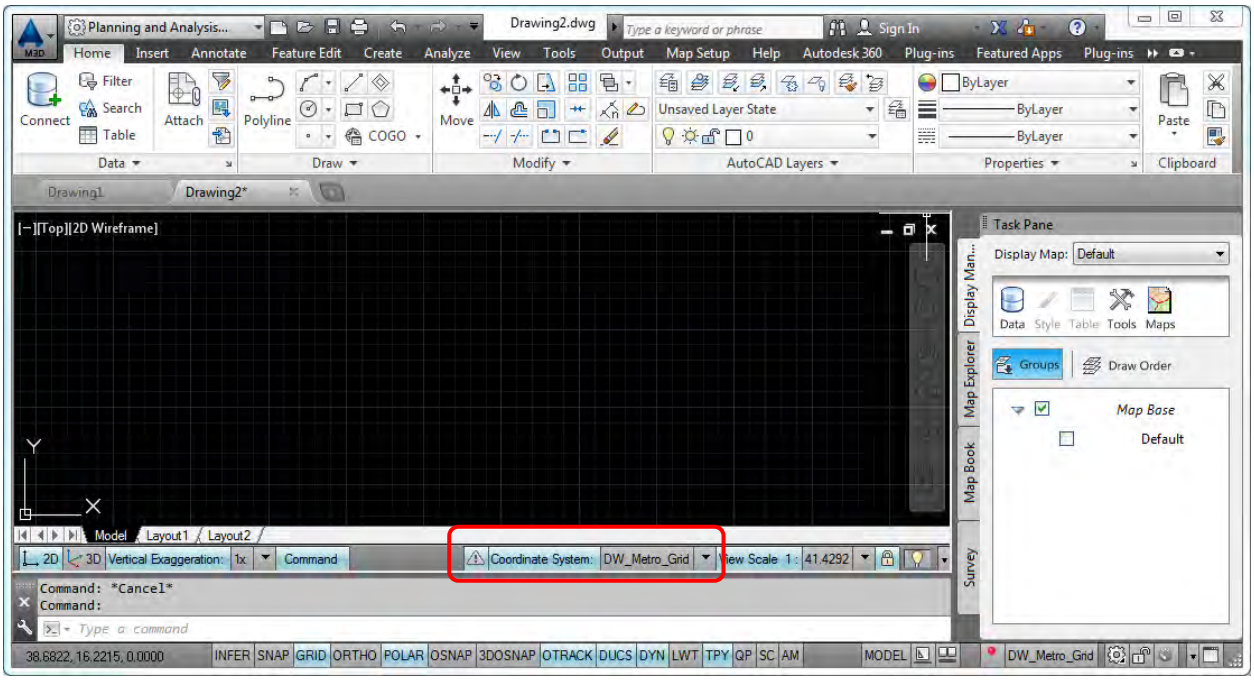
The Coordinate System - Assign pop-up window will appear; to quickly access DW's custom Coordinate Systems type DW_ in the empty search field:



All of DW's custom Coordinate Systems will display. Choose the appropriate Coordinate System from the list and click <Assign>:



The assigned Coordinate System will now appear in the Drawing Status Bar:



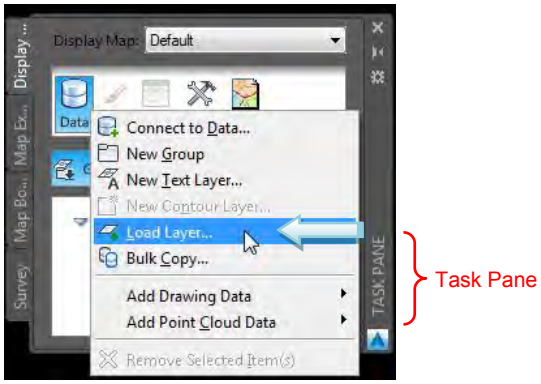
Add/Remove FDO Layers

Custom, stylized layer files have been created to help quickly access GIS data. Use the following steps to add and remove layers.

Adding Layers

In the *Task Pane*, on the Display Manager tab, click the Data icon and select *Load Layer…*:

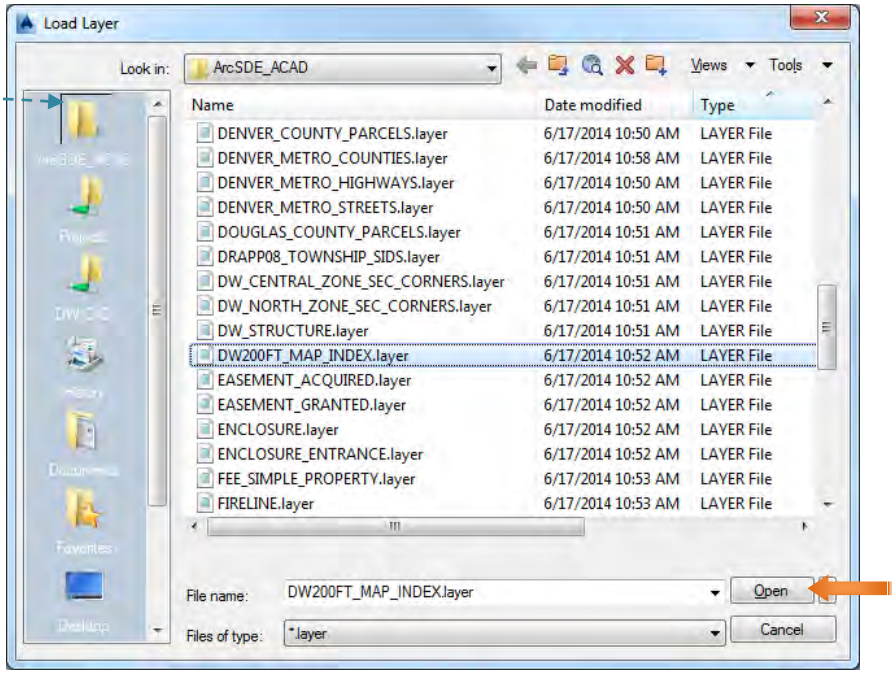
Tip: Task Pane
Type MAPWSPACE at the command prompt to turn the Task Pane ON or by clicking it on the *Quick Tools* Tool Palette.



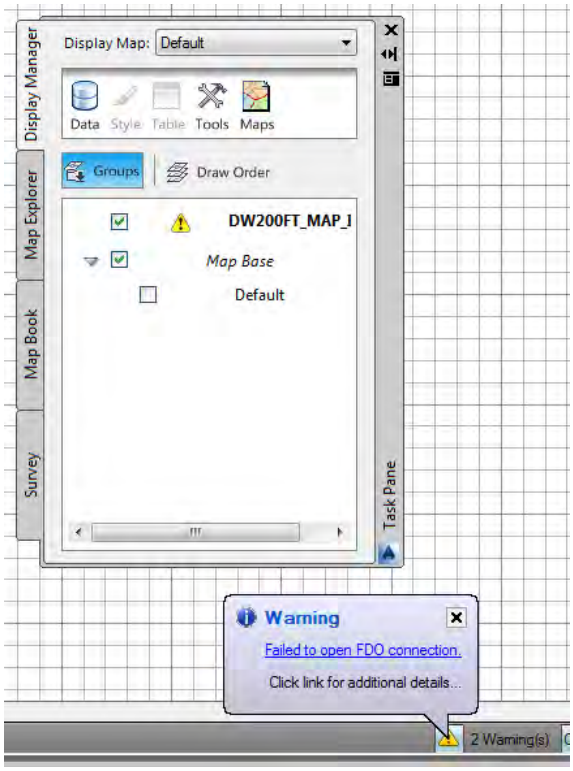
NOTE: For this process, layers do not refer to AutoCAD layers, they are ARC/SDE layer files with live intelligence.

The Load Layer pop-up window will appear. To see the available list of layers, navigate to \\Prdeng01\DW CAD\ArcSDE_ACAD; select the desired layer from the list (typically the 200' Map is picked first) and click <Open>:

Tip: Shortcut
In most cases AutoCAD will already be preset with an "ArcSDE_ACAD" shortcut, located on the left side of AutoCAD pop-up windows.



The *Task Pane* will display the loaded layer(s) with a yellow warning sign; this means that the connection to SDE has not yet been established. A pop-up "Warning" may also be seen on the Drawing Status Bar:



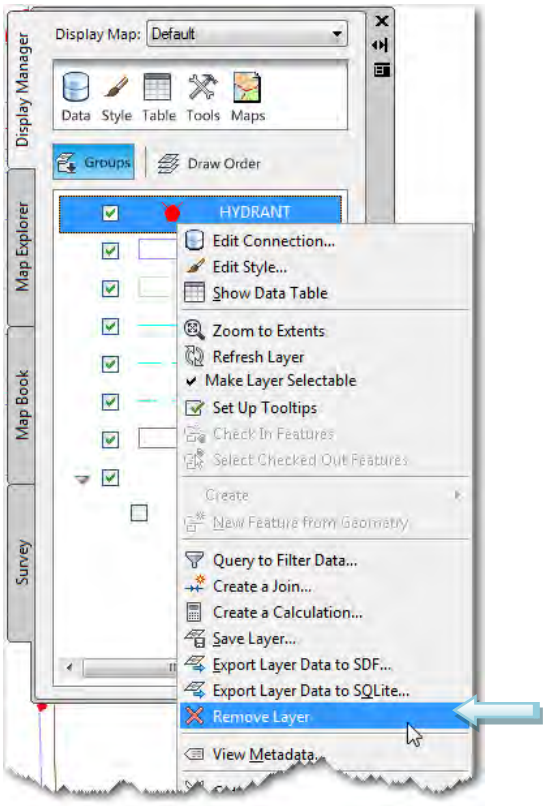
Tip: Always Connect!
After the first layer is loaded sometimes it will appear that they are connected – this may not be the case – always connect, [see *Establish SDE Connection, page 8.0-9*].

NOTE: Multiple layers may be loaded at this point, however it is ideal to establish a connection first.

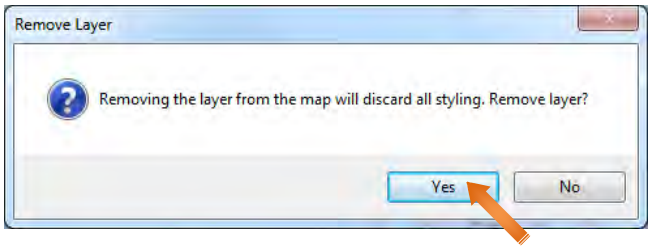
When applicable, repeat these steps for loading additional layers.

Removing Layers

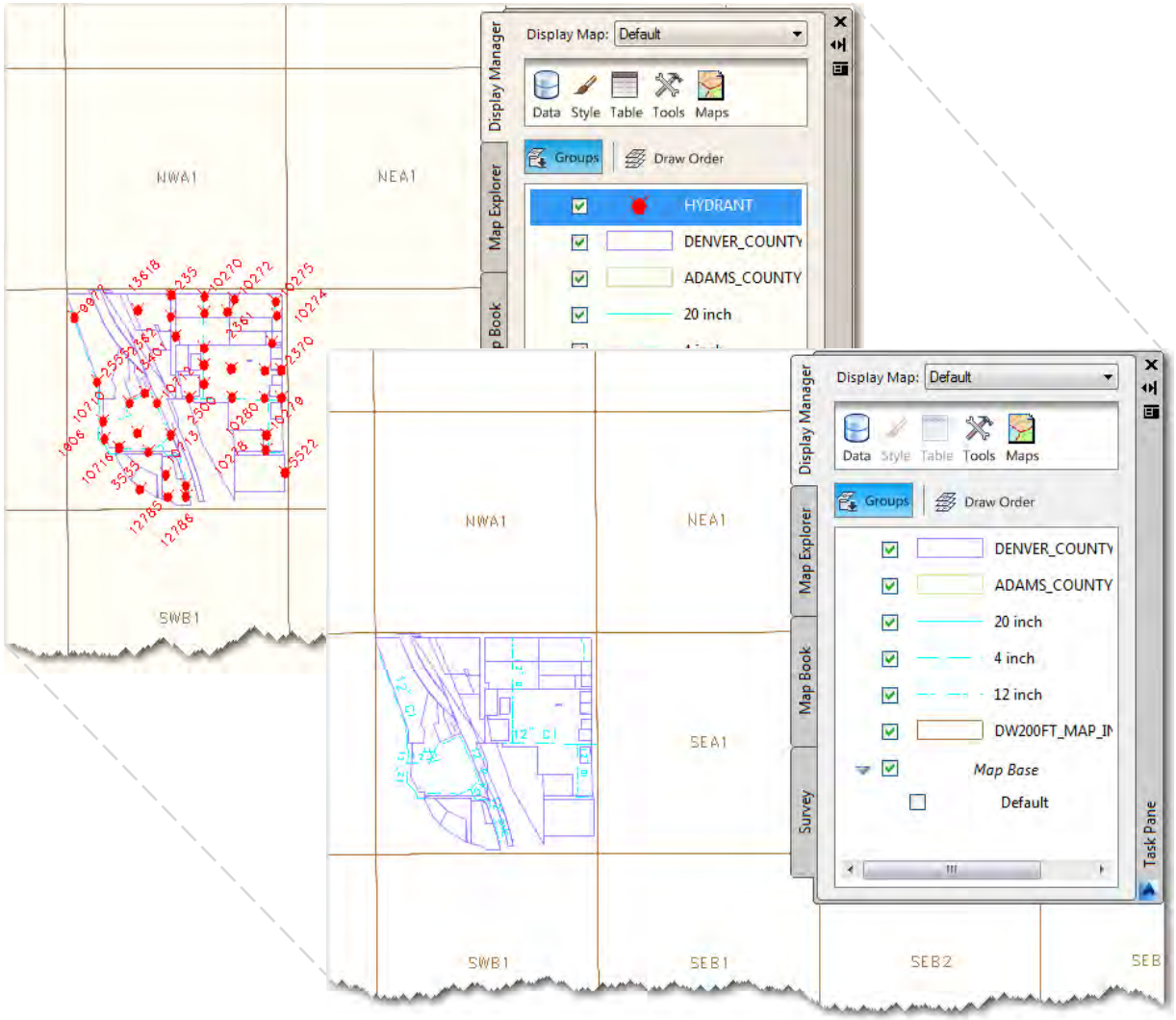
If an unnecessary layer was added, right-click on the layer to be deleted and select *Remove Layer*:



The *Remove Layer* pop-up window will appear, click <Yes> to remove the layer:



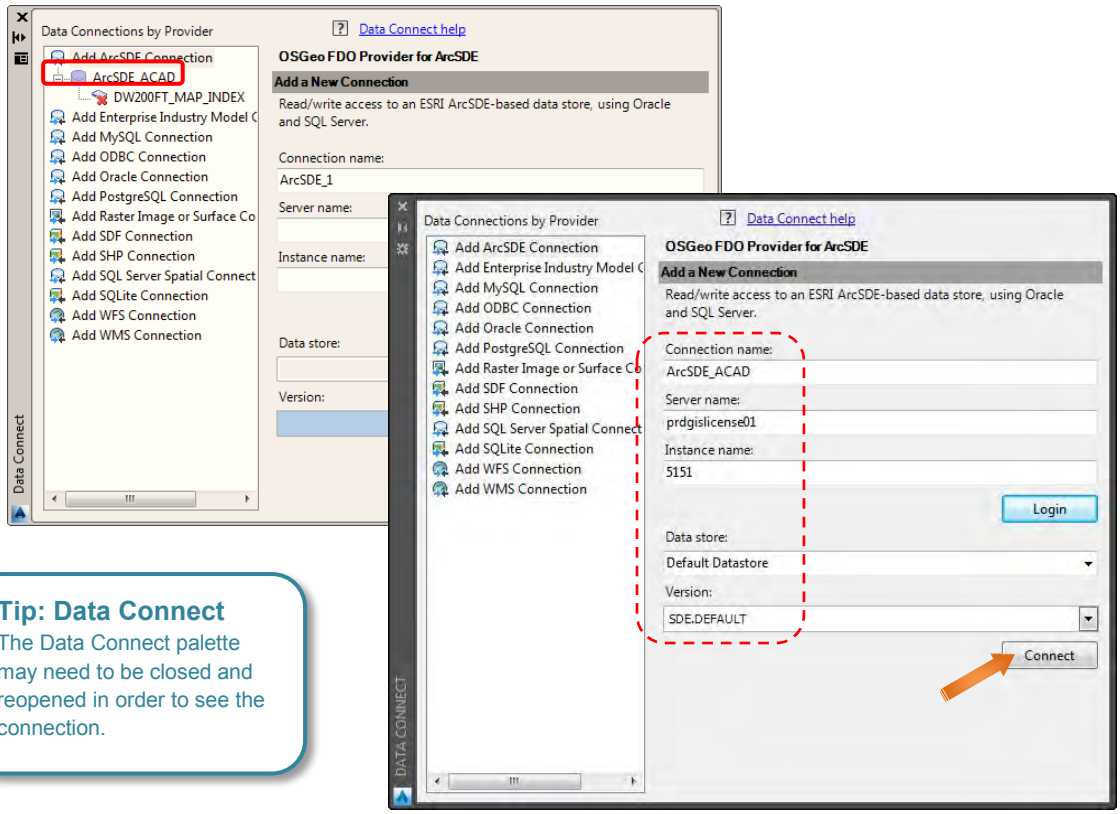
The layer will now be removed from the *Task Pane* and Model Space:



Establish SDE Connection

Although the SDE Connection is built into the layers, a live connections must still be established. Click the Data icon on the Task Pane and select Connect to Data…:

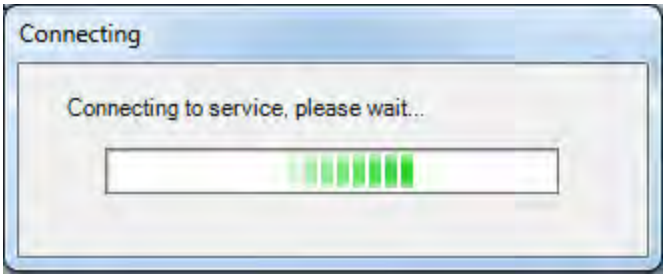
By selecting the ArcSDE_ACAD connection in the *Data Connect* palette, all of the correct connection information should automatically be populated; click <Connect>:



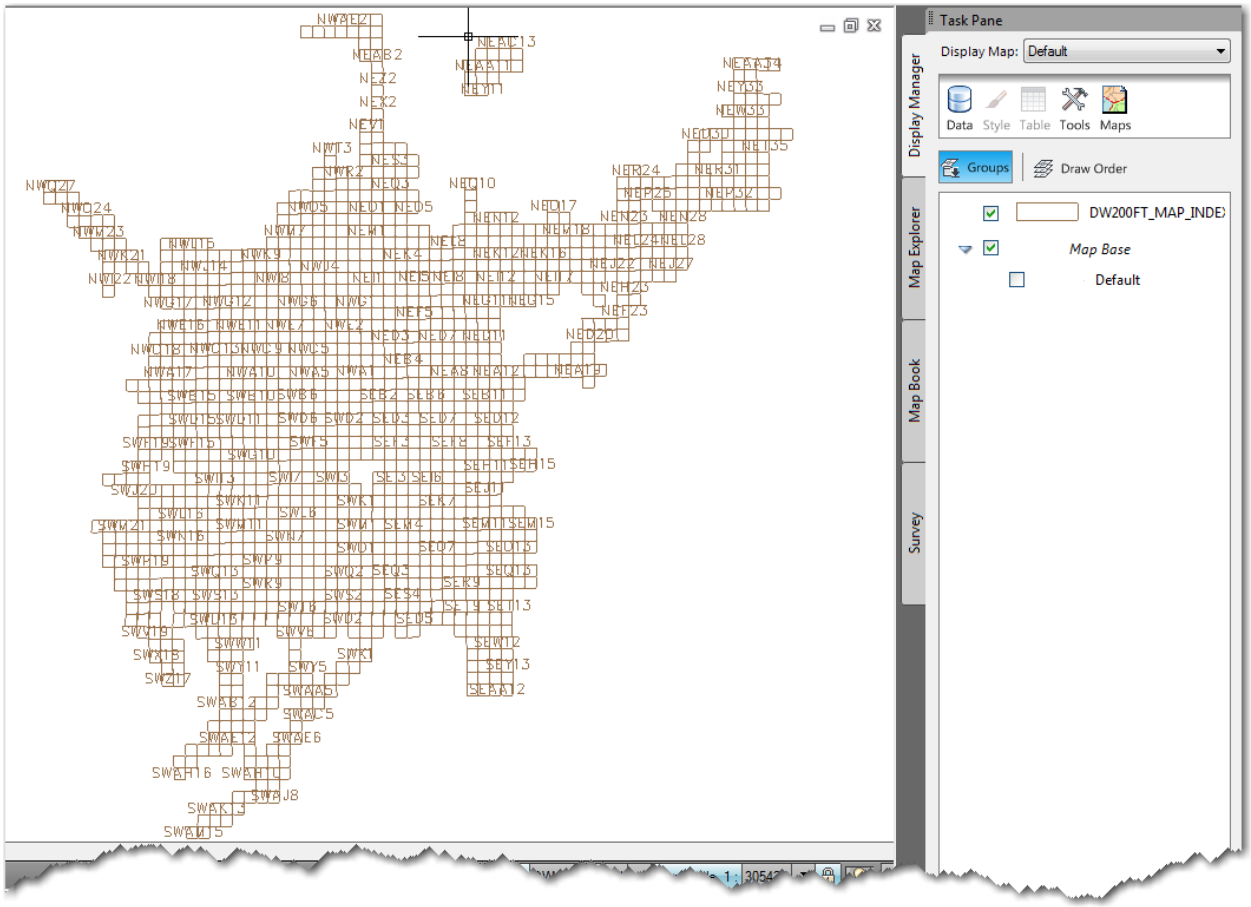
Tip: Data Connect
The Data Connect palette may need to be closed and reopened in order to see the connection.

NOTE: The icon indicates the drawing is disconnected from FDO/SDE, also note the schema is not available.

Progress of the SDE connection can be seen in the *Connecting* pop-up:



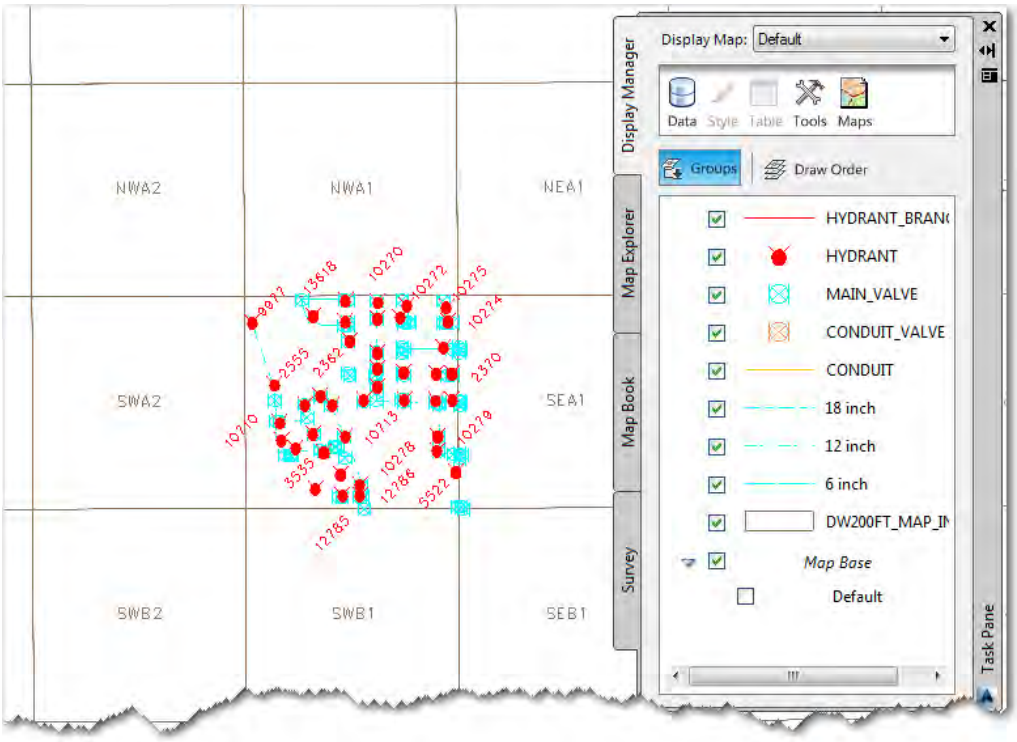
Once the connection is established, the loaded layer (DW200FT_MAP_INDEX in this example) can been seen in Model Space and the yellow warning sign will be gone from the *Task Pane*:



NOTE: The remainder of the FDO layers may be added at this time.

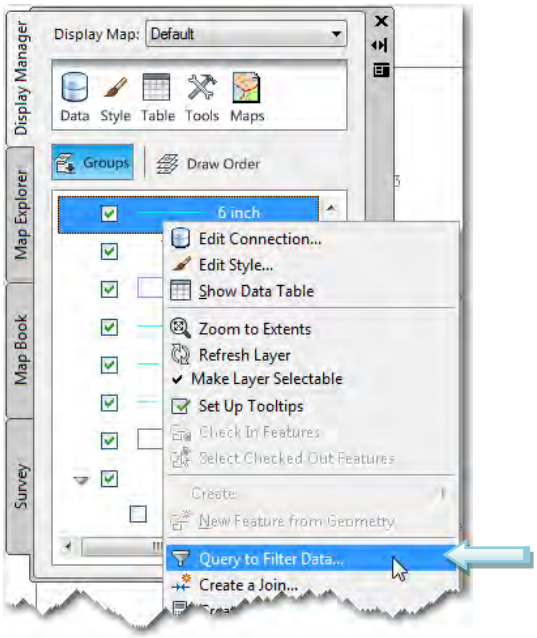
Query Data

Single or multiple layers can be queried to a specified area at any time; the following steps describe both methods. By default, most layers are pre-queried to the **SWA1** 200 FT MAP location and will need to be queried to show the desired location:

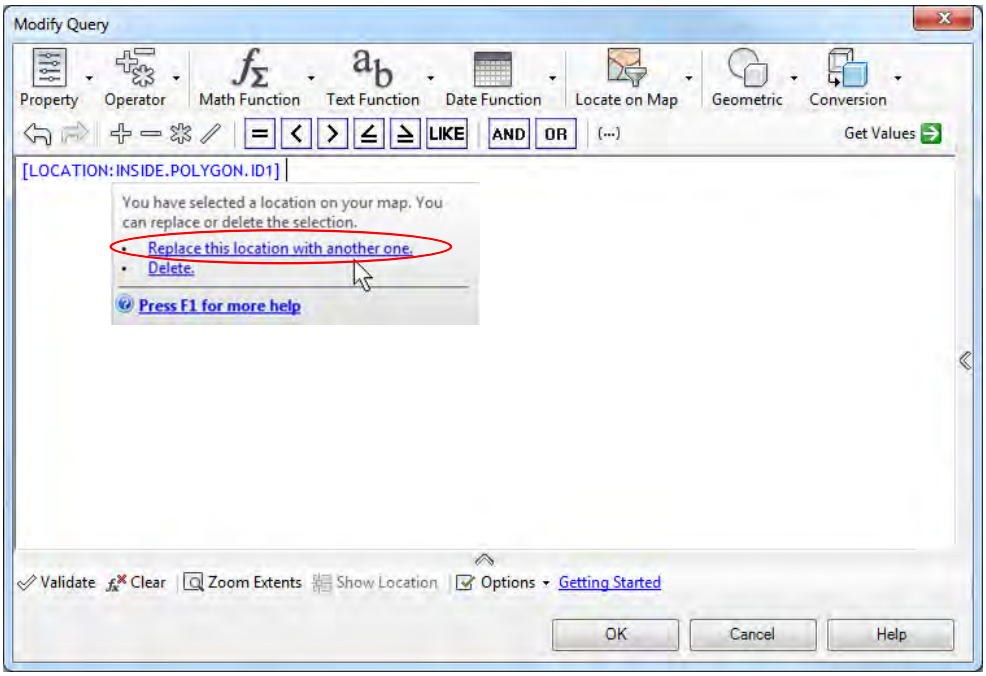


Single Layer

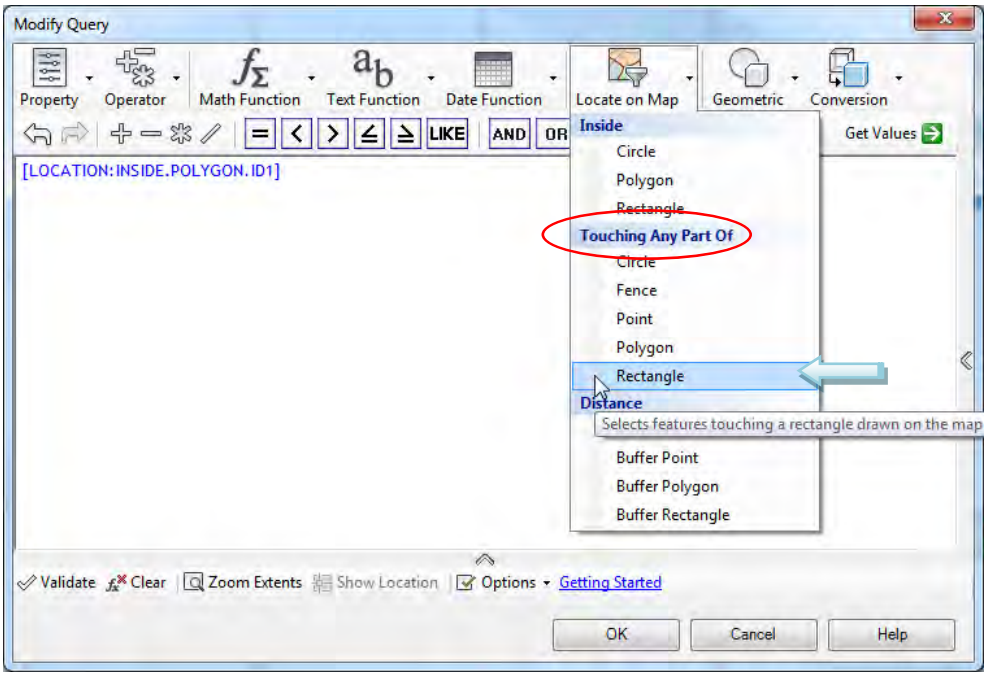
To query a single layer to a specific area, select the layer of interest, right-click, and then select *Query to Filter Data…*:



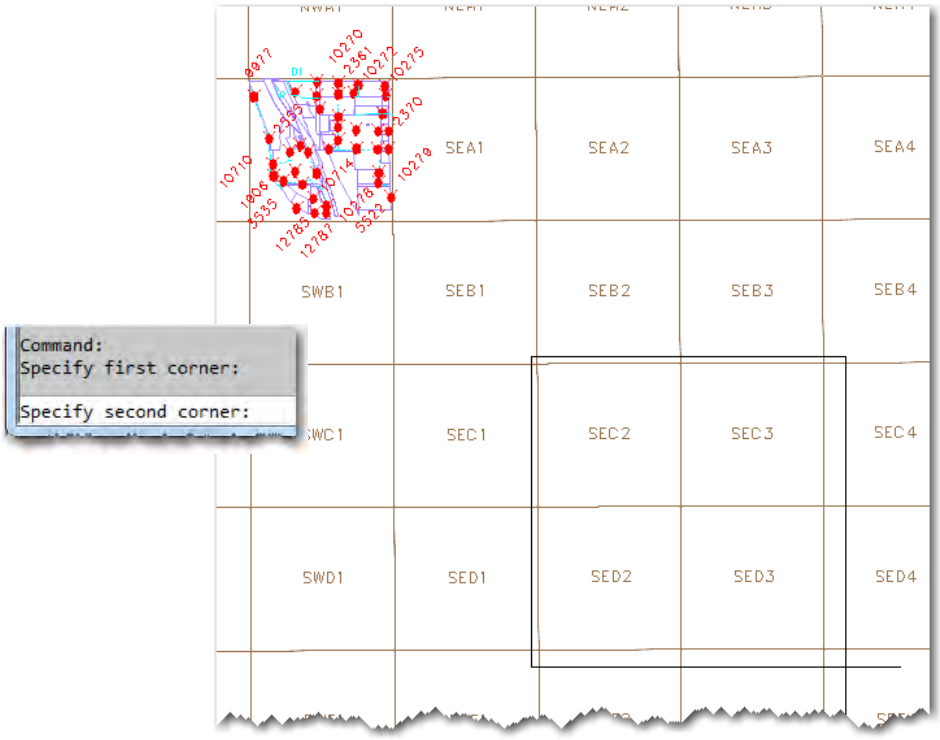
The *Modify Query* window will appear. Click the blue link (for example [LOCATION:INSIDE.POLY.ID1]) and choose *Replace this location with another one*:



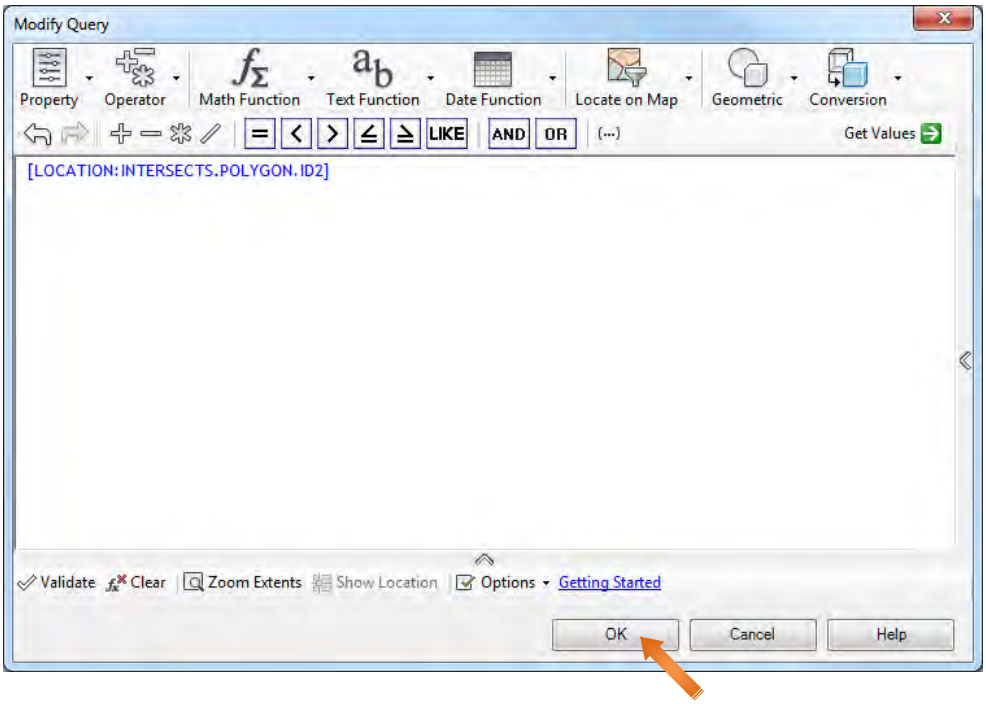
The *Locate on Map* pull-down menu will appear. Select the desired type of query, the most common being "Touching Any Part of → Rectangle:"



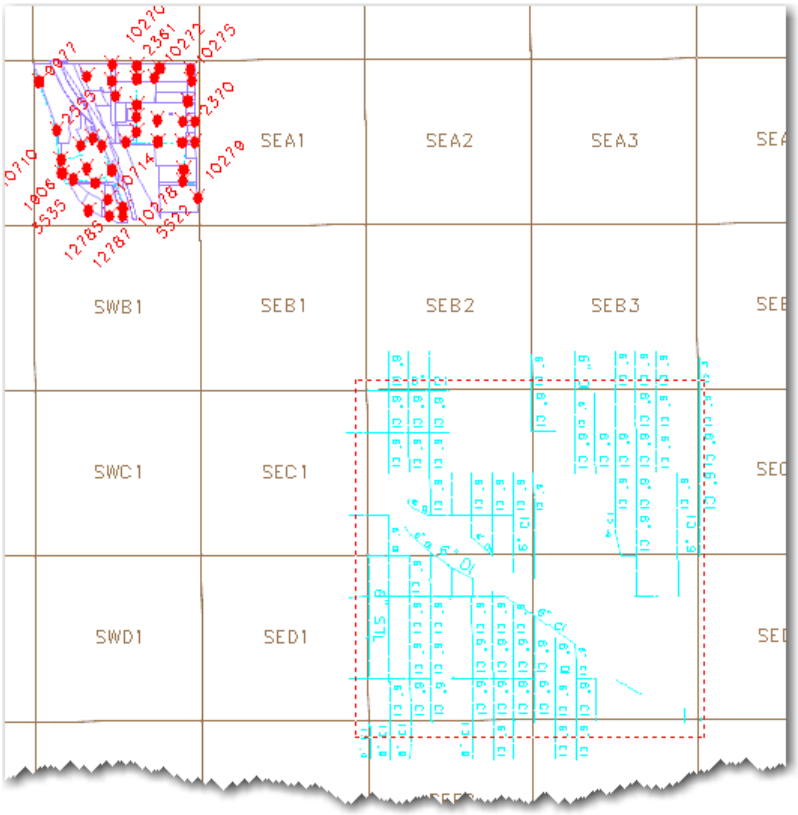
In Model Space, the command line will prompt the user to Specify first corner; click and drag a rectangle around the area of interest:



The Modify Query window will reappear, click <OK>:

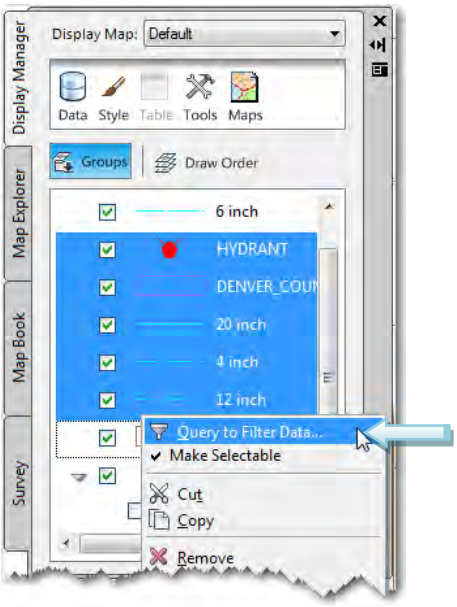


The queried information should now display in Model Space:



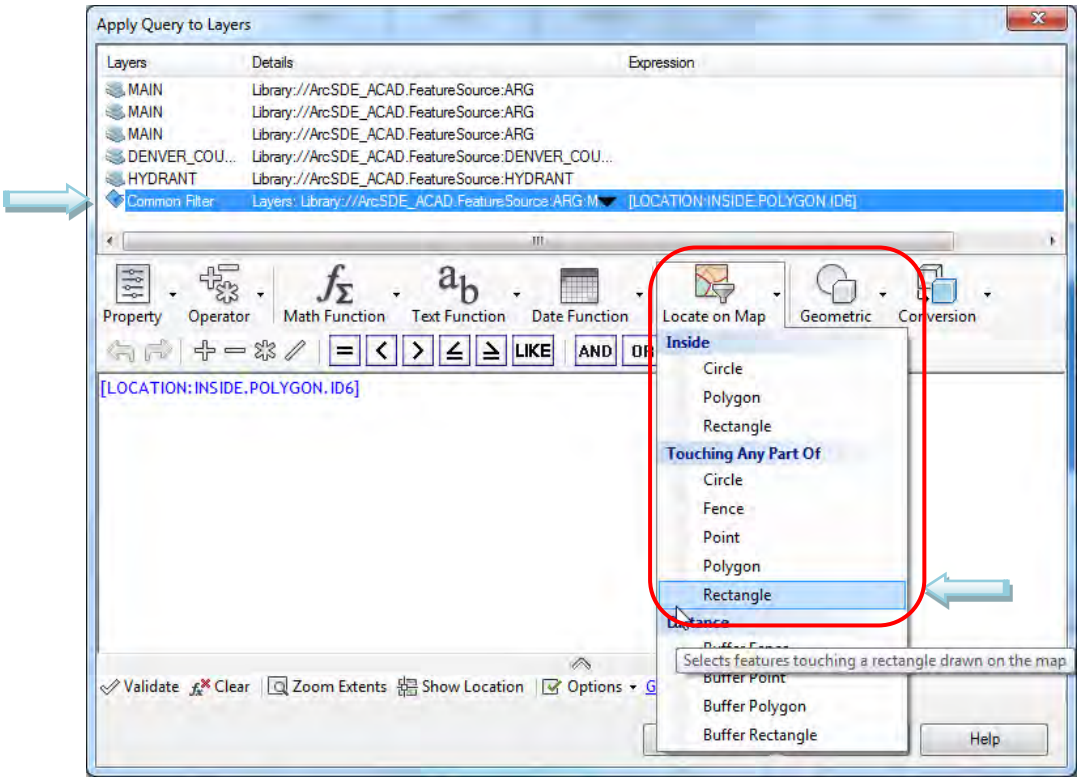
Multiple Layers

To query multiple layers to a specific area select the layers of interest, right-click, and then select *Query to Filter Data…*:

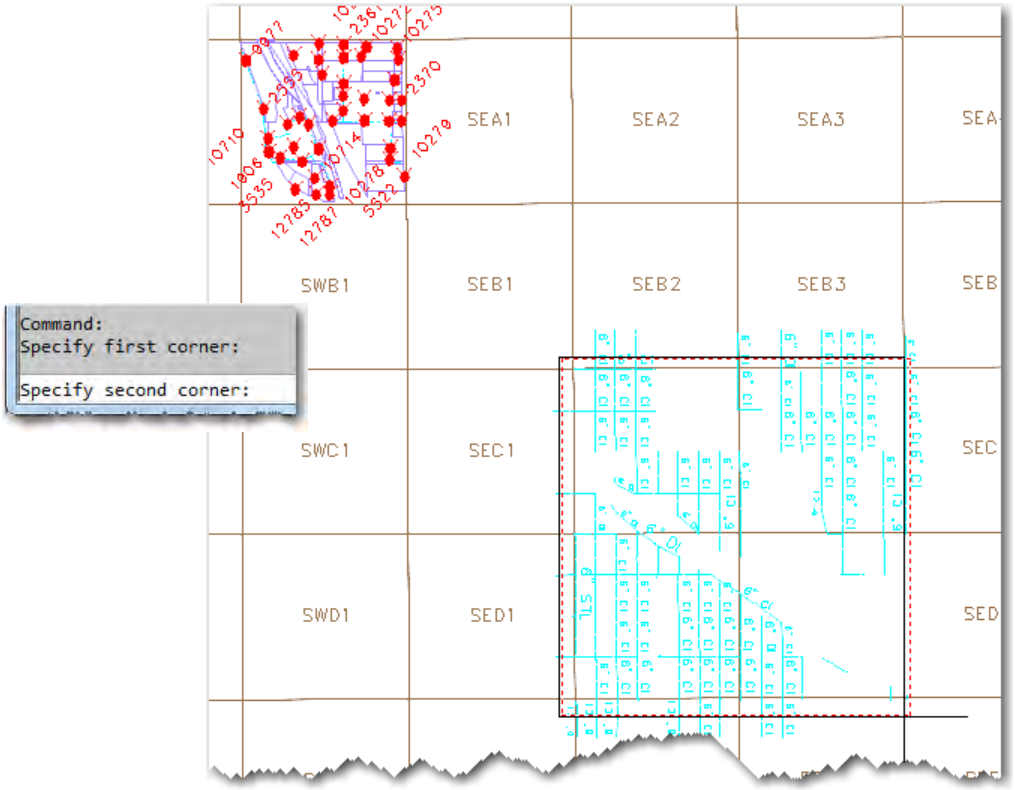


Tip: Selecting Multiple Layers
Hold down the Shift or Ctrl keys on the keyboard to select more than one layer at a time.

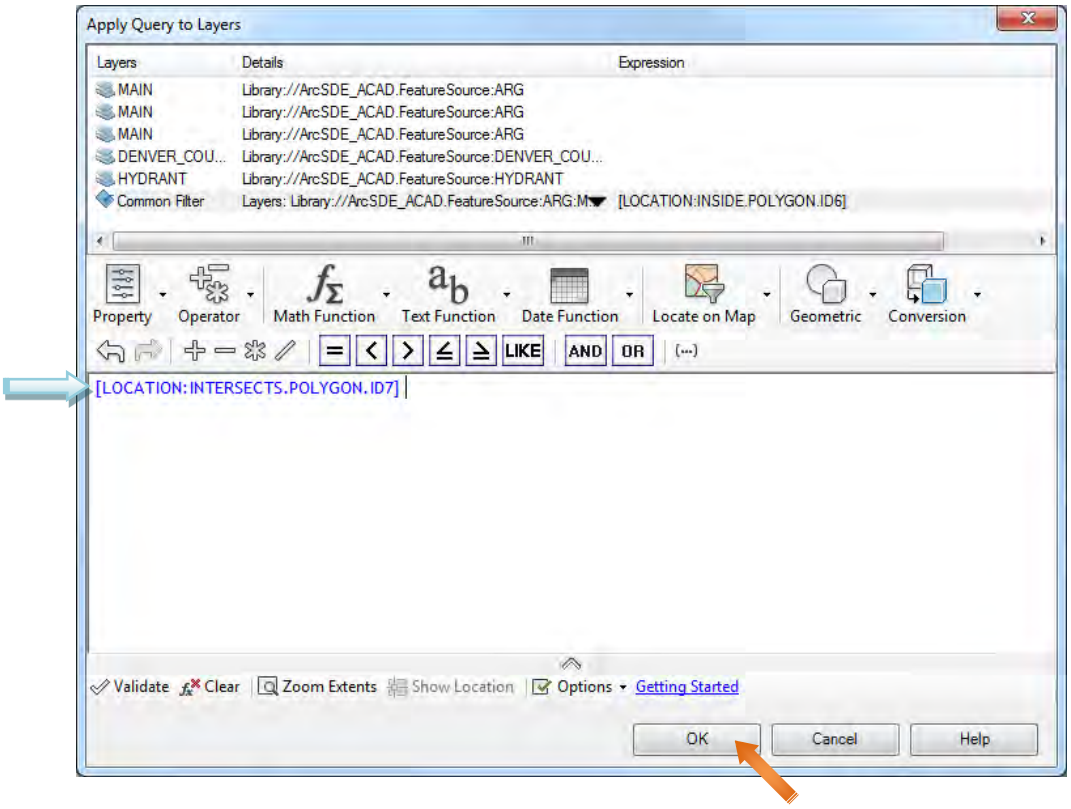
The *Apply Query to Layers* window will appear showing a list of the selected layers and a common filter. Select the Common Filter and click the *Locate on Map* pull-down. Choose the selection type "Touching Any Part of → Rectangle:"



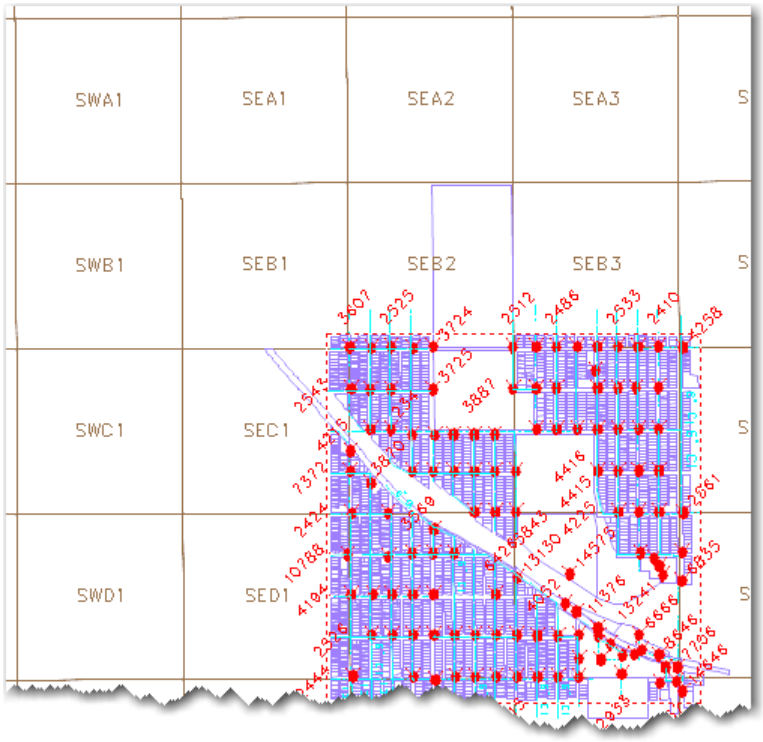
In Model Space, the command line will prompt the user to *Specify first corner;* click and drag a rectangle around the area of interest:



The *Apply Query to Layers* window will re-appear showing the code for the queried information, click <OK>:



The queried information should now display in Model Space:

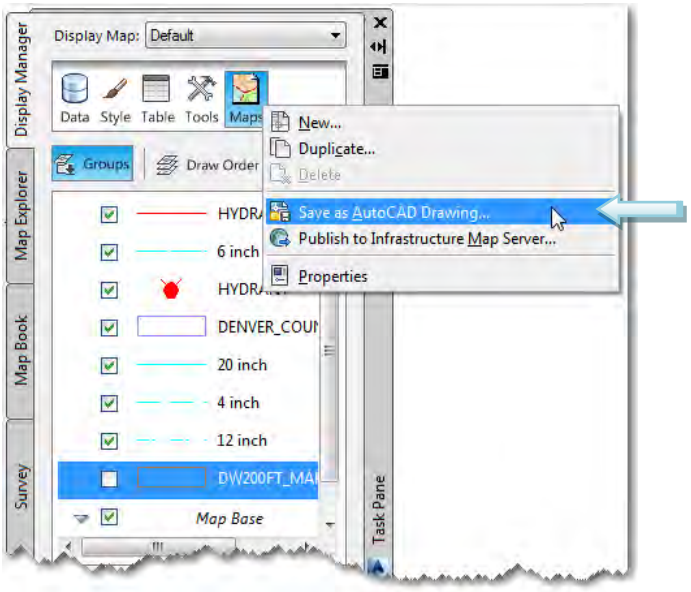


NOTE: Do not save this drawing, in the next step you will convert the map features to CAD objects, it is uncessary.

Save As AutoCAD Drawing

Once the desired information has been loaded and queried, the user must convert the FDO layers to AutoCAD layers. The following steps show how to accomplish this.

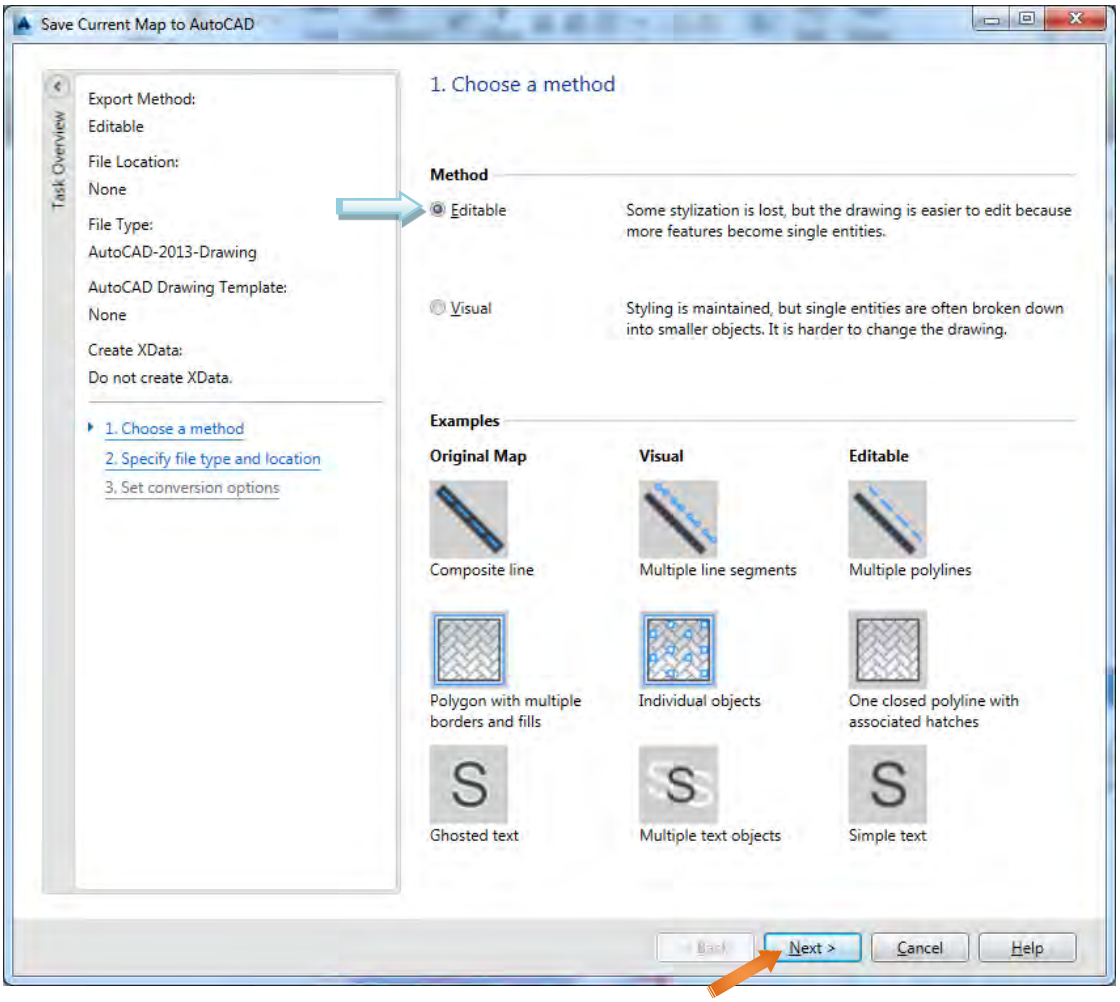
In the *Task Pane*, click the Maps icon and select *Save as AutoCAD Drawing…*:



Tip: FDO Layers
Only the layers that are checked will convert to AutoCAD **layers**.

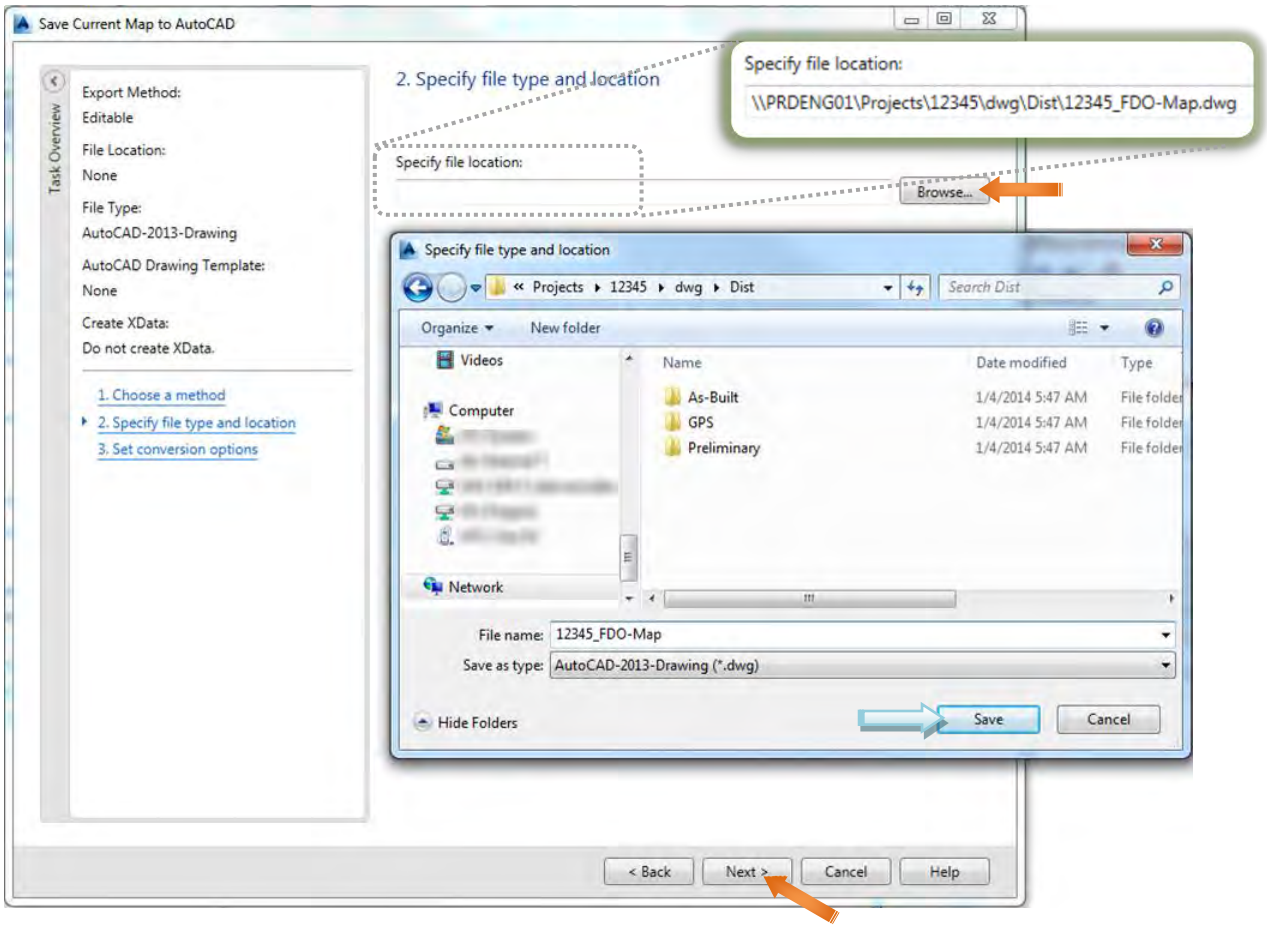
1. Choose a method

The *Save Current Map to AutoCAD* pop-up window will appear. In step 1 choose the *Editable* option and click <Next>:



2. Specify file type and location

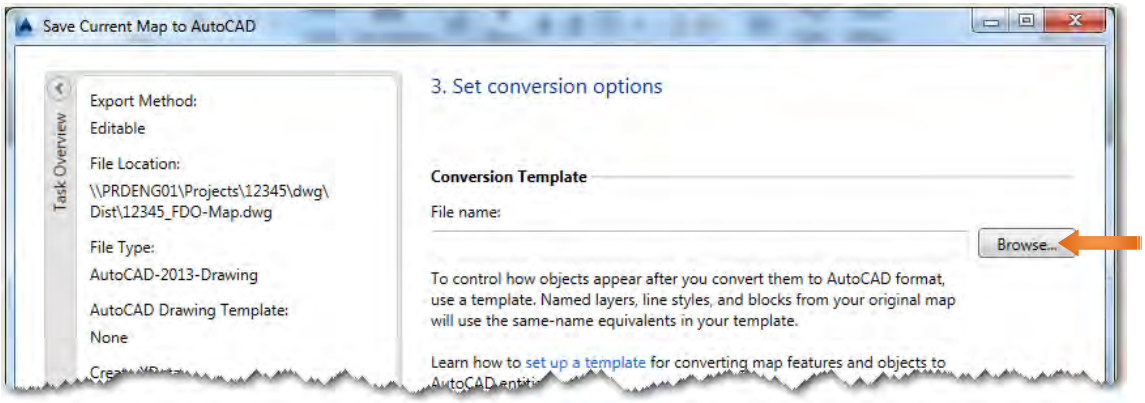
In step 2, click <Browse> and navigate to the network project location where the FDO drawing shall be saved; name the drawing appropriately (PTNO_FDO). Click <Next>:



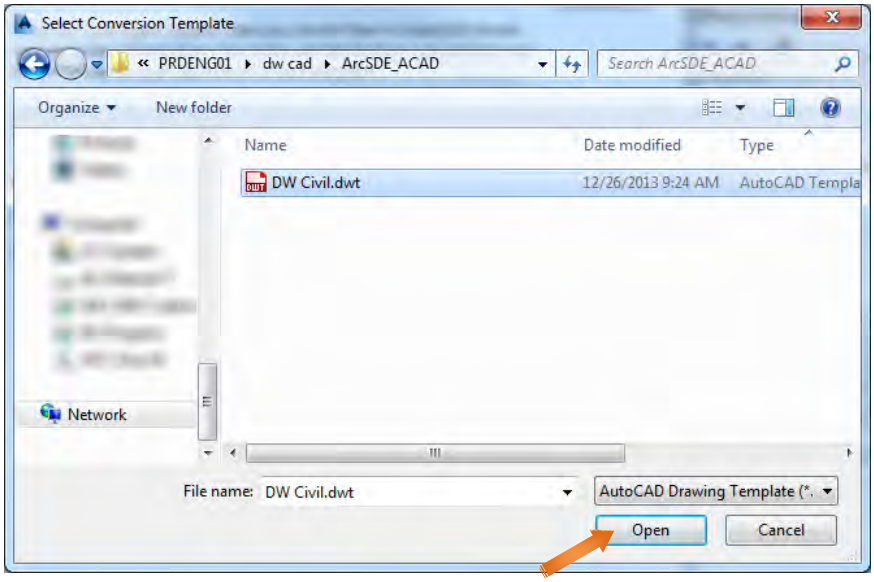
NOTE: This FDO drawing should be named accordingly to distinguish between a MAP and C3D drawing.

3. Set conversion options

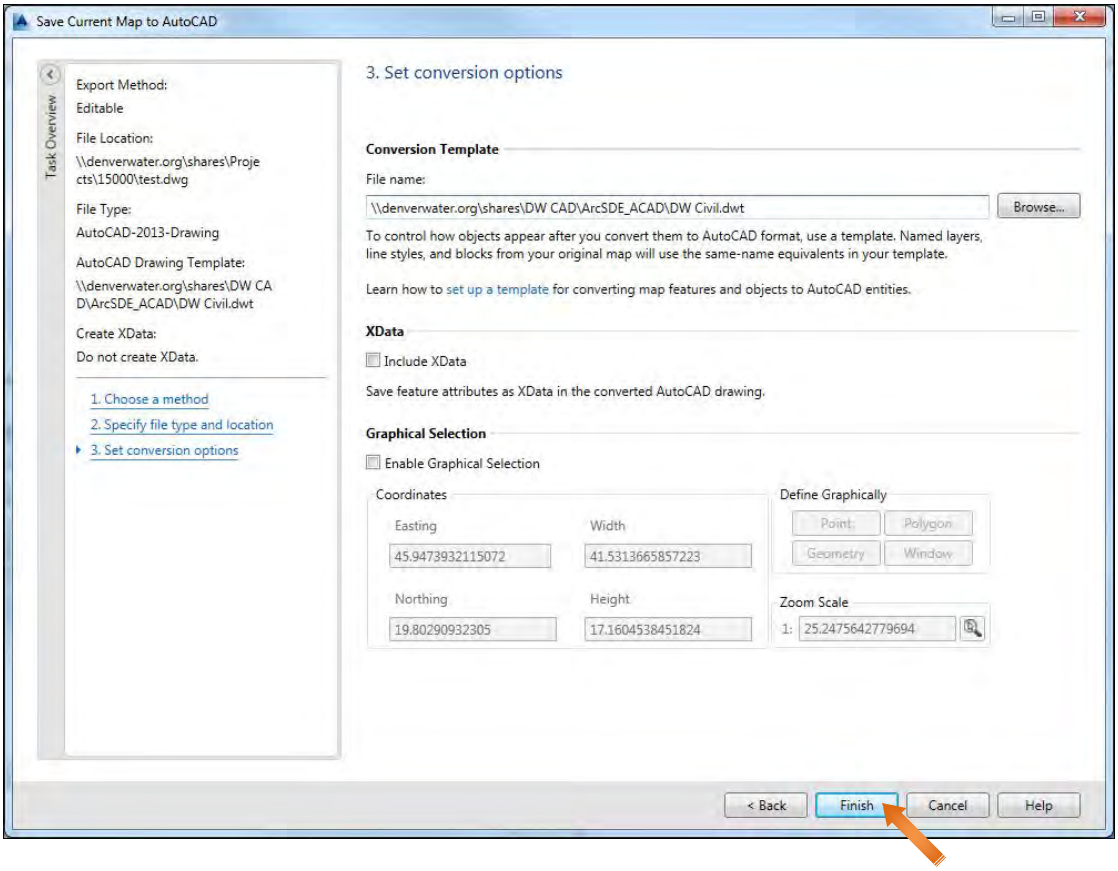
In order for the symbols to translate properly a custom template must be selected in step 3. Click the <Browse> button:



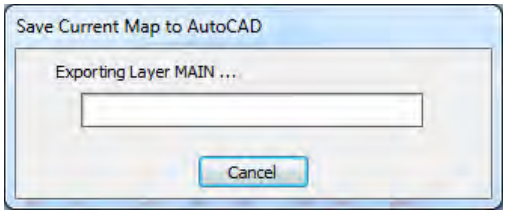
In the *Select Conversion Template* pop-up window browse to *…DW CAD\ArcSDE_ACAD* and select the *DW Civil.dwt*; click <Open>:



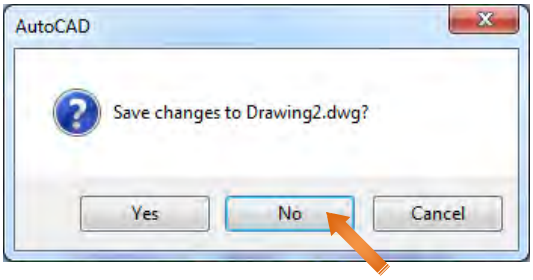
Click <Finish> once the template has been selected:



The *Save Current Map to AutoCAD* pop-up will appear indicating the queried data is converting the Map Features to basic AutoCAD entities:



Once this is complete, close the AutoCAD Map 3D application without saving the current drawing:



NOTE: The remainder of the steps will take place in AutoCAD Civil 3D.

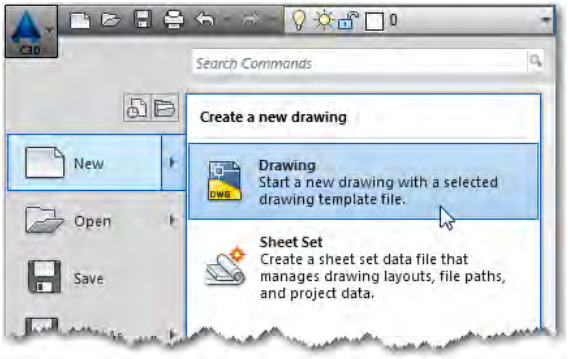
Quick Check

- Open AutoCAD Map 3D
- Use DW's template to create new drawing
- Set Coordinate System
- Load 200' Map Index layer
- Connect to Data
- Load all other layers
- Query Data
- Save to AutoCAD drawing
- Close AutoCAD Map 3D

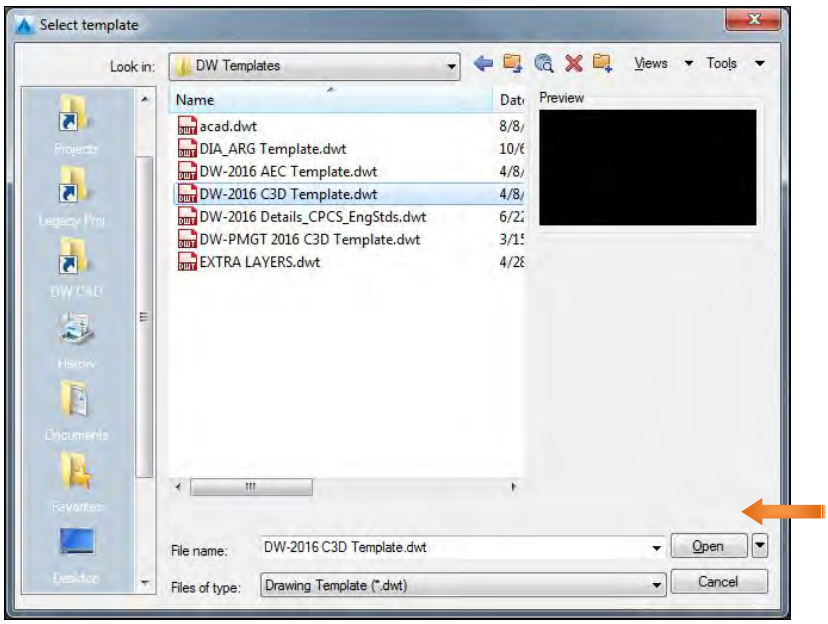
Convert FDO Drawing to DW Standards

The recently created FDO drawing will need to be converted to DW Standards before it is useable in a project drawing, the following steps accomplish this.

In AutoCAD **C3D** create a new drawing by clicking the Application Menu pull-down, selecting *New*, and then *Drawing*:

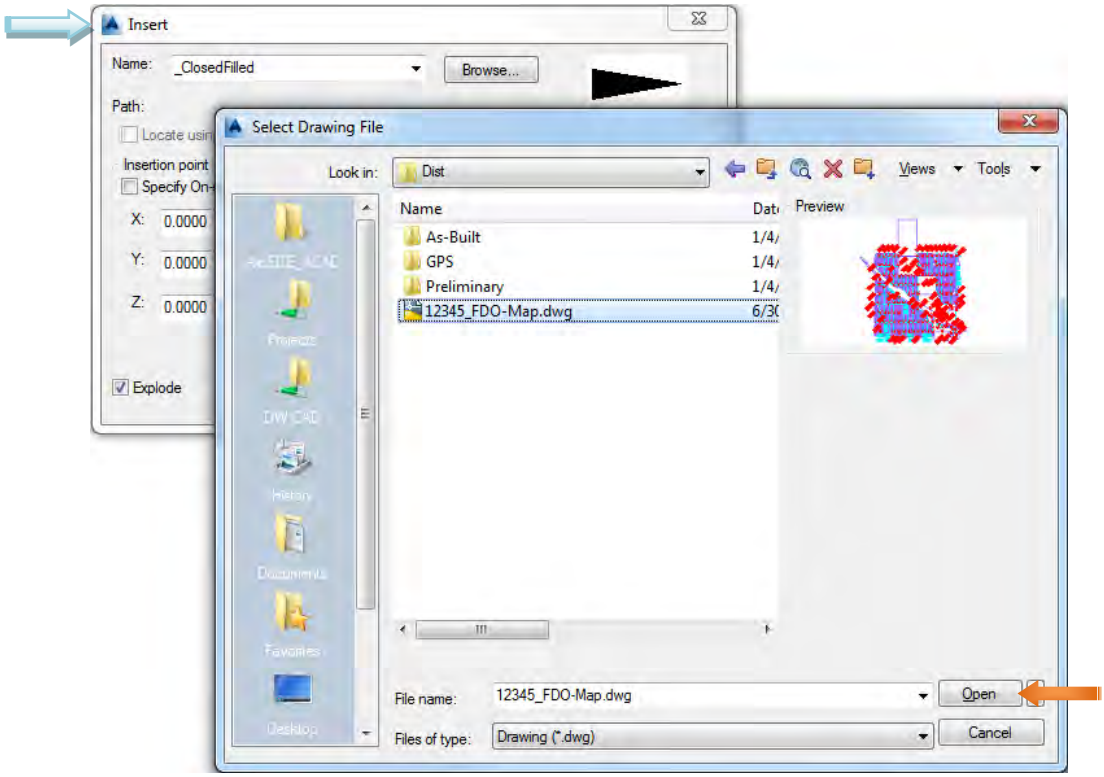


The *Select template* pop-up window will appear, choose the *DW-2016 C3D Template.dwt* and click <Open>:

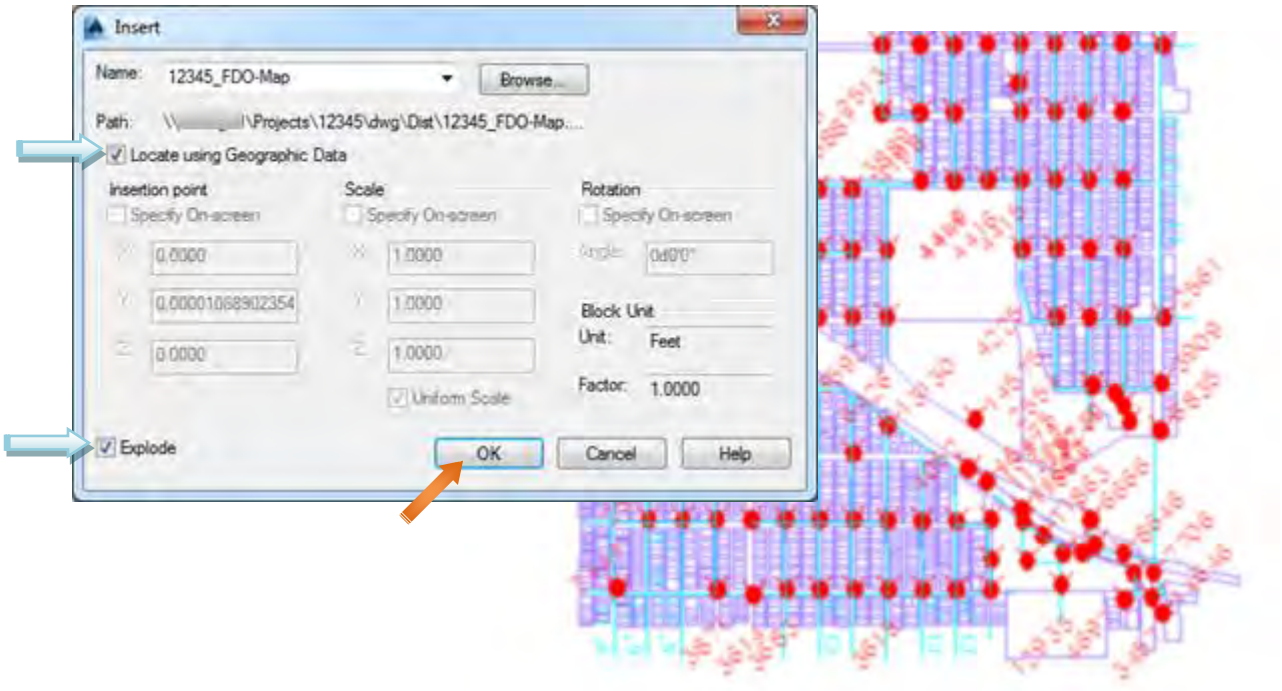


Drawings shall be created using predefined coordinate systems. New drawings *DO NOT* have the coordinate systems preset. **This must be done before anything is drawn in Model Space. [**See *Section 11.0 - Coordinate Systems* of the DW CAD Standards]:

Using the INSERT command, add the recently saved FDO drawing into the current drawing:

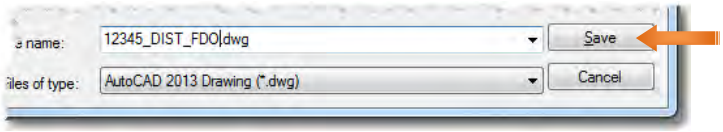


Once the FDO drawing is selected the *Insert* pop-up will reappear. Ensure the *Locate using Geographic Data* and *Explode* checkboxes are selected and click <OK>. The inserted/exploded AutoCAD features can now be seen in Model Space:



NOTE: the target and source drawings must be set to the same coordinate system for this to translate successfully.

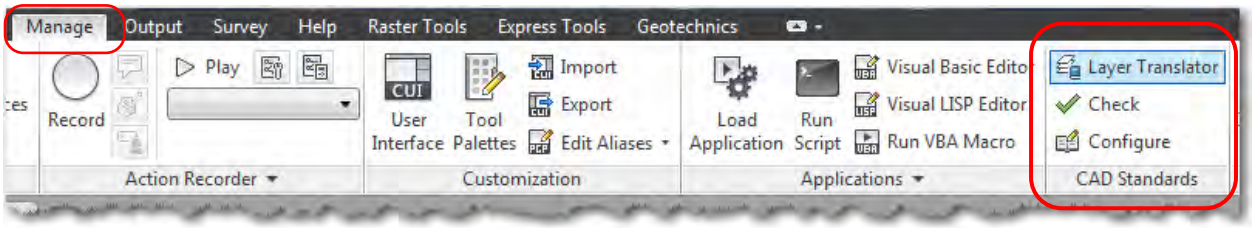
Save the current drawing, name appropriately, ***PTNO_DIST_FDO.dwg***:



Layer Translator

Layers and symbols within the FDO drawing must be placed on the correct DW Standard layers [see *Section 12.0: Layers & Linetypes* of the DW CAD Standards for "GIS" layers]. **The Layer Translator must be utilized in this process.**

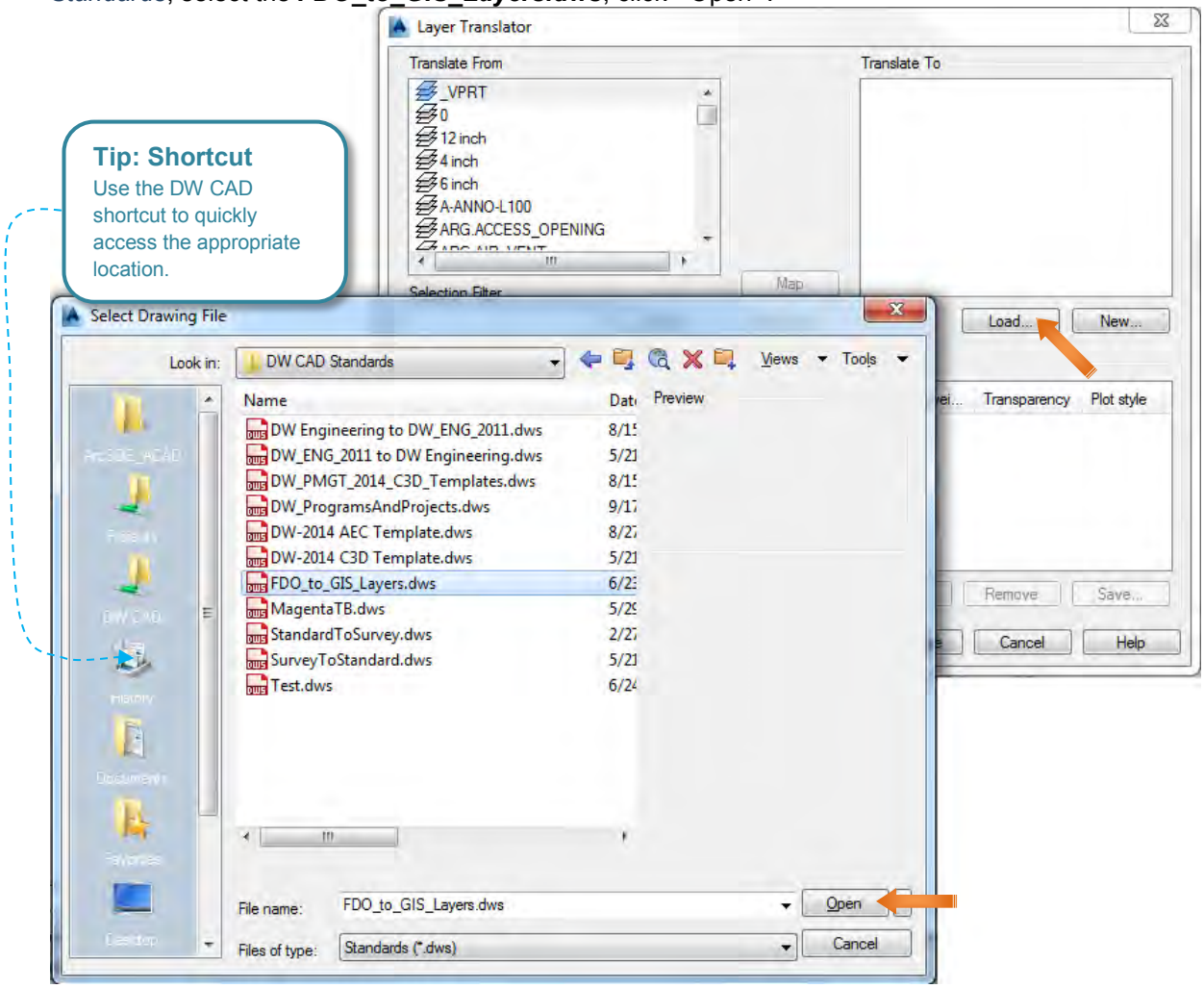
On the Manage tab of the ribbon, CAD Standards panel, click *Layer Translator*:



The *Layer Translator* pop-up window will appear displaying the current drawing's layers in the *Translate From* column.

Automatic Layer Mapping

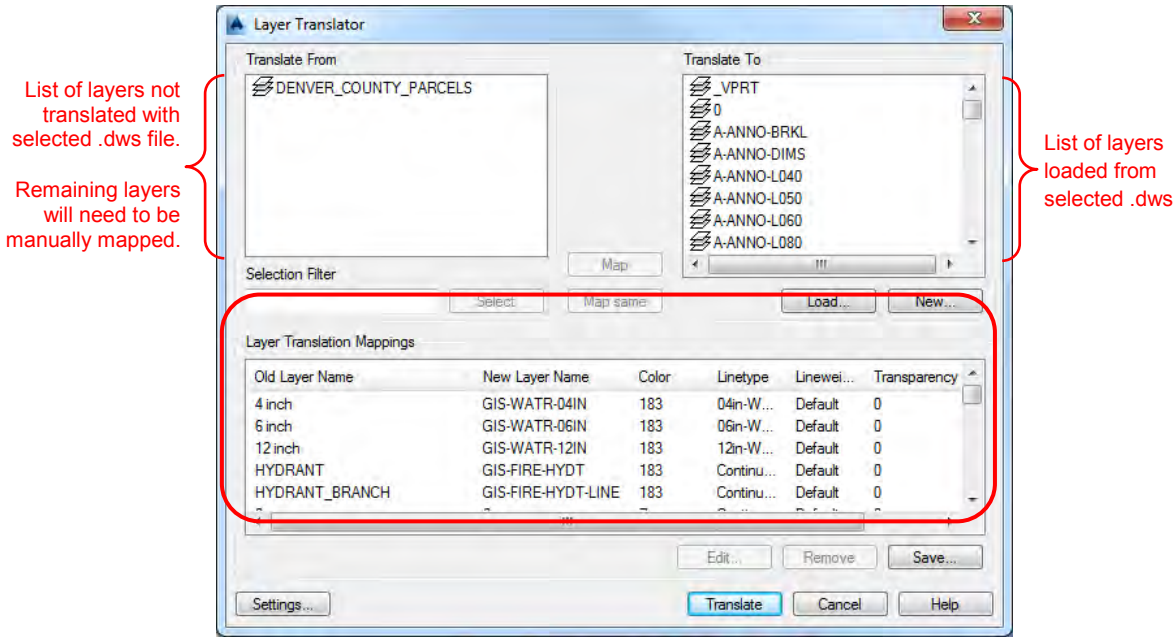
To automatically map a majority of the layers, click the <Load> button and navigate to *DW CAD/DW CAD Standards*; select the ***FDO_to_GIS_Layers.dws***, click <Open>:



NOTE: Always check that the *Files of type* is set to the correct file extension.

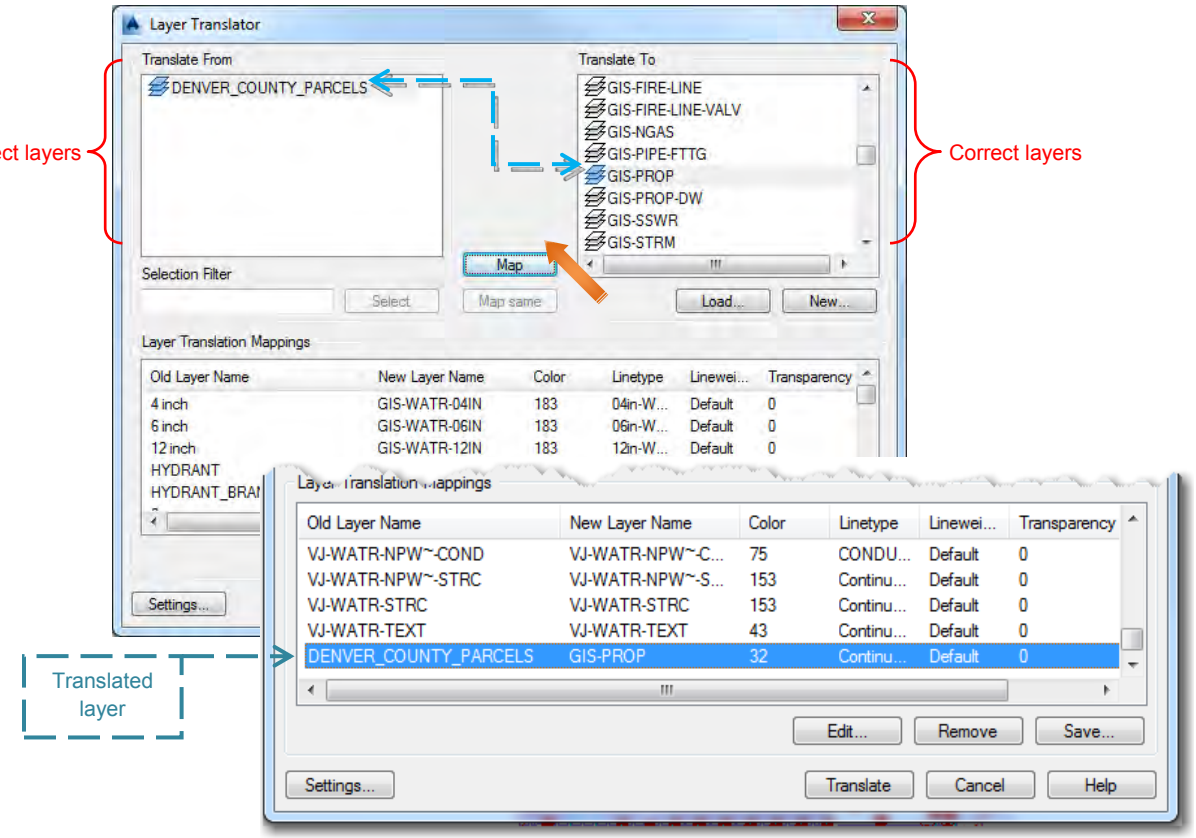
DO NOT SKIP THIS STEP

In the *Layer Translator* pop-up, the layers that have been automatically mapped/translated to DW Standard layers can be seen in the Layer Translation Mappings section:

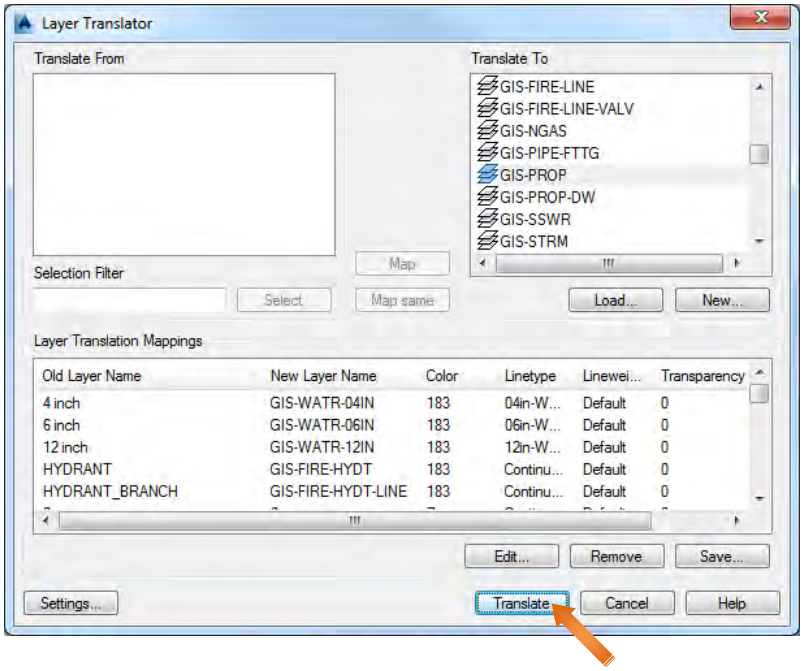


Manual Layer Mapping

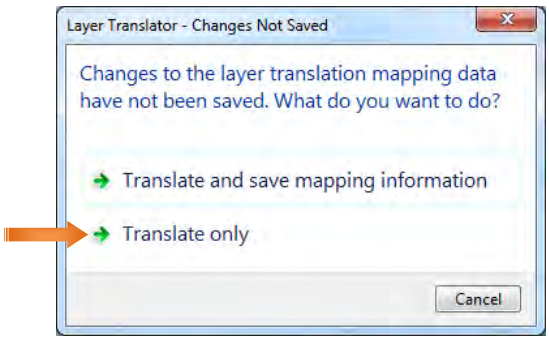
Any layers left in the *Translate From* column will need to be manually mapped/translated to the applicable GIS prefixed layers. To do this, choose the incorrect layer in the *Translate From* list (left) and the correct layer in the *Translate To* list (right) and then click <Map>; this will add the selected layer to the *Layer Translation Mappings* section (bottom):



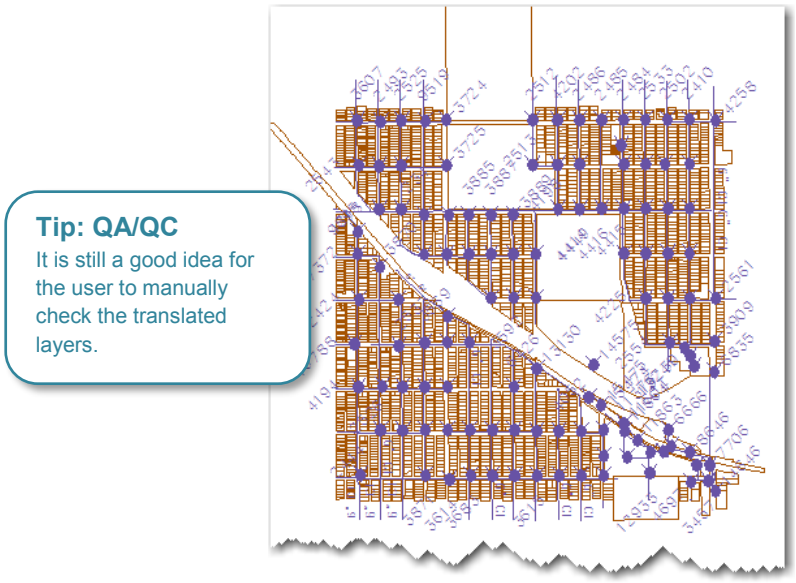
Once all of the layers required have been mapped, click <Translate>:



The *Layer Translator – Changes Not Saved* pop-up window will appear, click <Translate Only>:



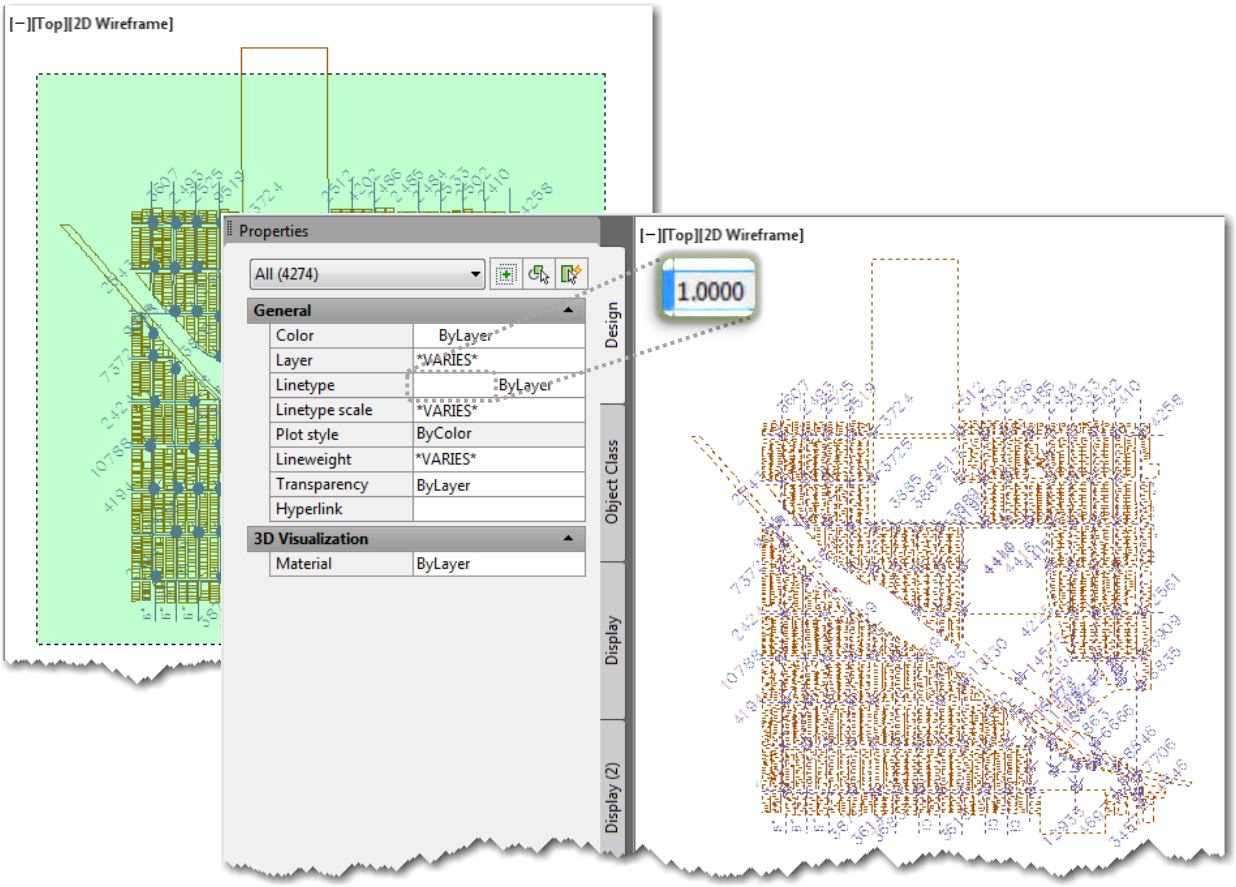
Model Space should now reflect the changes to the layers, most notably the layer colors:



Tip: QA/QC
It is still a good idea for the user to manually check the translated layers.

Linetype Scales

Select all of the AutoCAD features located in Model Space by using a selection window. Using the *Properties* palette change all object Linetype Scales to **1**:



Cleanup FDO Drawing

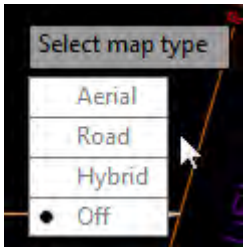
The FDO drawing will still require some basic CAD cleanup and maintenance before this drawing is considered usable in a project drawing; for example:

- Erasing unnecessary text
- Trimming out lot lines
- Purging the drawing

Once the drawing is completely cleaned up it can be inserted into any project drawing at any time.

GEOMAP Command

GEOMAP is a command used to access reference base maps in conjunction with an Autodesk 360 Account, great for verifying project location. Your 360 Account must be linked to Denver Water's contract with Autodesk.



Aerial - displays the map in the current viewport using satellite images.

Road - Displays the map in the current viewport using vector images.

Hybrid - Displays the map in the current viewport overlaying satellite images over vector images and highlighting roads.

Off - Turns off the map.

Note: you must be signed into Autodesk 360 and the drawing contain geographic location information to use.

Section 8.1

E-Map Images via WMS Connections

Overview - Section 8.1

Denver Water has a standard set of imagery to be used at all times. The following steps can be used to access this imagery through AutoCAD C3D or AutoCAD Map 3D. By using WMS to connect to imagery basic AutoCAD functions, such as setting layers, will not apply to these images. Any visual modifications to images will need to be performed each time the drawing is opened.

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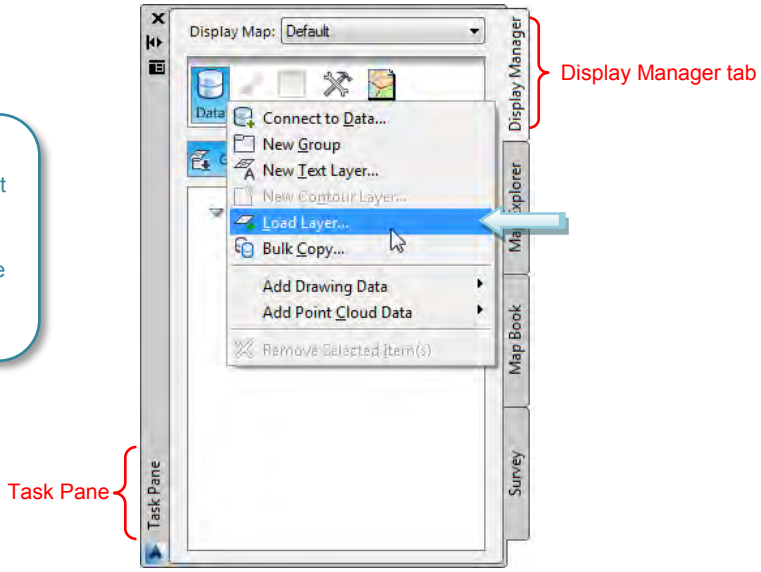
Adding An Aerial Image

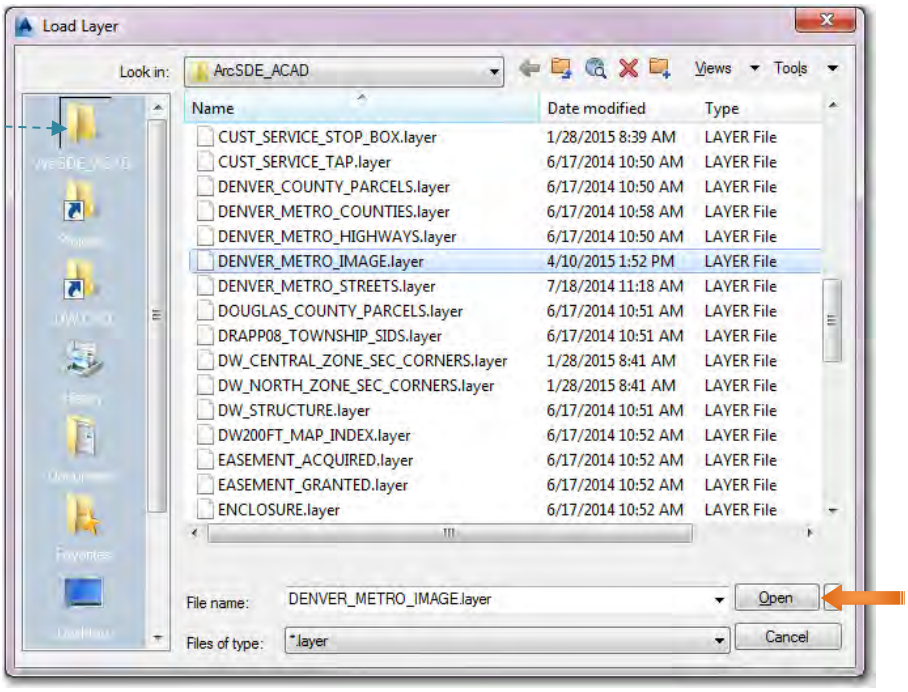
In the *Task Pane*, on the Display Manager tab, click the *Data* icon and select *Load Layer…*:

Tip: Task Pane
Type MAPWSPACE at the command prompt to turn the Task Pane ON or by click it on the Quick Tools tool palette.



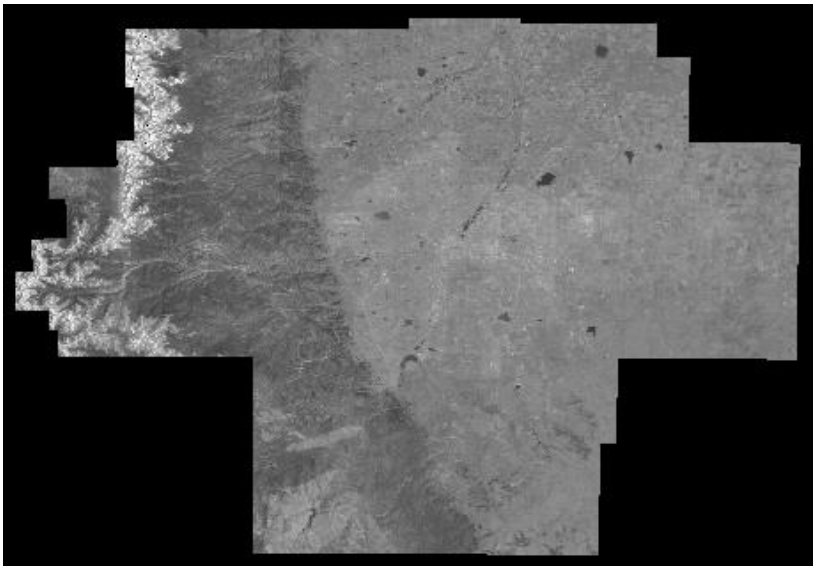
The *Load Layer* pop-up window will appear. Navigate to *DW CAD\ArcSDE_ACAD*; select ***DENVER_METRO_IMAGE.layer*** and click <Open>:

Tip: Shortcut
In most cases AutoCAD will already be preset with an "ArcSDE_ACAD" shortcut, located on the left side of AutoCAD pop-up windows.



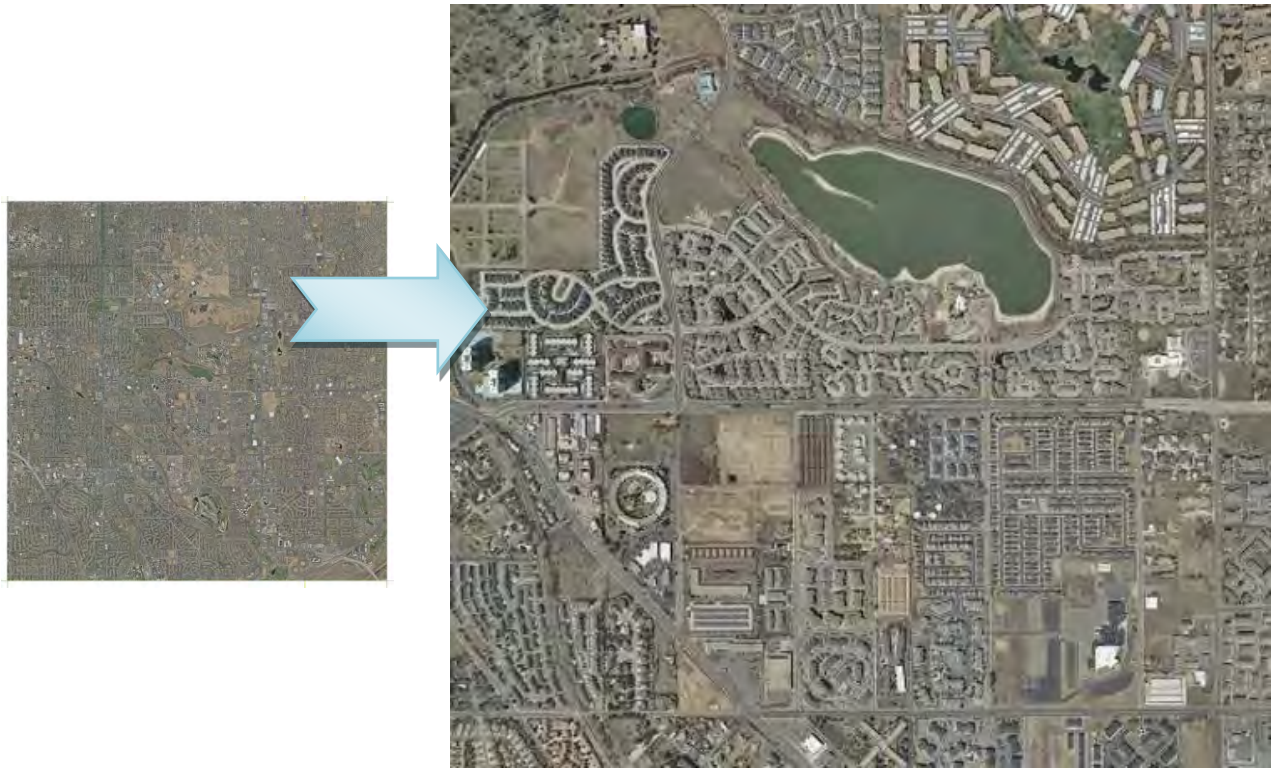
Loading the ***DENVER_METRO_IMAGE.layer*** will automatically establish a connection to GIS data.

Once the connection is established, Model Space should resemble the example below:

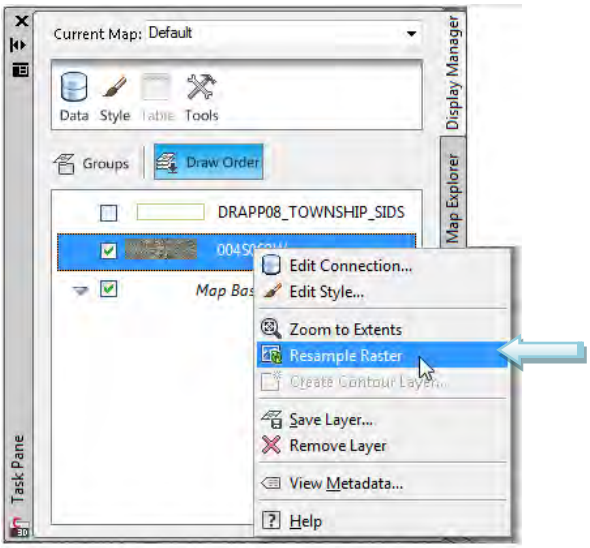


Resizing images

To display only the desired area of an image, zoom into the scope of work in Model Space:



In the Task Pane, right-click on the image layer and select Resample Raster:

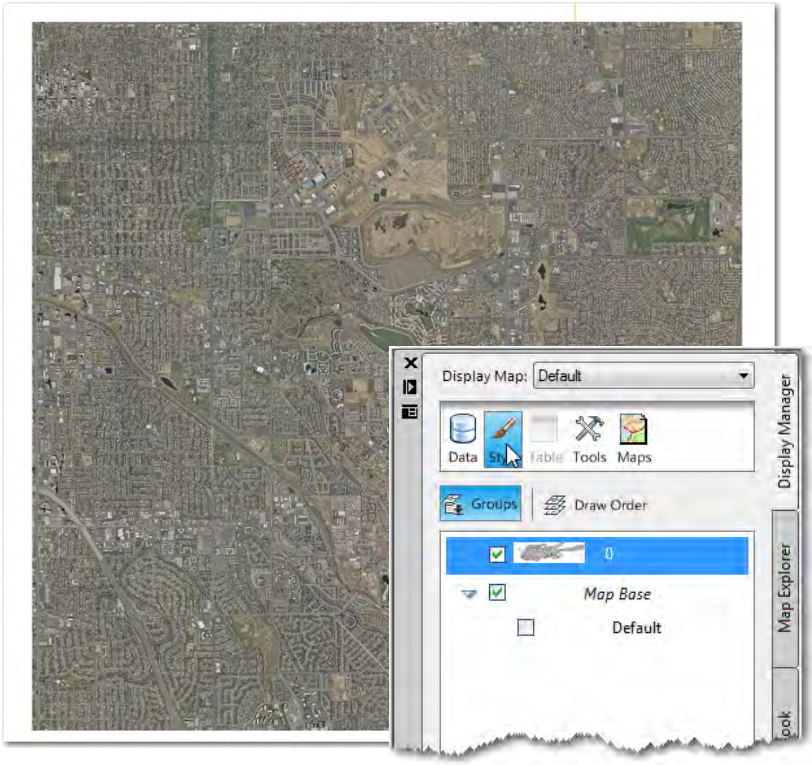


In Model Space the frame of the image will resize to the extents of the display area:

ATTENTION
Saving the drawing will not save any resizing of the image. The next time the drawing is opened the user will have to go through these steps again.

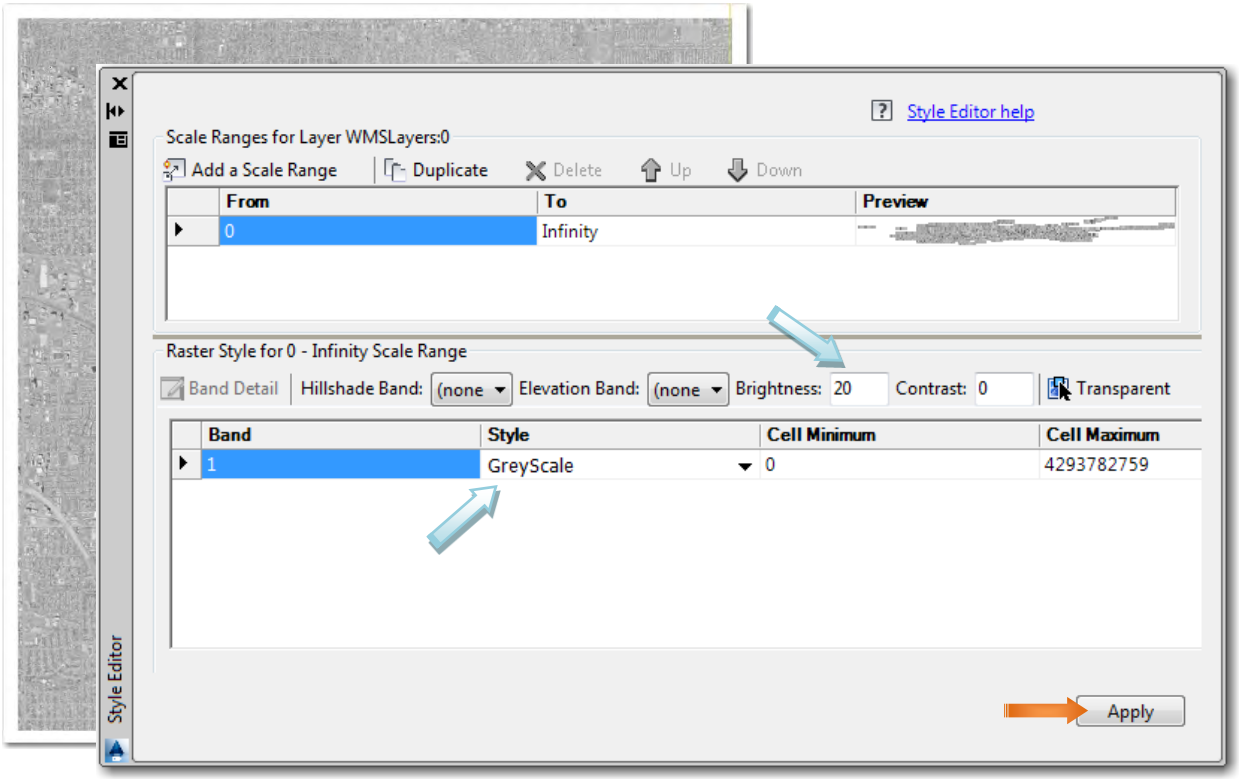
Image GreyScale & Brightness Adjustment

To change an image from color to greyscale select the image in the Task Pane and click the Style icon to open the Style Editor:



In the *Style Editor,* in the *Style* pull-down, change the selection from *Full Color* to *GreyScale*. If the image is too dark when plotted, then the *Brightness* can also be adjusted from the *Style Editor* palette, choose a number between 0-25.

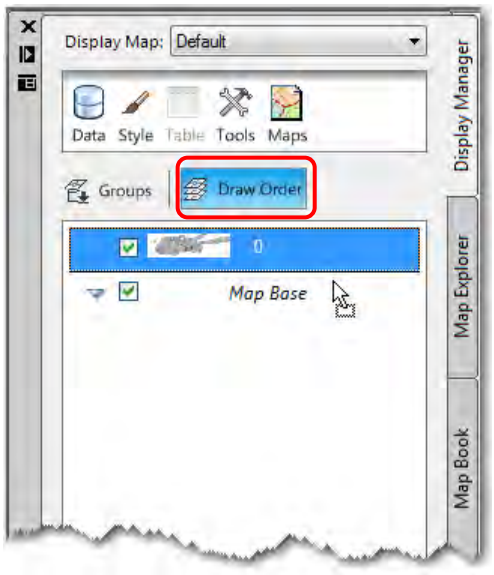
When finished click <Apply>:



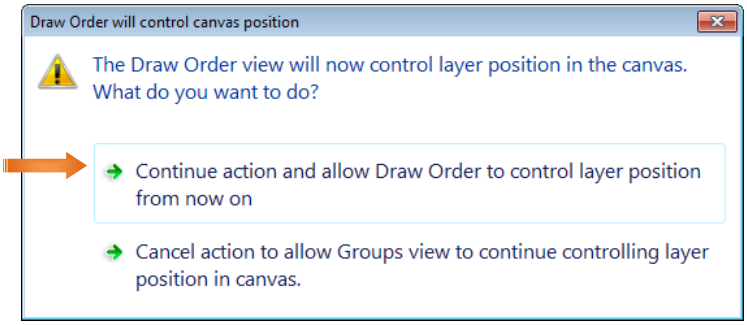
Display Order

Initially images come in on top of everything else; a combination of tools/commands will need to be performed to send the image(s) to the back.

In the Task Pane, click the Draw Order icon and drag the image layer to the bottom of the list:



The Draw Order will control canvas position pop-up window will appear. Click <Continue action and allow Draw Order to control layer position from now on>:



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Section 8.2

SID Images via Raster Connections

Overview - Section 8.2

Denver Water has a standard set of imagery to be used at all times. The following steps can be used to access this imagery through AutoCAD C3D or AutoCAD Map 3D. By using FDO to connect to imagery basic AutoCAD functions, such as setting layers, will not apply to these images. Any visual modifications to images will need to be performed each time the drawing is opened.

*DRAPP08_TOWNSHIP_SIDS.layer is no longer the most current imagery. Please use DENVER_METRO_IMAGE.layer whenever possible or **DRCOG_IMAGE_FOOTPRINTS.layer** as seen in section below.

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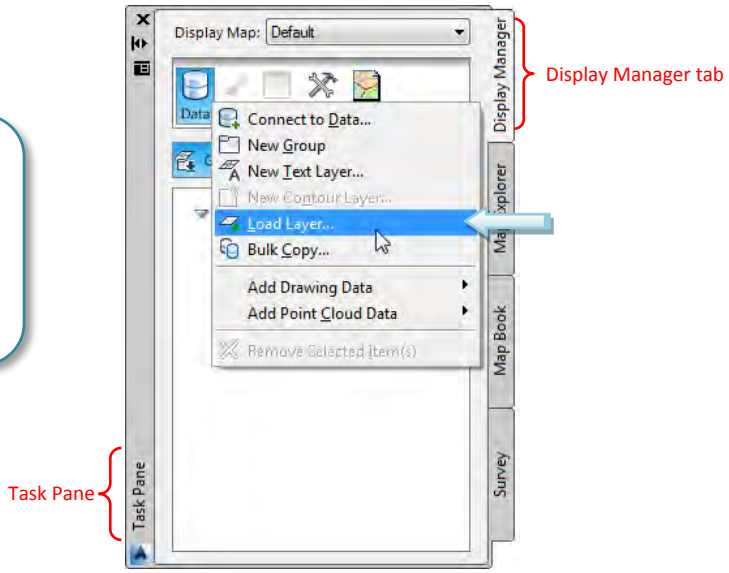
Adding An Aerial Image

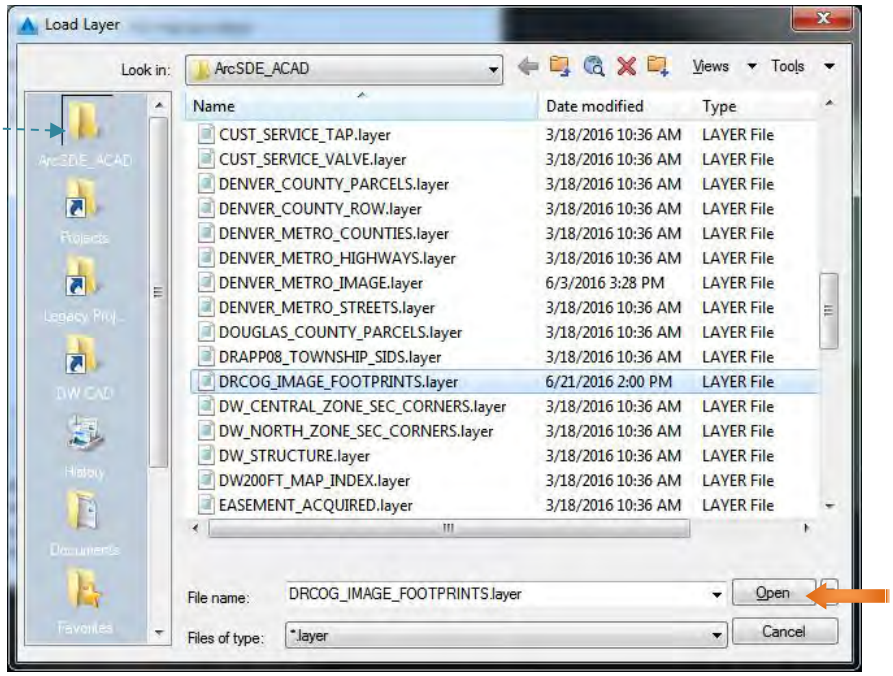
In the *Task Pane*, on the Display Manager tab, click the *Data* icon and select *Load Layer…*:

Tip: Task Pane
Type MAPWSPACE at the command prompt to turn the Task Pane ON or by click it on the Quick Tools tool palette.



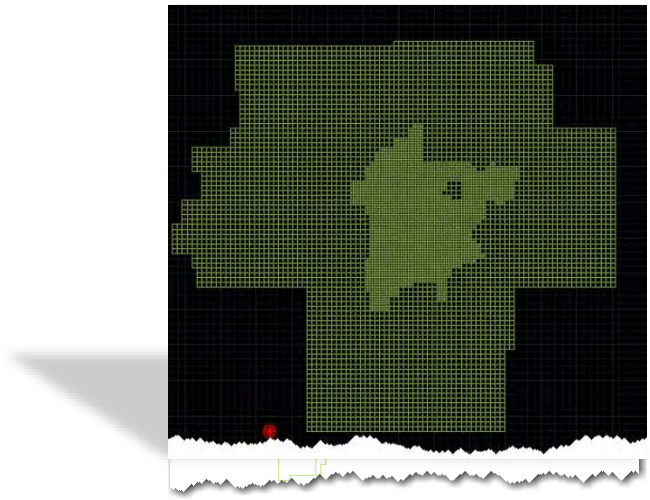
The *Load Layer* pop-up window will appear. Navigate to *DW CAD\ArcSDE_ACAD*; select ***DRCOG_IMAGE_FOOTPRINTS.layer*** and click <Open>:

Tip: Shortcut
In most cases AutoCAD will already be preset with an "ArcSDE_ACAD" shortcut, located on the left side of AutoCAD pop-up windows.

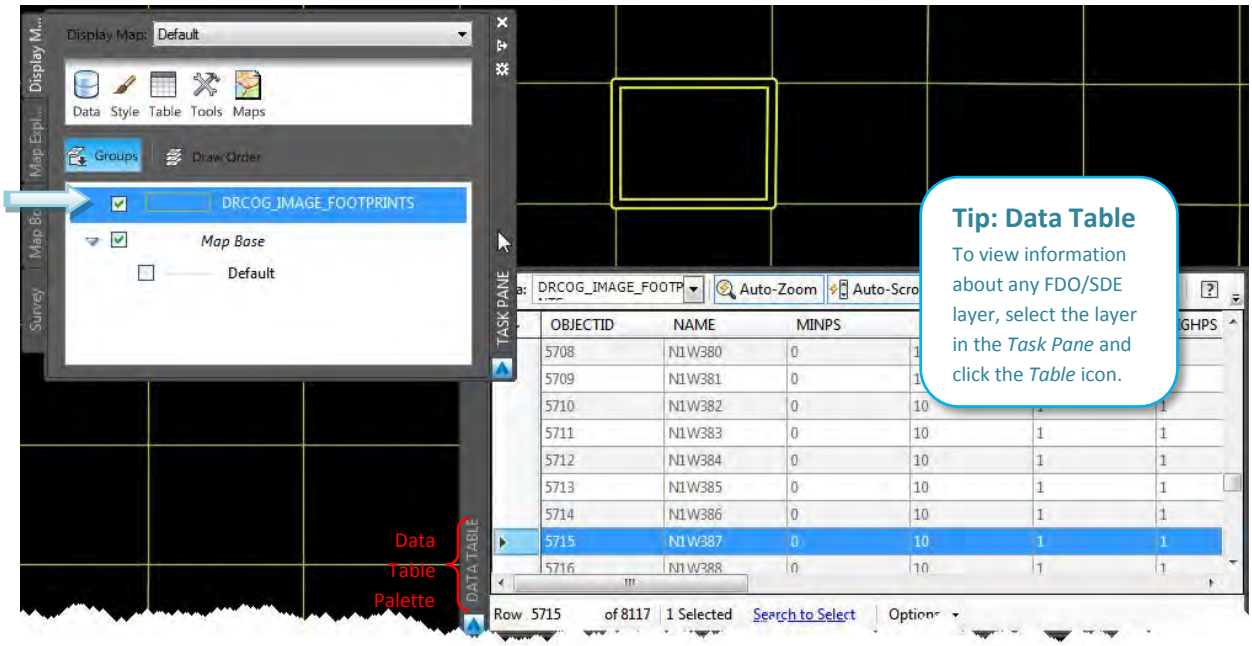


Loading the ***DRCOG_IMAGE_FOOTPRINTS.layer*** will not automatically establish an SDE connection. For instructions on how to establish an SDE connection see *Section 8.0 - FDO Instructions, page 8.0-9*:

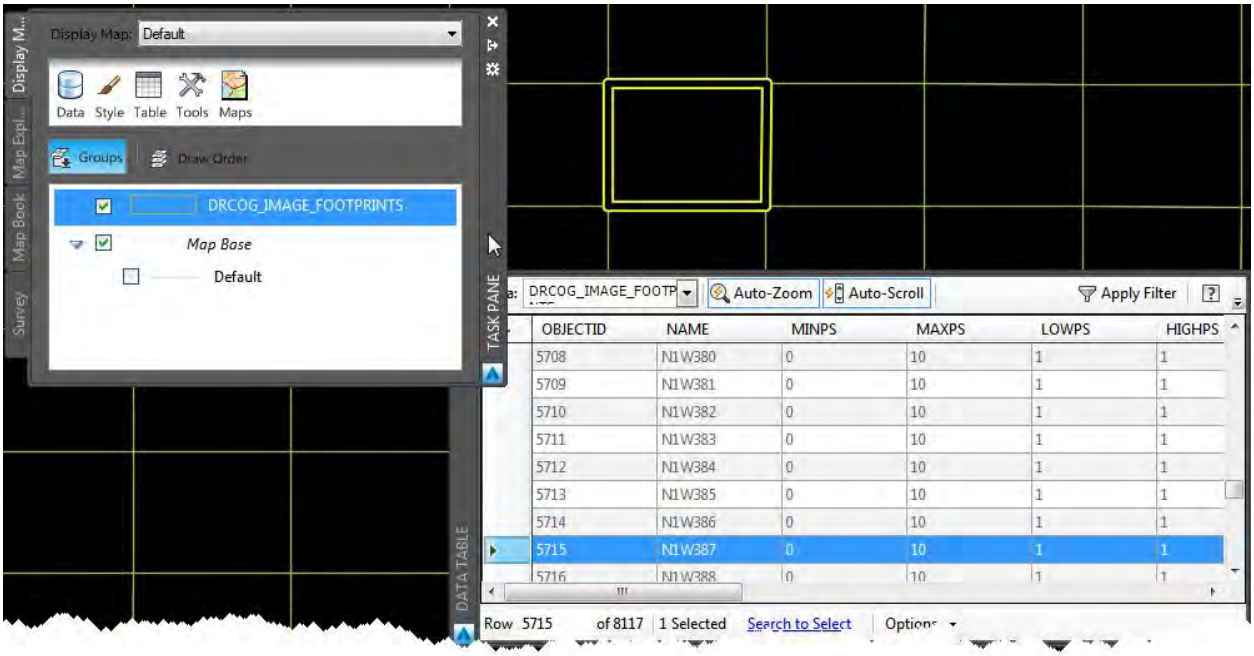
Once the SDE Connection is established, Model Space should resemble the example below:



In the *Task Pane* select the ***DRCOG_IMAGE_FOOTPRINTS.layer*** and click the *Table* icon. The *Data Table* palette will appear:

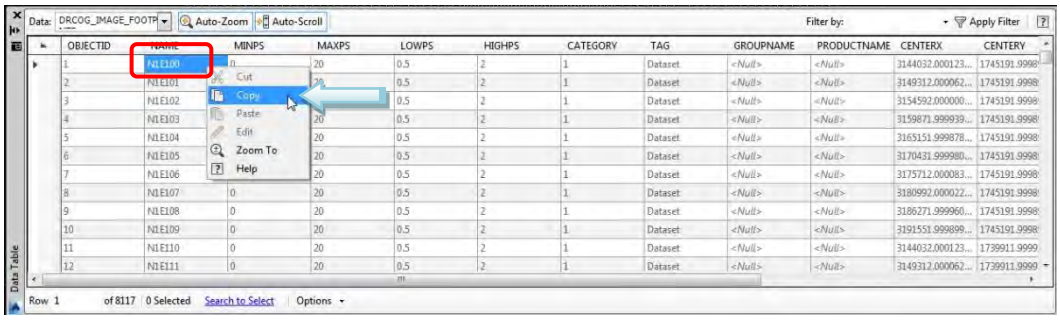


In Model Space, select the tile(s) corresponding to the scope of work. The tile(s) will become highlighted along with the information in the *Data Table*:

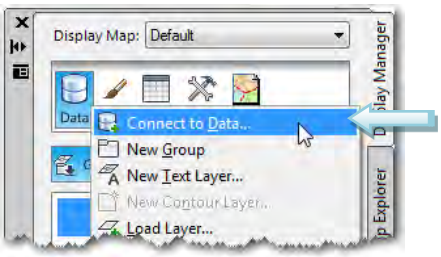


NOTE: To add multiple images you can also simply select more than one tile/square.

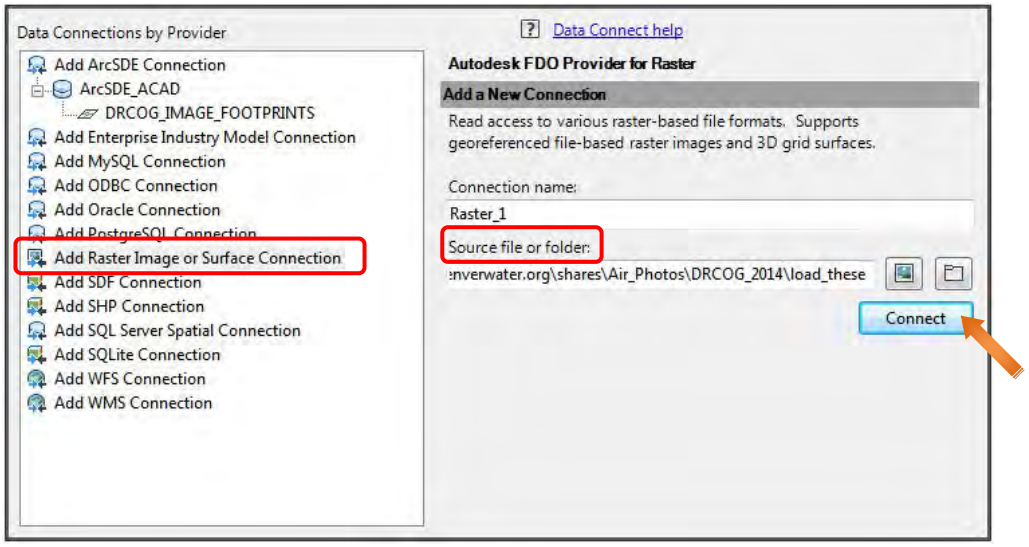
In the NAME column, highlight the name(s), right-click and select *Copy* (for reference paste to notepad):



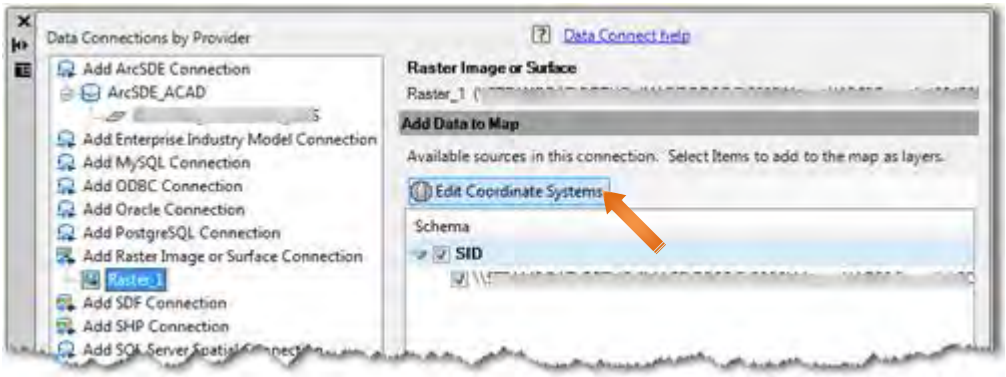
In the *Task Pane*, on the Display Manager tab, click the *Data* icon and select *Connect to Data…*:



The *Data Connect* fly-out will appear. Choose *Add Raster Image or Surface Connection* from the list on the left and type \\denverwater.org\shares\Air_Photos\DRCOG_2014\load_these into the *Source file or folder* field. Click <Connect> when finished (this connection may take a couple of minutes):

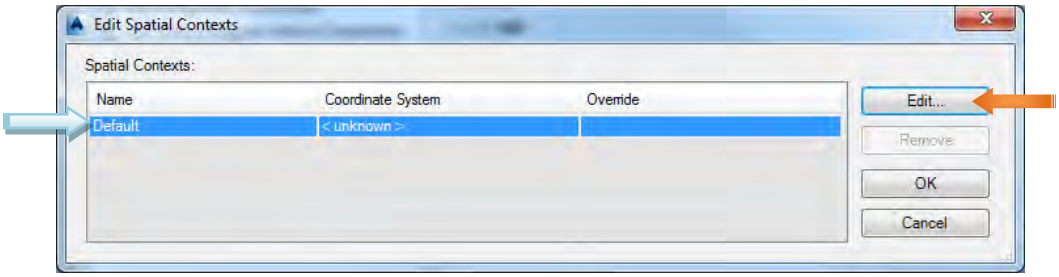


Typically the **CO83-CF** (Colorado State Plane) Coordinate System will be assigned to each image. To do this click the <Edit Coordinate Systems> button:

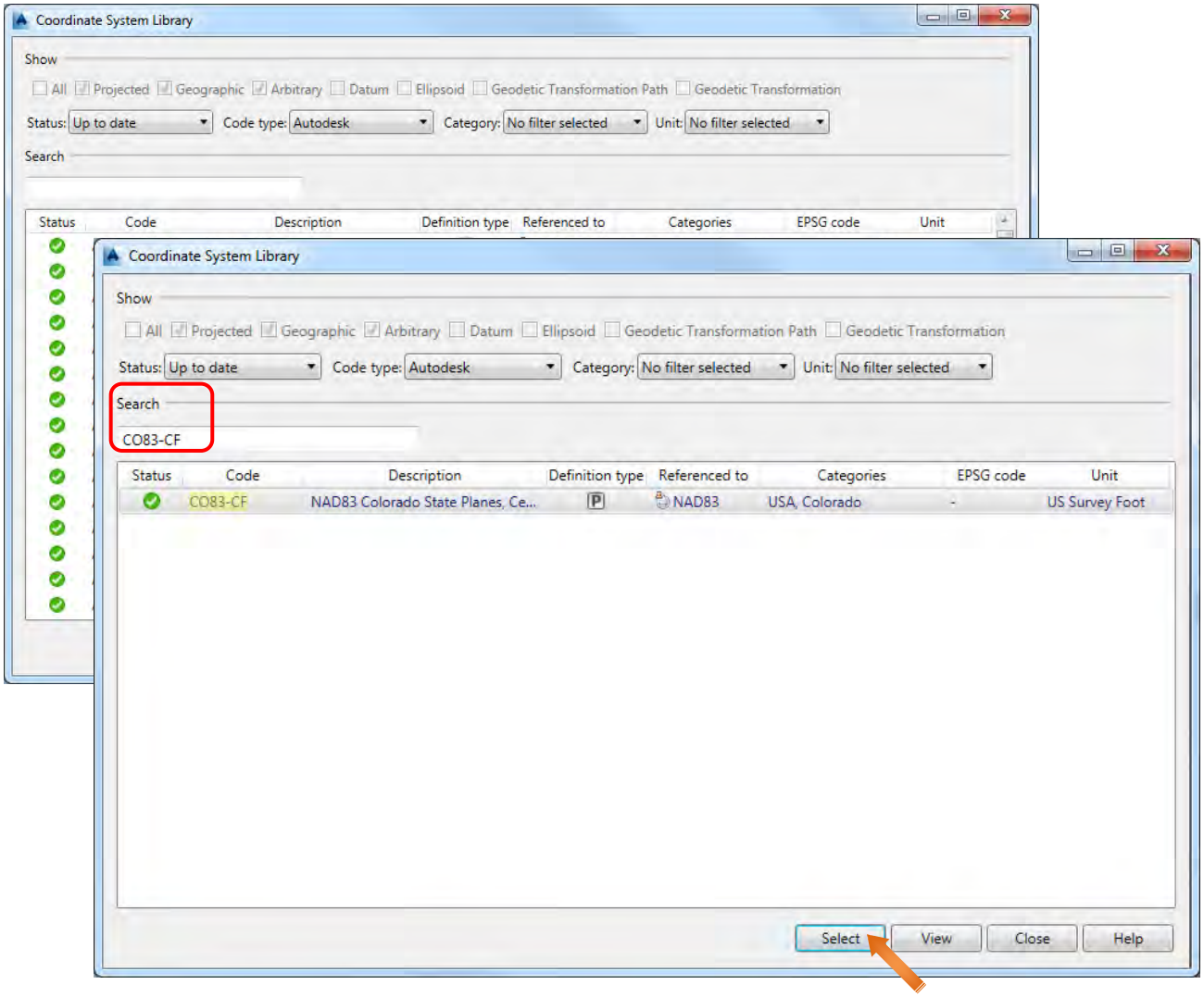


NOTE: The images typically use the CO83-CF Coordinate System. images from other sources may require a different coordinate system to be assigned.

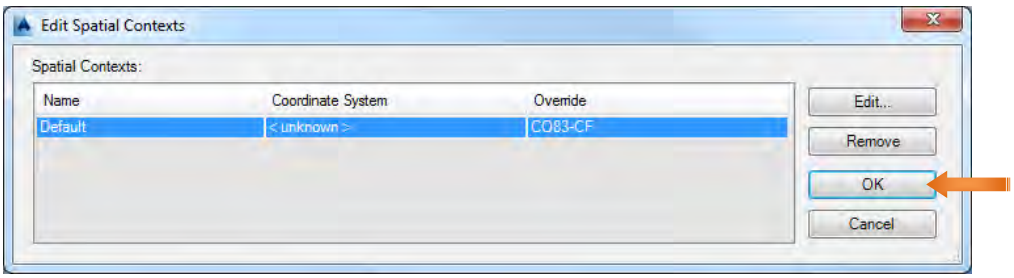
In the *Edit Spatial Contexts* pop-up window, pick Default and click <Edit…>:



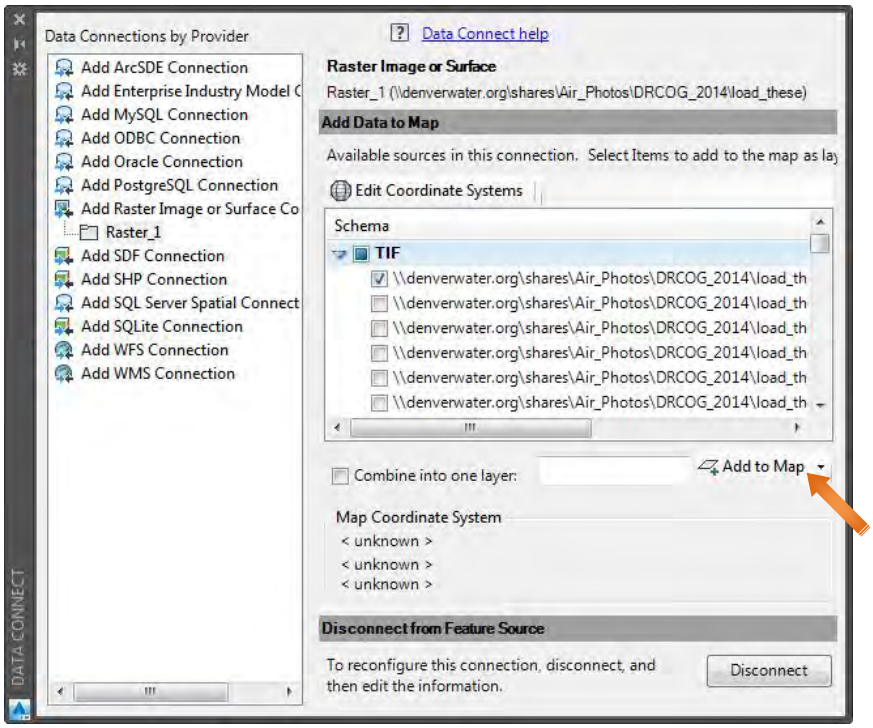
The Coordinate System Library window will appear, in the Search field type CO83-CF and click <Select> when finished:



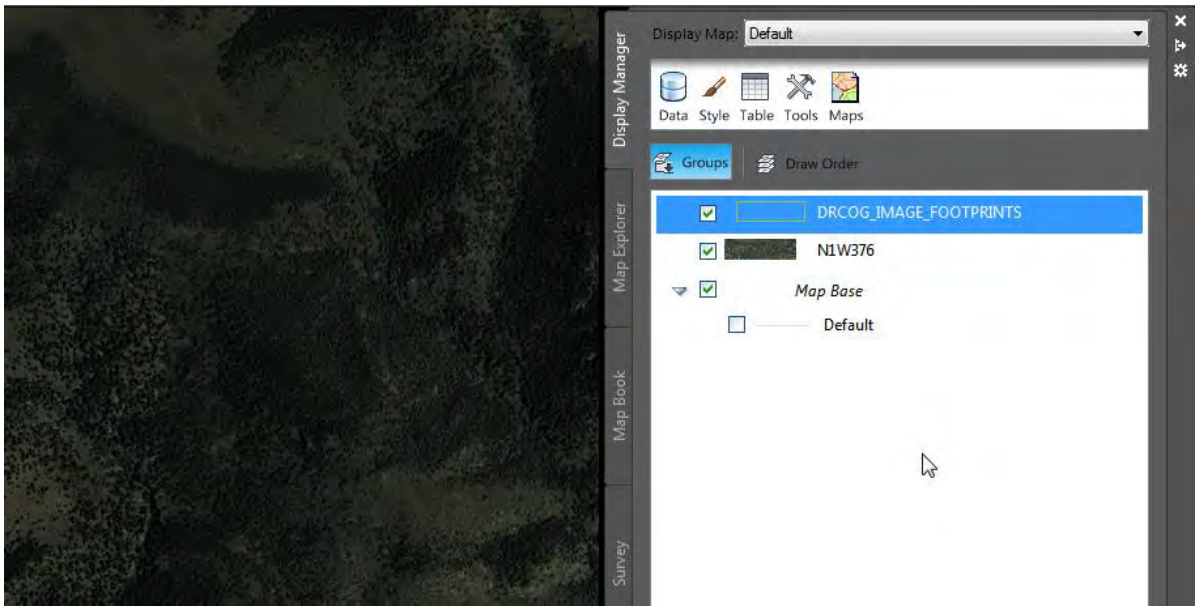
The Edit Spatial Contexts pop-up window will reappear click <OK>:



In the Data Connect fly-out, select the desired tiff tiles, click <Add to Map>:

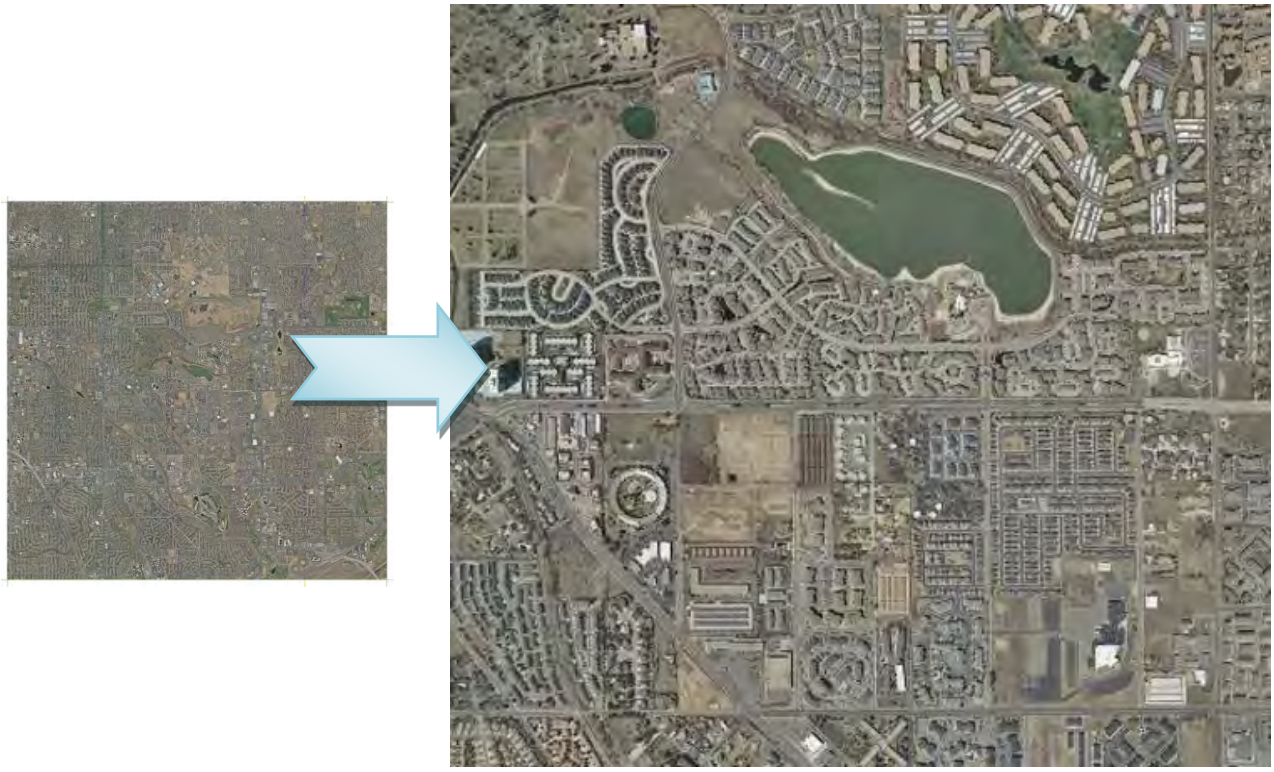


The selected image should now be visible in the Task Pane and in Model Space:

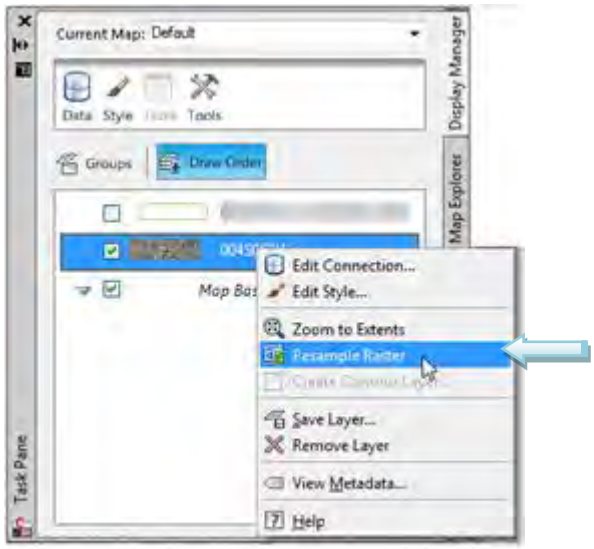


Resizing images

To display only the desired area of an image, zoom into the scope of work in Model Space:



In the Task Pane, right-click on the image layer and select Resample Raster:



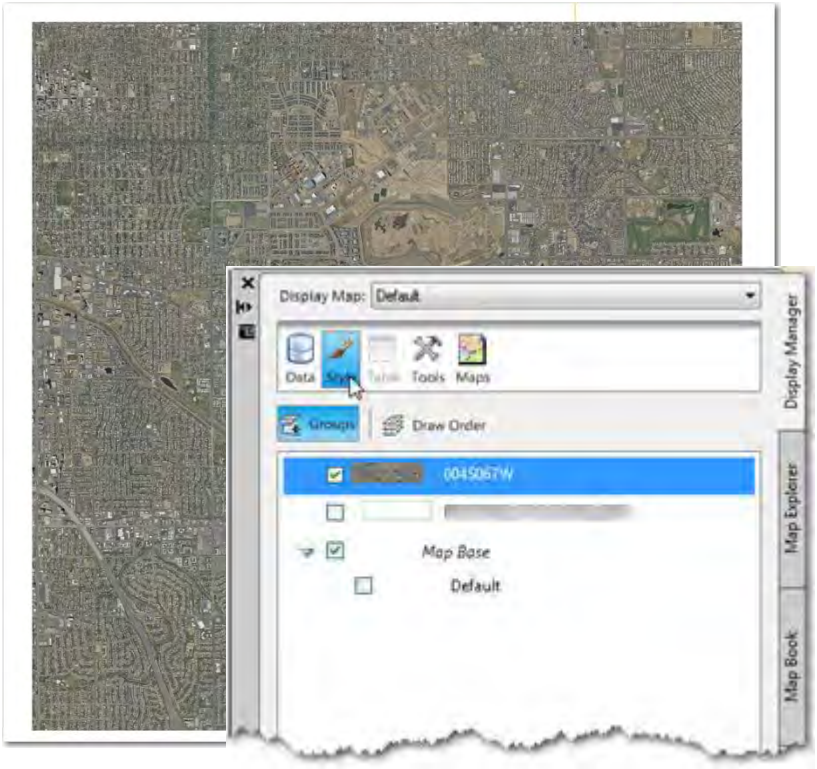
In Model Space the frame of the image will resize to the extents of the display area:

NOTE: Upon reopening a drawing, image layers will appear to be on in Model Space, but off in the Task Pane. Click the check box a couple of times to reset.

ATTENTION
Saving the drawing will not save any resizing of the image. The next time the drawing is opened the user will have to go through these steps again.

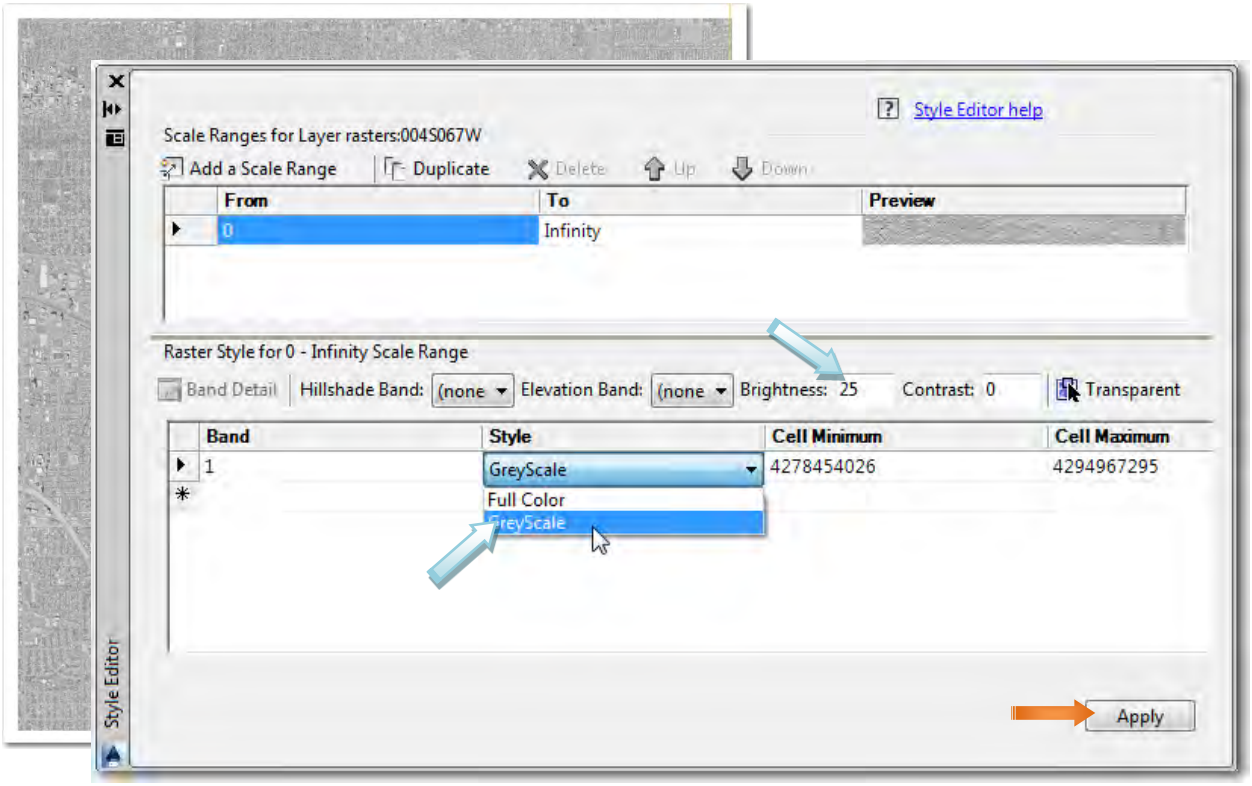
Image GreyScale And Brightness Adjustment

To change an image from color to greyscale select the image in the Task Pane and click the Style icon to open the Style Editor:

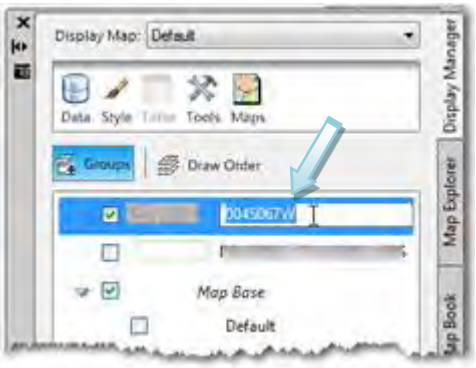


In the Style Editor, in the Style pull-down, change the selection from Full Color to GreyScale. If the image is too dark when plotted then the Brightness can also be adjusted from the Style Editor palette, choose a number between 0-25.

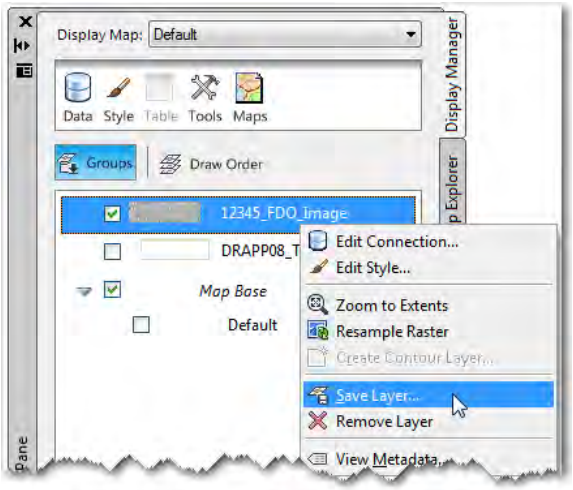
When finished click <Apply>:



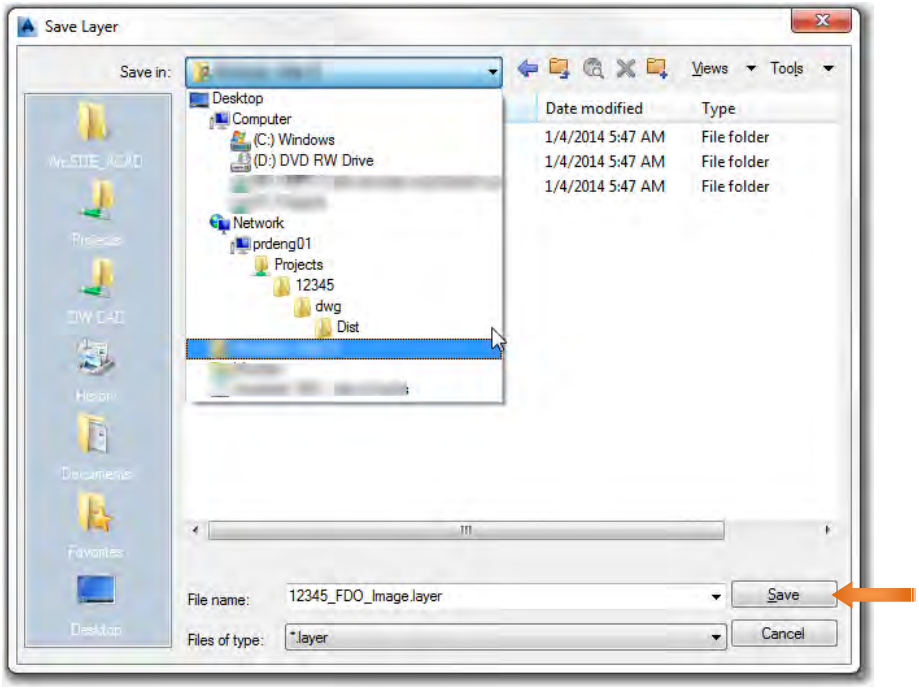
To retain the image stylization for the current drawing the layer should be saved. To rename the layer in the Task Pane click in the name field next to the image:



Rename the layer in accordance with DW naming conventions (ex: 12345_FDO_Image). Right-click on the image layer and select Save Layer…:



In the Save Layer dialog box navigate to the appropriate project folder; click <Save>:



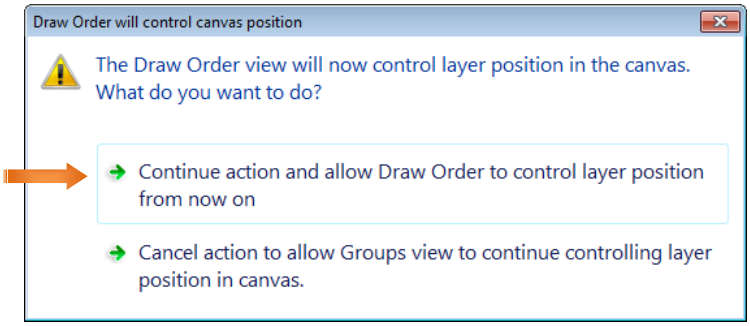
NOTE: Once saved, the image layer can be loaded into any drawing just like any other predefined FDO layer. Image resizing and display order are not saved with the layer.

Display Order

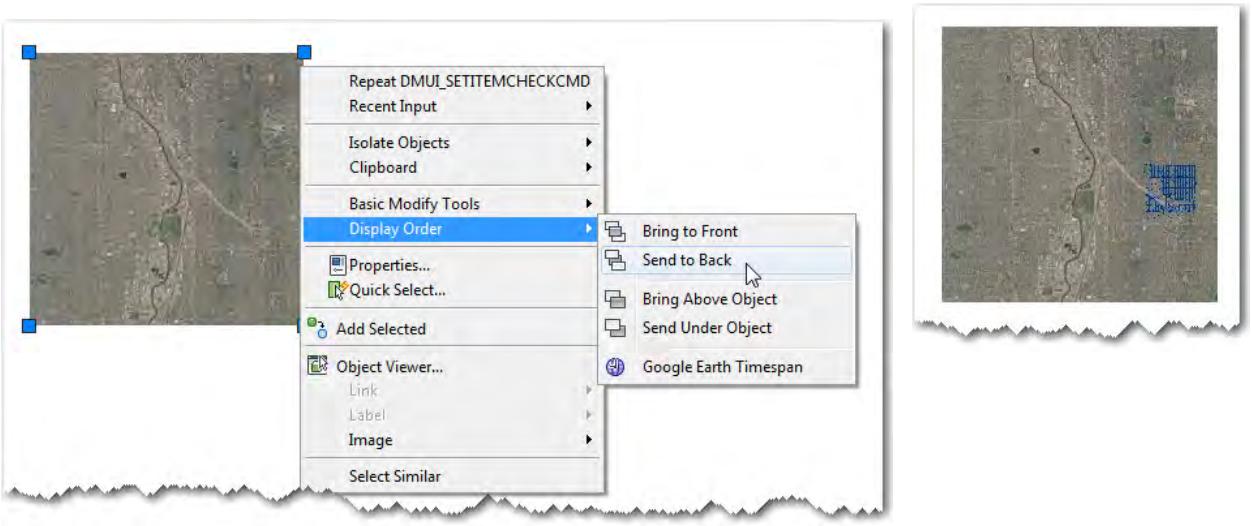
Initially images come in on top of everything else; a combination of tools/commands will need to be performed to send the image(s) to the back.

In the Task Pane, click the Draw Order icon and drag the image layer to the bottom of the list:

The Draw Order will control canvas position pop-up window will appear. Click <Continue action and allow Draw Order to control layer position from now on>:



In Model Space, select the image frame and right-click; select Display Order and choose Send to Back:



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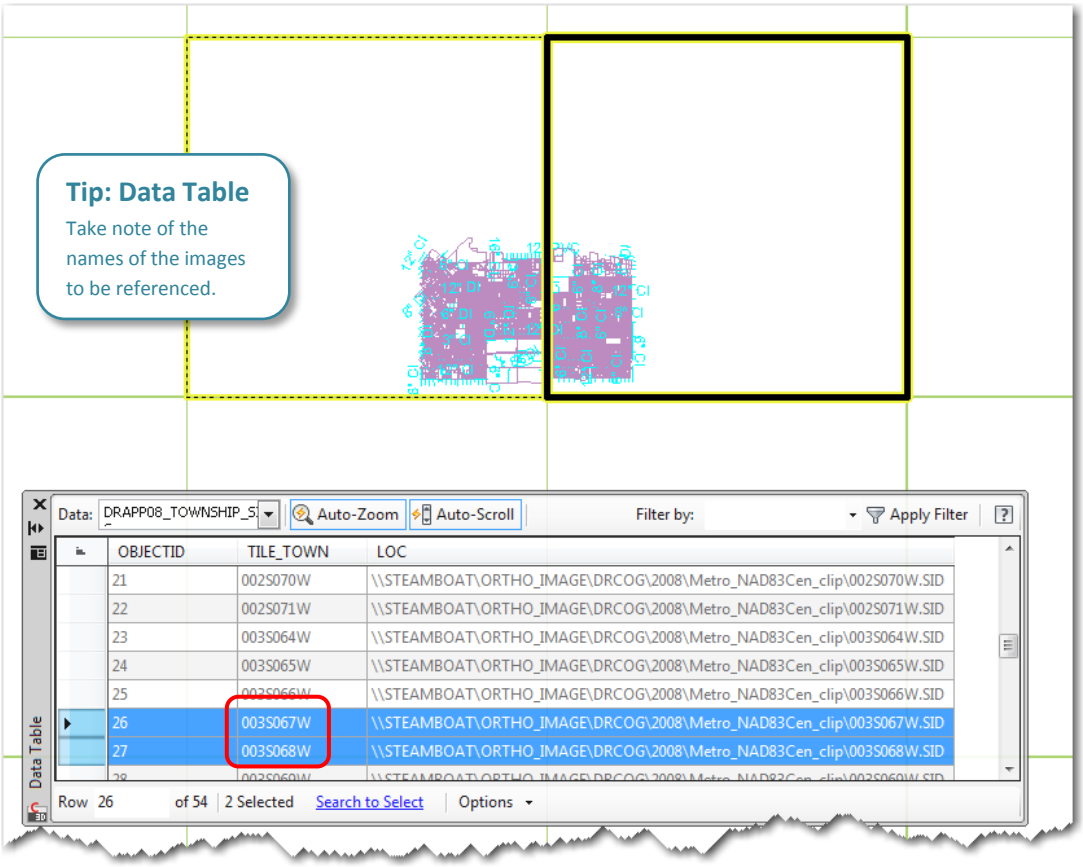
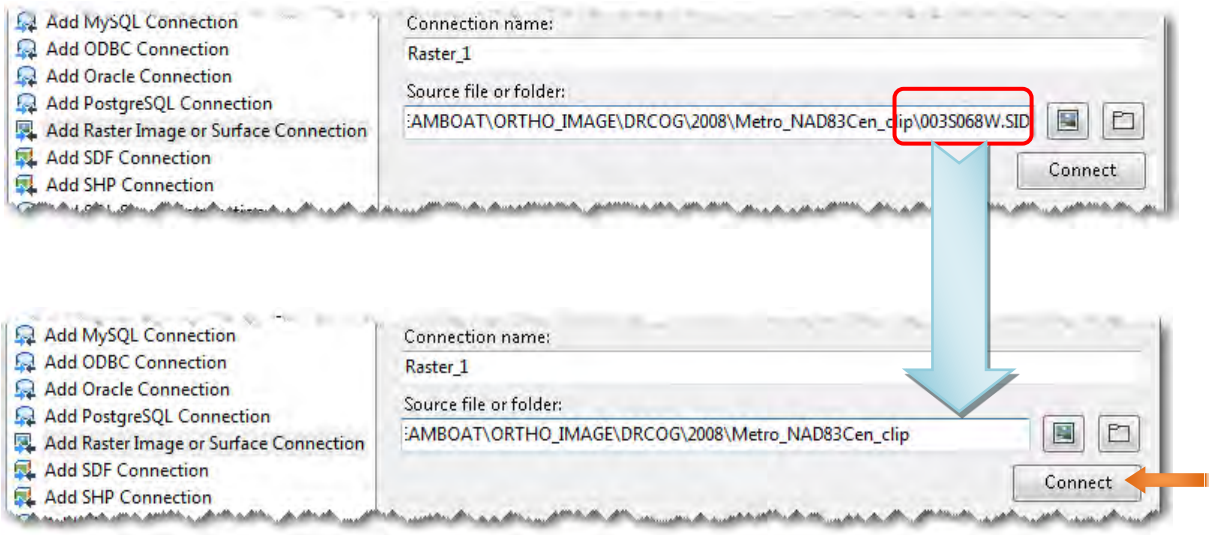
Combining Multiple Image Files

When selecting multiple images it is best to use the following method to ensure the image frames do NOT appear when plotting. This example shows a project spanning across two images. The assumption has been made all steps in *pages 8.1-3* to *8.1-6* have been completed:

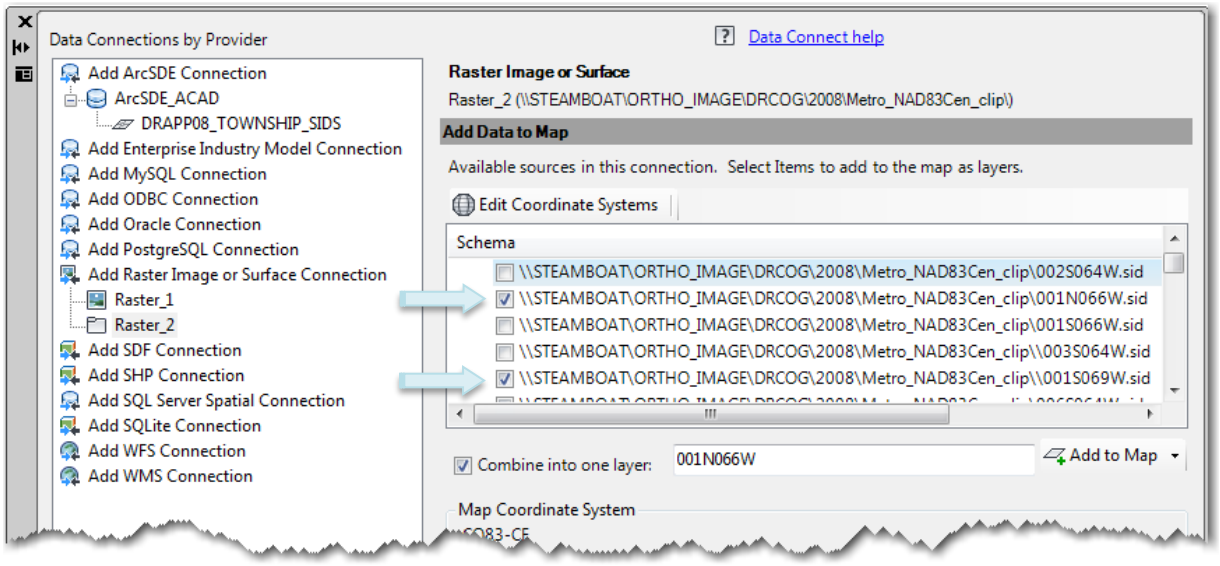


As shown on *page 8.1-6*, *Copy* and *Paste* one of the image paths into the *Source file or folder* field. At the end of the path delete the file name and last slash, then click <Connect>:

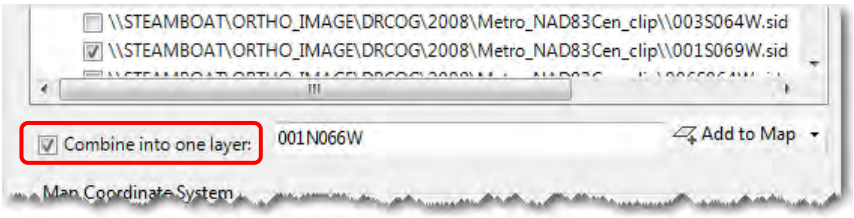


NOTE: By removing the individual file name multiple images can be selected.

Choose the desired images from the Schema:

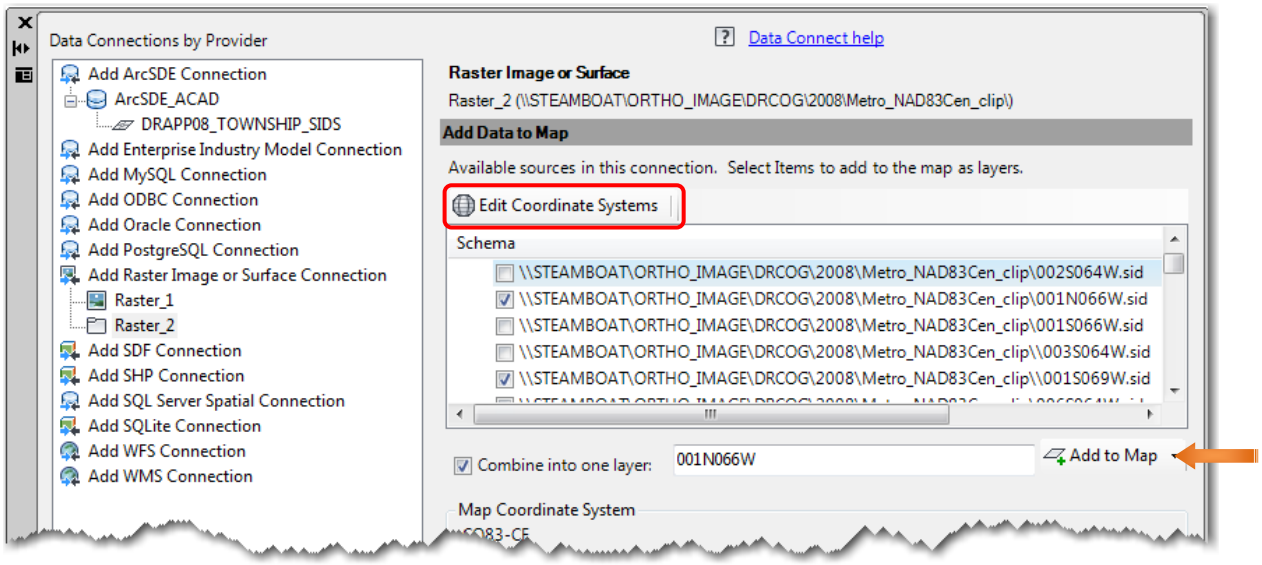


Check the box next to Combine into one layer:



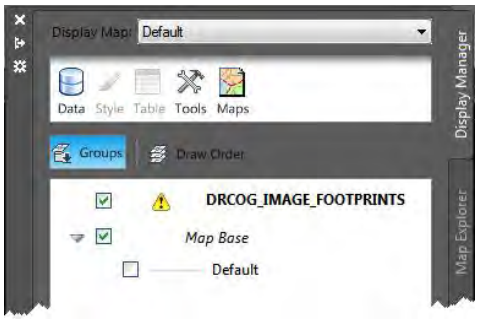
The Coordinate system will need to be set for combined images. Refer to *page 8.1-6* and *8.1-7* to apply the appropriate Coordinate System.

Select <Add to Map>:

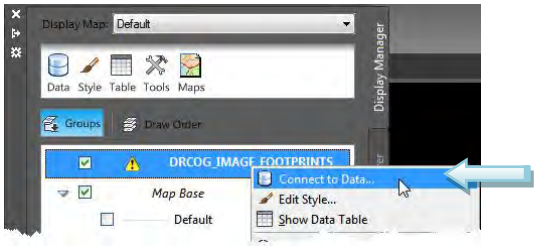


RECONNECTING

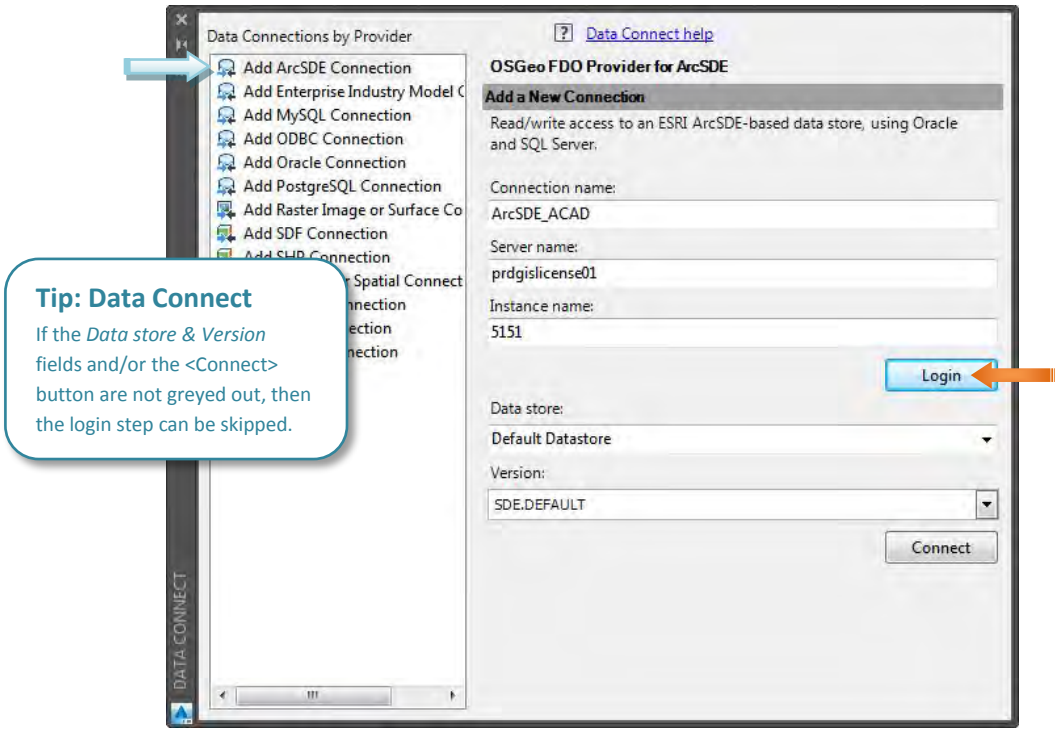
For various reasons, the SDE connections within FDO may become disconnected. The most common sign of disconnection is a yellow shield ⚠ appearing next to one of the layers in the *Task Pane*:



To reconnect, click the *Data* icon and select *Connect to Data …*:



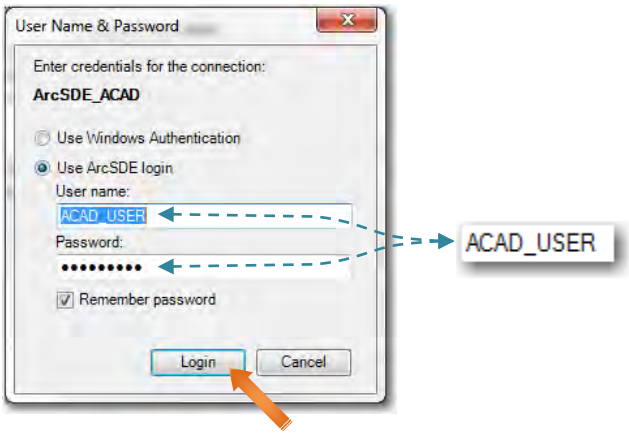
In the *Data Connect* palette select the **ArcSDE_ACAD** connection on the left, then click <Login>:



NOTE: The icon indicates the drawing is disconnected from SDE, and the schema is not avaliable.

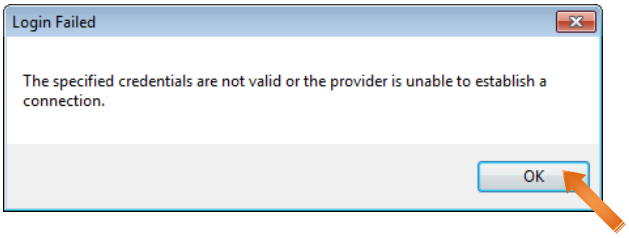
The *User Name & Password* pop-up window will appear. Using all caps, type **ACAD_USER** as the *User name* and the *Password*, then click <Login>:

Tip: Credentials
Check *Remember Password* to only have to do this one time.

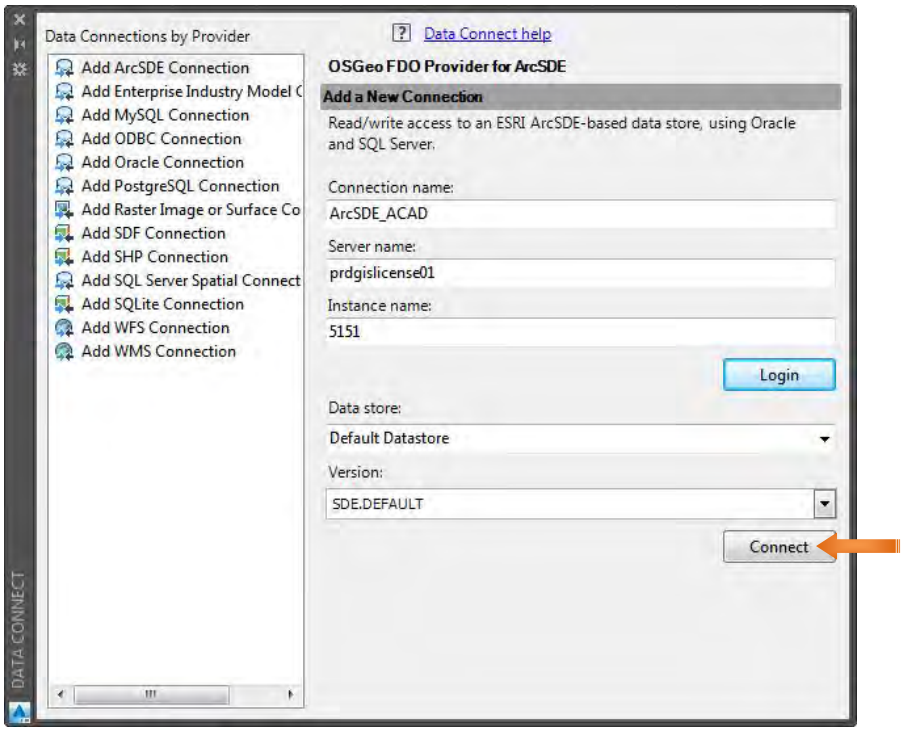


If the following pop-up appears, click <OK> and double-check the user name and password:

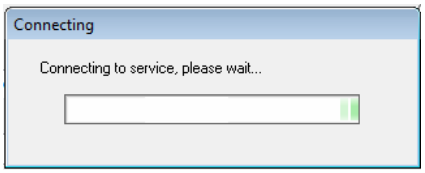
Tip: Credentials
Contact CAD Management if this error continues to occur.

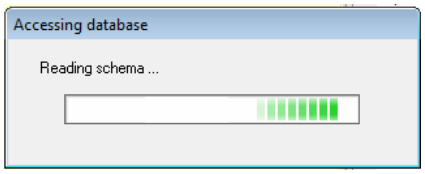


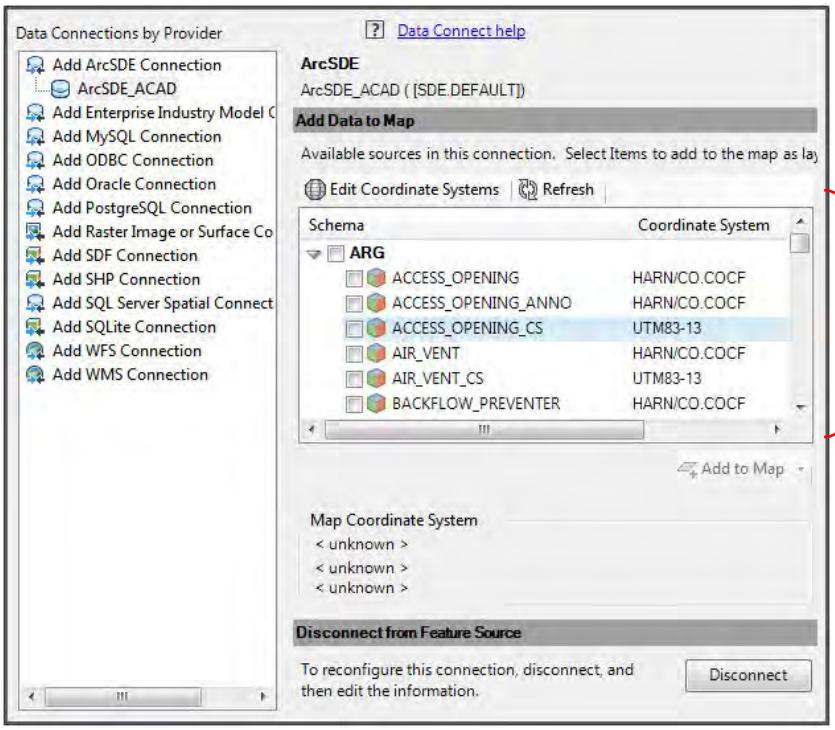
The *Data Connect* palette will display the Data store and Version fields as active, click <Connect>:



While AutoCAD connects to the Schema (GIS data) two separate pop-ups will quickly appear and disappear; the Data Connect palette will then display the available Schema:

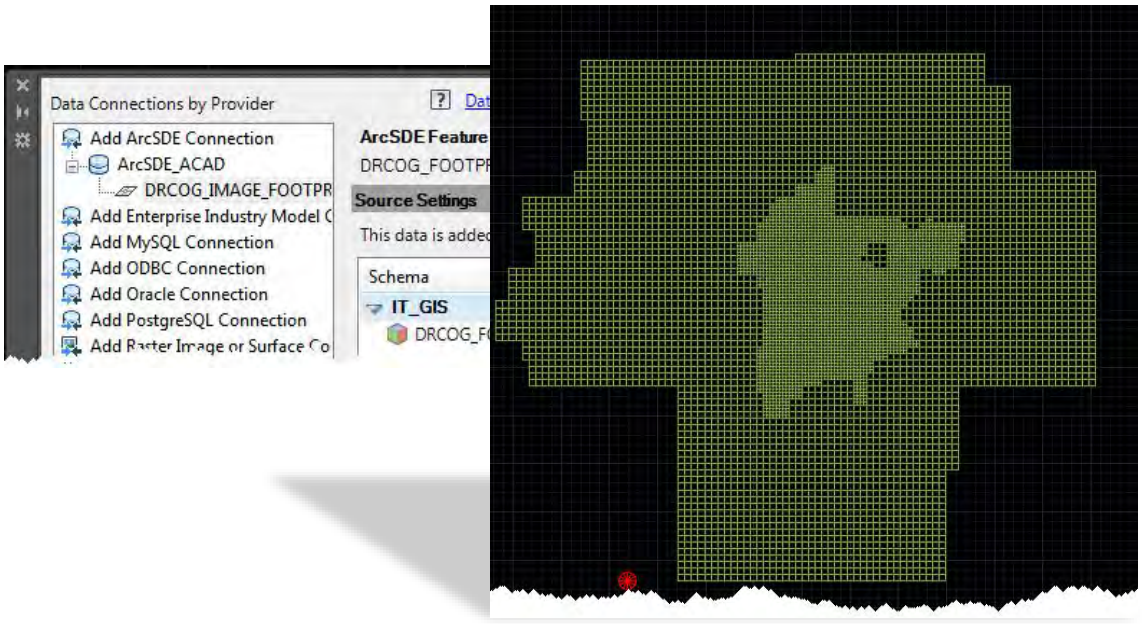






Schema shows available information from DW's GIS (E-map), and the Coordinate System it was posted in.

In the Data Connect palette the red X's will be gone and Model Space will display all layers loaded in the Task Pane:



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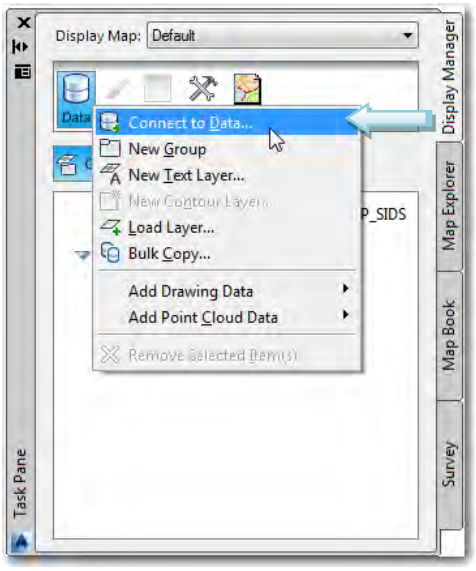
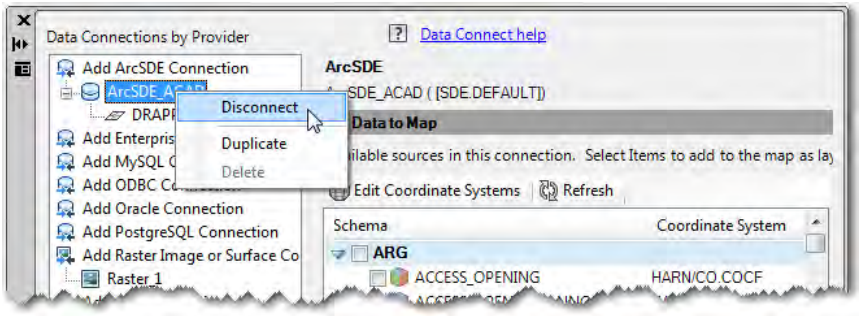
Disconnecting

It is best practice to disconnect all SDE, Raster, and other connections when drawings are being shared or used as an XREF.

In the *Task Pane*, on the Display Manager tab, click the *Data* icon and select *Connect to Data…*:

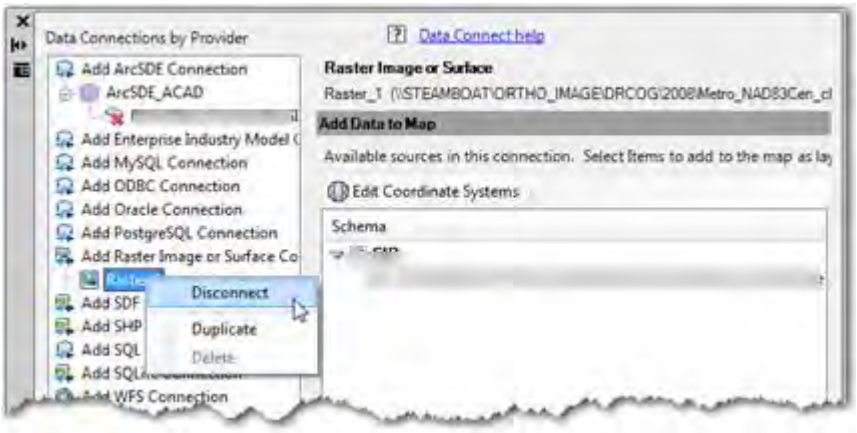


In the *Data Connect* palette, right-click on the ArcSDE Connection, and choose *Disconnect*:



NOTE: In this example the connection is called ArcSDE_ACAD.

Repeat this process for all connections within the drawing:



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Section 9.0

Sharing Project Data

Table of Contents: Section 9.0

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Overview - Section 9.0

In order to have a successful project, collaboration and communication is crucial, especially since many projects require work from multiple sections within Engineering. AutoCAD and Civil 3D have several ways to ensure project data gets shared effectively and efficiently:

- C3D Data Shortcuts and References - [*Section 9.1*]
- External References (XREF's) - [*Section 9.2*]
- Exporting and Importing C3D Data (XML) - [*Section 9.3*]
- eTransmit - [*Section 9.4*]

Utilize the following subsections to ensure proper use of each of these methods.

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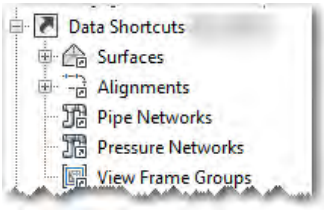
Section 9.1

C3D Data Shortcuts & References

Overview - Section 9.1

Data Shortcuts and *Data References* allow the users to share any Civil 3D information with other users on the same project. For example, the survey technician can create a surface in their drawing and create a *Data Shortcut*. The drafting technician can then use a *Data Reference* in their drawing to get the exact surface information from the survey drawing. The following is a list of data that can be shared using Data Shortcuts:

- Surfaces
- Alignments
- Pipe Networks
- Pressure Networks
- View Frame Groups



NOTE: This section does not cover all types of Shortcuts and References.

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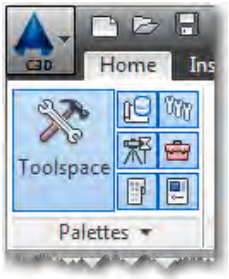
Data Shortcuts

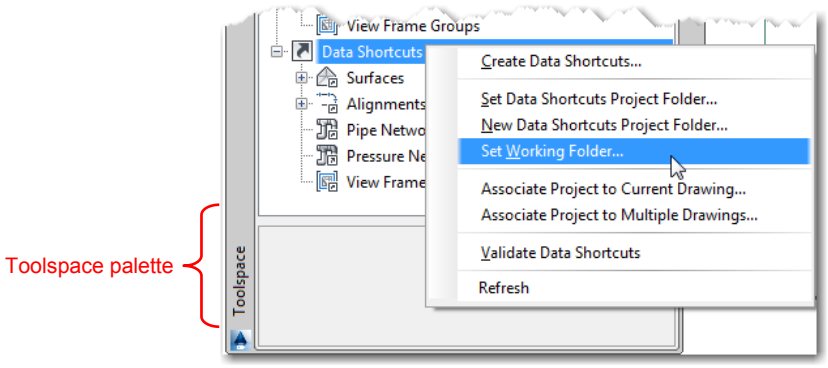
Each group will create any Data Shortcuts needed for a project from the aforementioned list. The following is an example of how to do this.

While in the drawing containing the data to be shared, click *Toolspace*, located in the Palettes panel on the Home tab of the Ribbon:

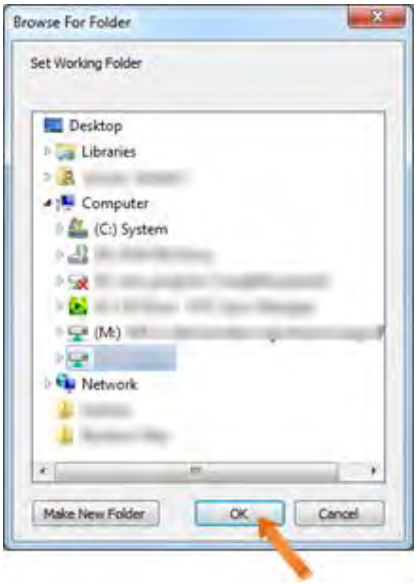


Tip: Panels
Only open/active items appear blue in the Panel on the Ribbon

Set Working Folder…
Ensure the working directory is set to the correct location. In the Propsector tab of the *Toolspace* palette right-click on *Data Shortcuts* and select *Set Working Folder…*:



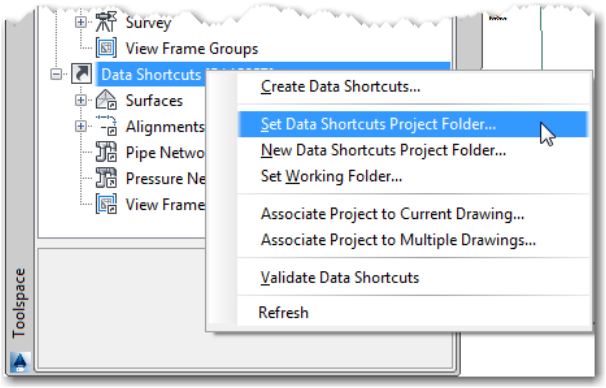
In the *Browse For Folder* pop-up window, browse to the mapped network location for Engineering projects - *C: drive* (internally); click <OK>:



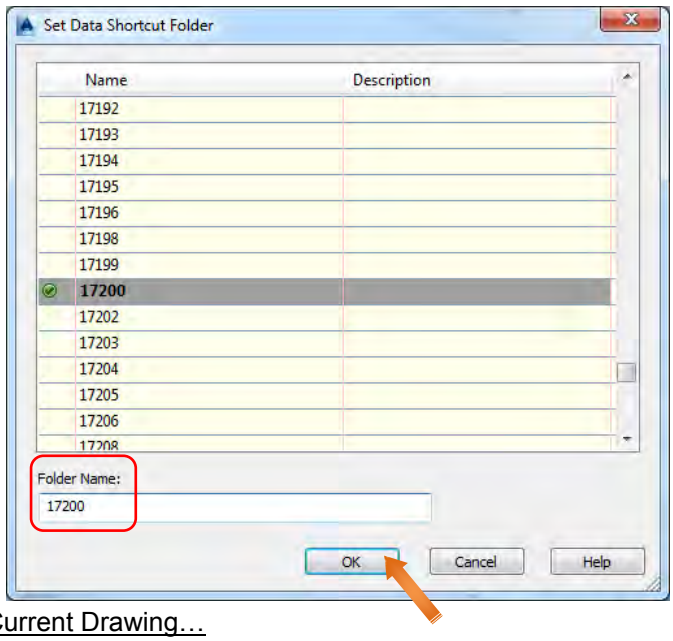
ATTENTION
Internally, mapped drives should only be used during this process,
DO NOT use C: drives within CAD for opening files, XREF'ing, etc. If you have trouble setting your Working Folder contact CAD Management.

Set Data Shortcuts Project Folder…

Next, ensure the Data Shortcuts directory is set to the correct location by right-clicking on *Data Shortcuts* and selecting *Set Data Shortcuts Project Folder…*:

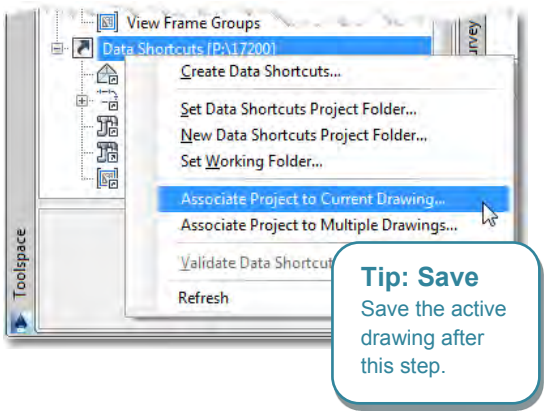


In the *Set Data Shortcut Folder* pop-up window, type the project tracker number in the *Folder Name* field, and then click <OK>:



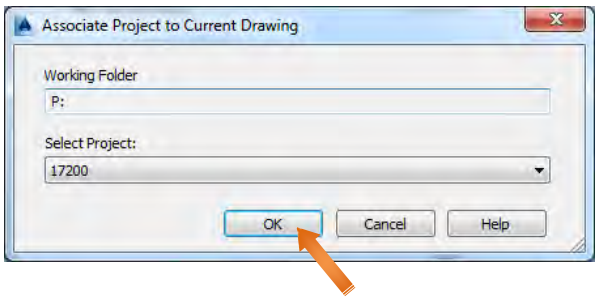
Associate Project to Current Drawing…

Right-click on Data Shortcuts, and select Associate Project to Current Drawing…:



Tip: Save
Save the active drawing after this step.

In the Associate Project to Current Drawing pop-up window accept the defaults by clicking <OK>:

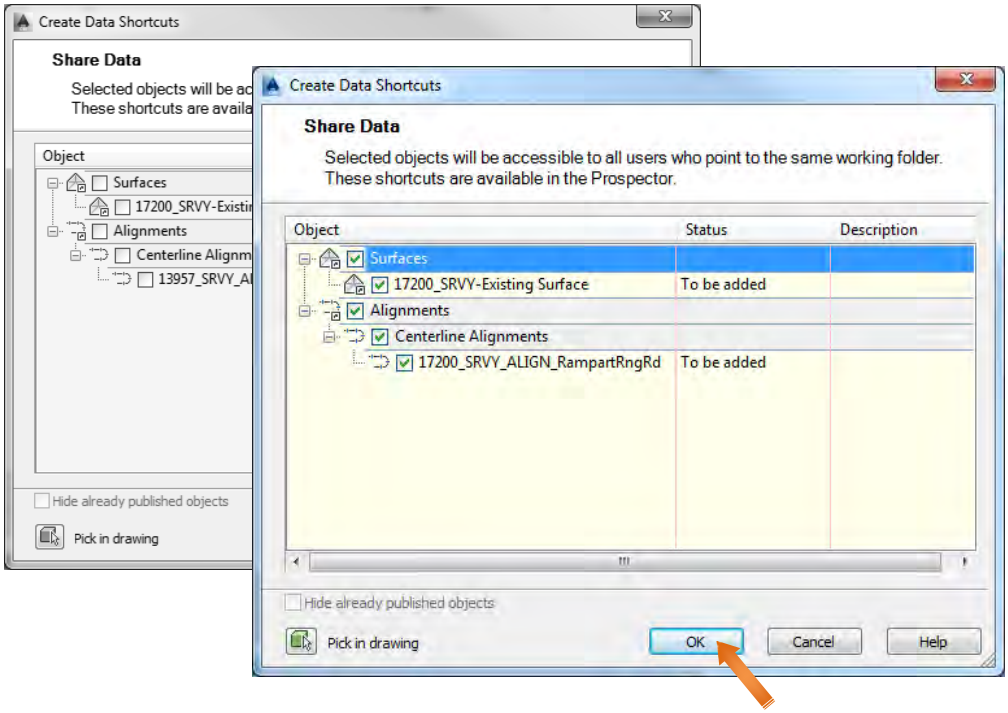


Create Data Shortcuts…

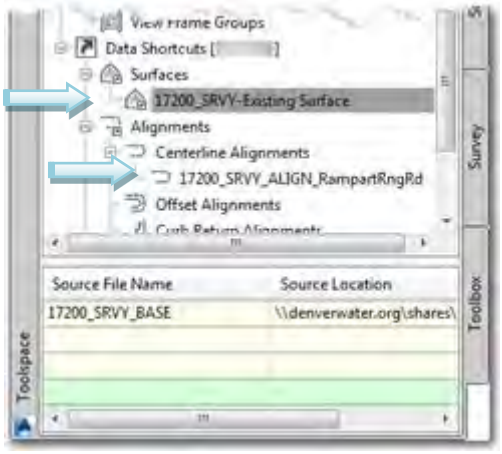
Once again, right-click on Data Shortcuts, and select Create Data Shortcuts…:

NOTE: Always follow the proper naming convention, see Section 6.2 – Naming Conventions.

In the Create Data Shortcuts pop-up window, select the items to be shared by using the checkboxes, then click <OK>:



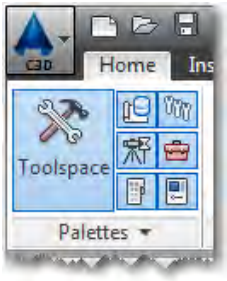
The Data Shortcuts can now be seen in the *Toolspace* palette:



Data References

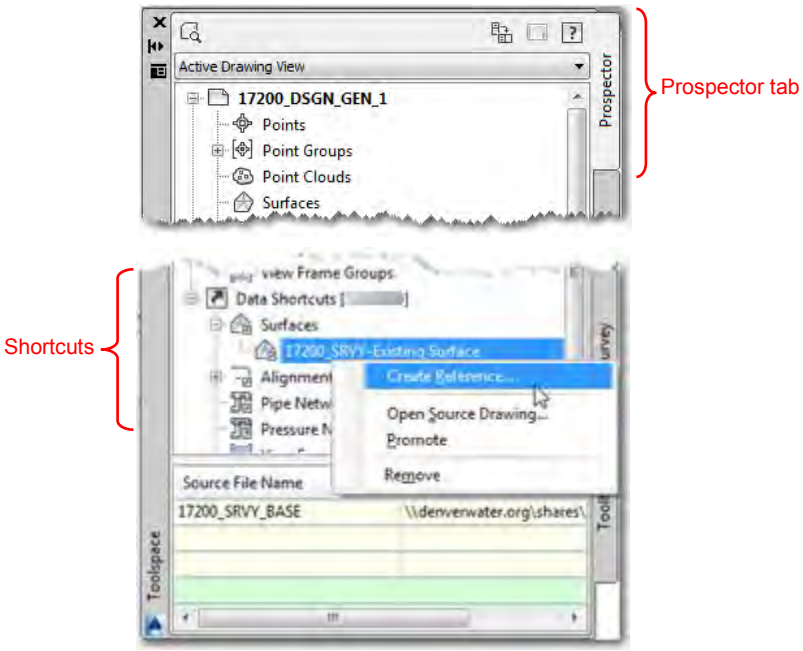
Each group will create Data References as needed. The following is an example of how to do this.

While in the working drawing, click *Toolspace*, located in the palettes panel on the Home tab of the Ribbon:

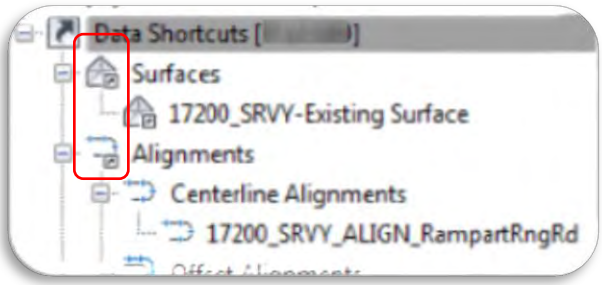


NOTE: Data Shortcuts need to exist before References can be used.

To reference the relevant data, in the Propsector tab of the *Toolspace* palette, right-click on the desired *Data Shortcut* and select *Create Reference…*:

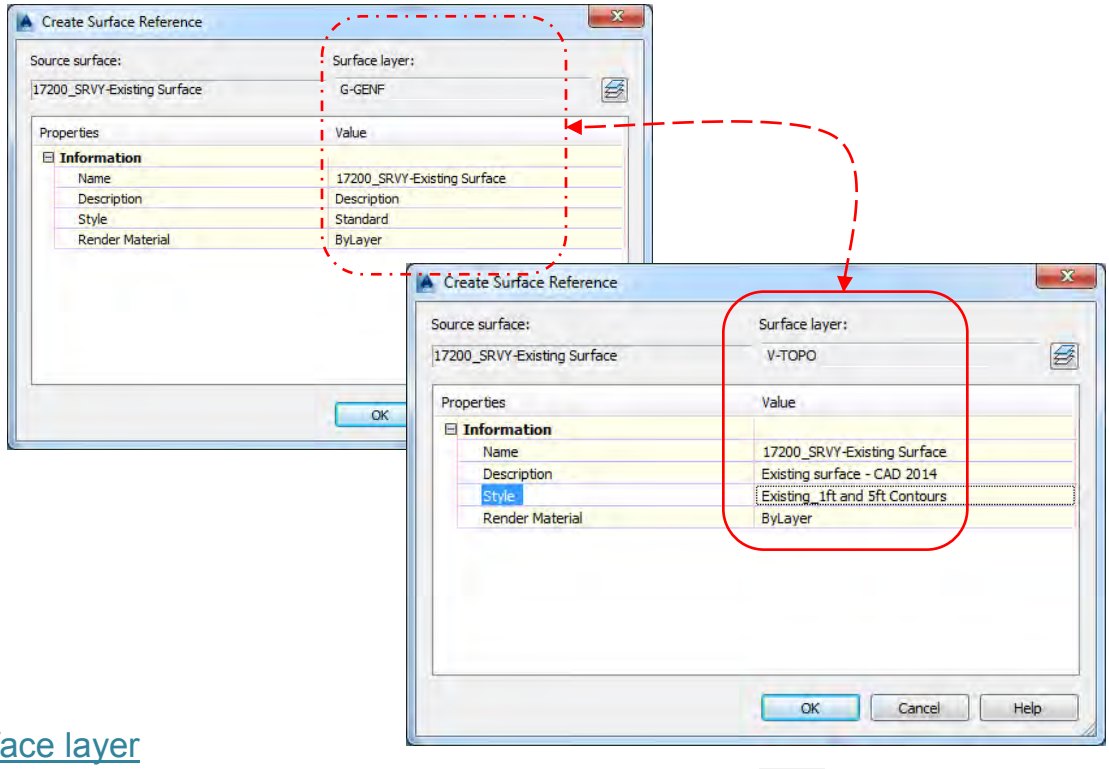


The "Create Reference" pop-up window will appear different for each type of *Data Shortcut* selected, displaying the same general type of information. Once a Reference is created, the *Toolspace* list will show little black arrows next to the listed items:



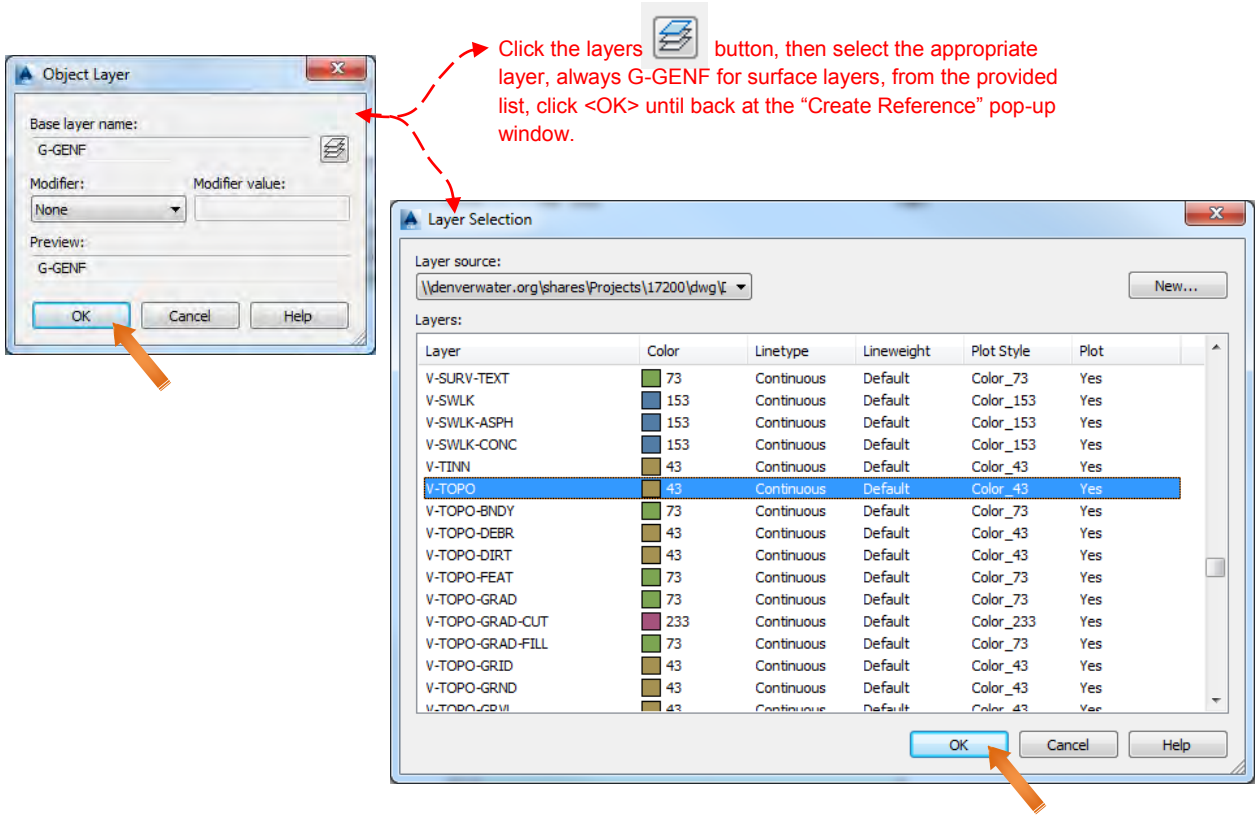
Reference Example - Surfaces:

In this example, the *Create Surface Reference* pop-up window appears. From here the user can define various visual and informational aspects for the selected surface:



Surface layer

To define the layer on which the surface will be created click the layers button in the “Create Reference” pop-up window; this will launch the *Object Layer* pop-up window, click the layers button again:

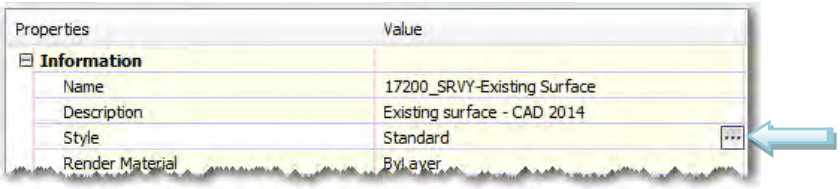


Description

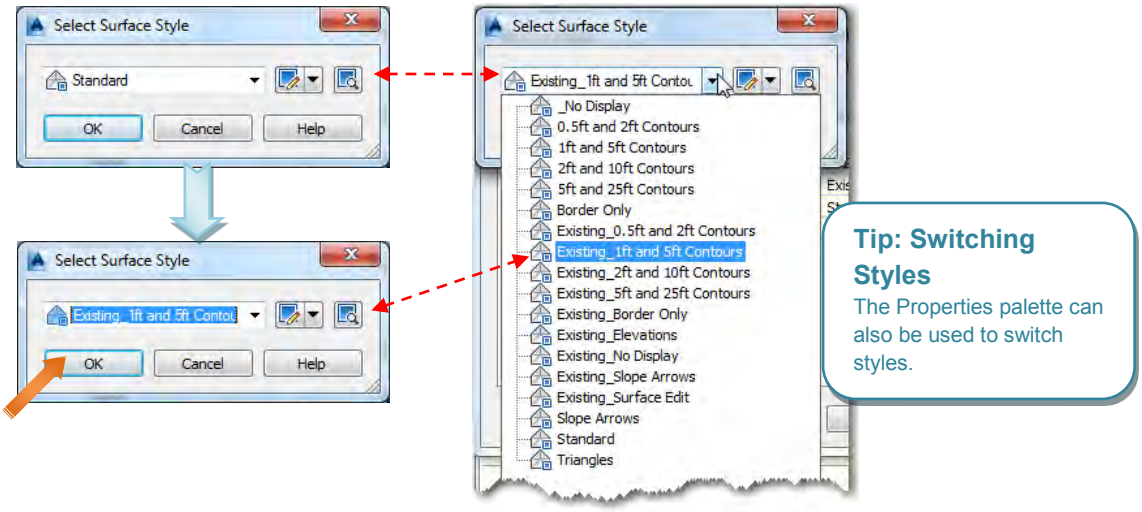
A Description can be provided to help clarify the surface data (optional):

Style

If the current drawing has been created using the most up-to-date template it will have pre-defined DW Standard Surface Styles. Click the ellipsis button next to the Style Value (Standard in this instance):



The Select Surface Style pop-up window will appear, from the pull-down menu select the desired surface style and click <OK>:



The selected surface will now appear in Model Space with the specified style. The style can be changed at any time.

Section 9.2

External References (XREF's)

Overview - Section 9.2

Another type of data sharing is through *External References (XREF's).* An XREF is a reference to a file outside of the current drawing that acts as though it is part of the current drawing. AutoCAD 2016 allows XREFs of DWGs, DWFs, DWFXs, PDFs, DGN underlays, and raster images. **The survey/base map drawings shall be XREF'd into design drawings as a basis for work; DO NOT do a "Save As" or insert as a block.**

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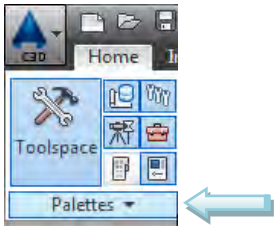
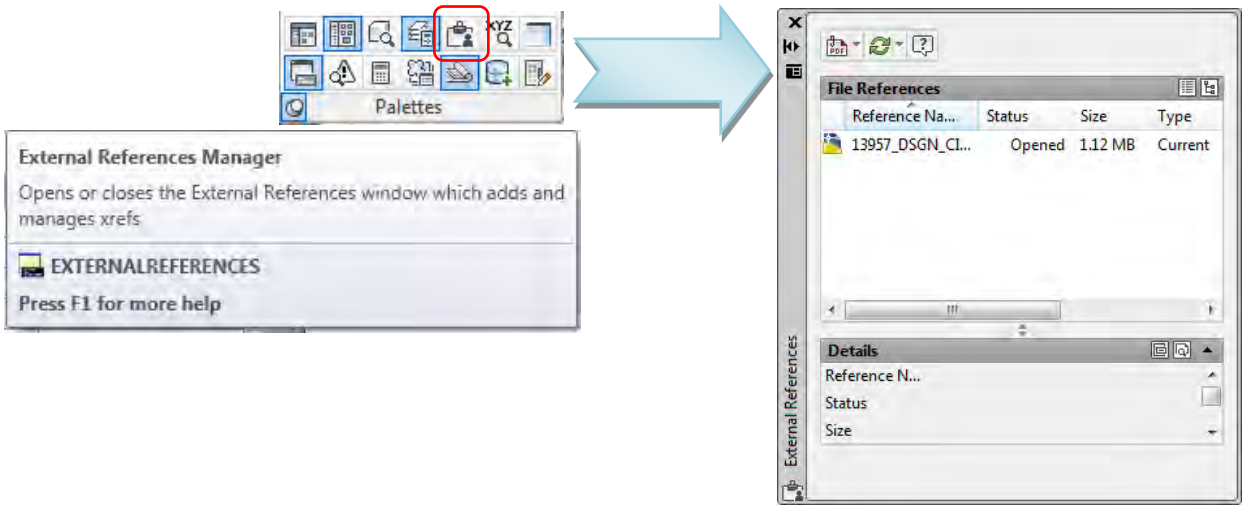
Attaching an XREF

To XREF, while in Model Space, navigate to the Home tab on the ribbon, select the Palettes panel pull-down:

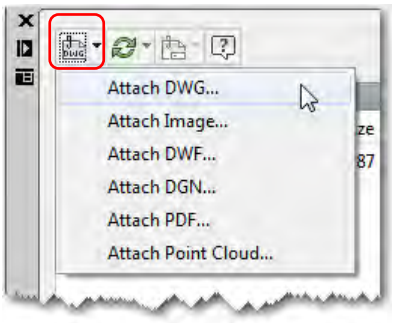


NOTE: Select appropriate layer first, typically C-ANNO-REFR or G-ANNO-REFR, before inserting XREF.

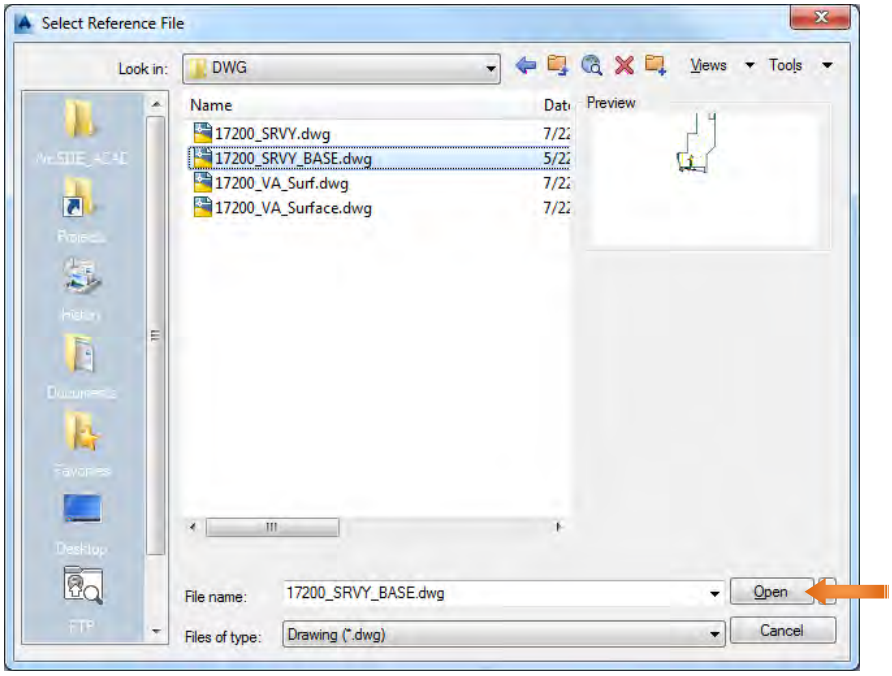
In the expanded palettes application, click the icon that looks like a clipboard (or XR, then ENTER); this will launch the *External References* palette:



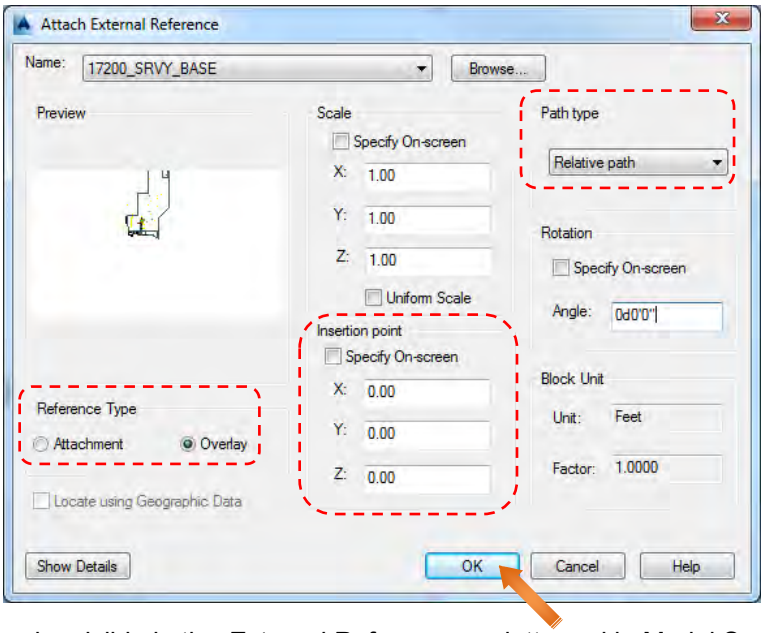
Using the *attach* icon pull-down, select the type of external reference desired; for example:



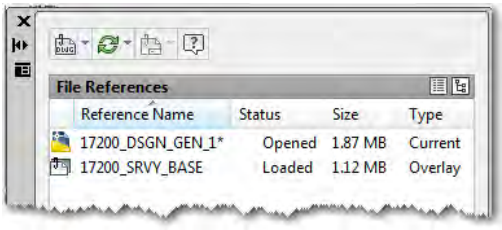
In the *Select Reference File* pop-up window, navigate to the location where the desired reference drawing is located. Select the desired file and click <Open>:



The *Attach External Reference* pop-up window will appear. Check that the **Reference Type** is Overlay, the **Insertion point** for X, Y, and Z is set to 0, and **Path type** is Relative, and then click <OK>:



The reference will now be visible in the *External References* palette and in Model Space of the drawing:



NOTE: The user may need to preform a zoom extents in Model Space to view the XR.

Section 9.3

Exporting & Importing C3D Data (XML)

Overview - Section 9.3

In some cases, Civil 3D data may need to be shared without use of a particular drawing; XML files can be used to accomplish this.

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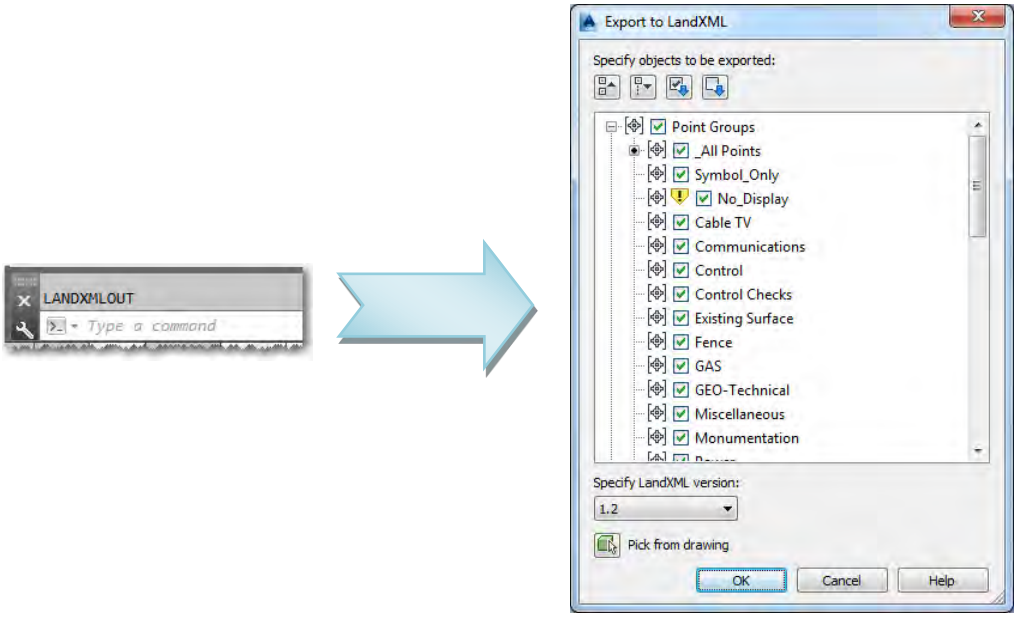
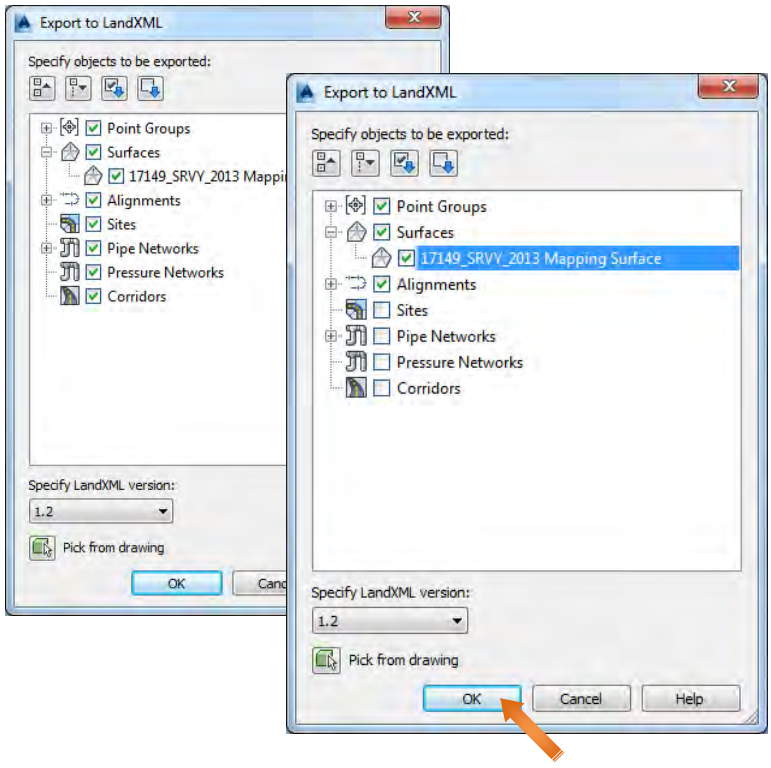
Exporting C3D Data with XML

While in the drawing with the information to be shared, type **LANDXMLOUT** at the command line, this will launch the *Export to LandXML* pop-up window:

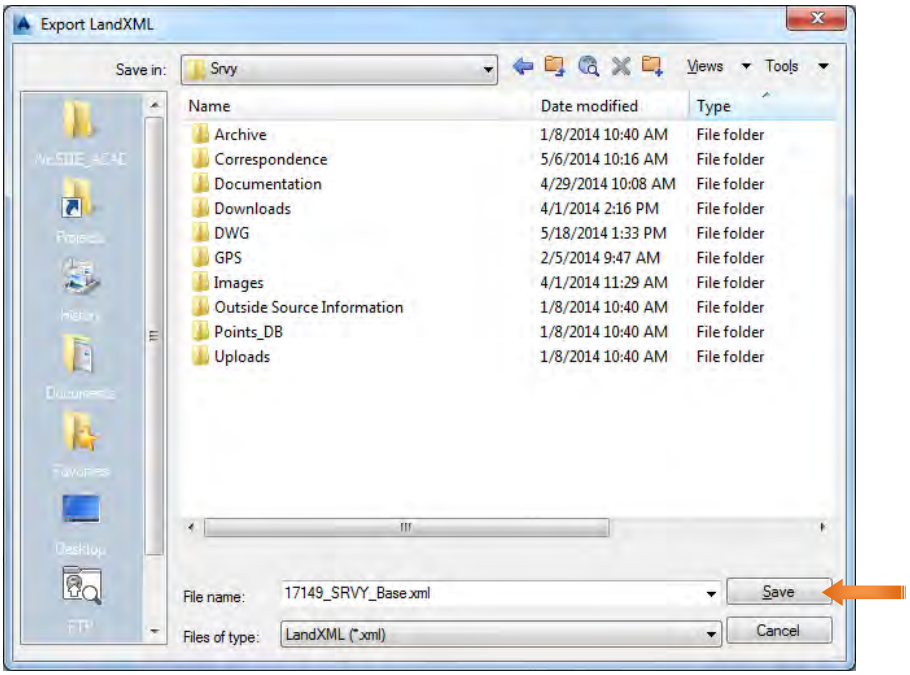


NOTE: Use the (+) and (–) symbols to expand particular lists.

In the *Export to LandXML* pop-up window use the check marks to decide what data needs to be shared, click <OK> once finished:

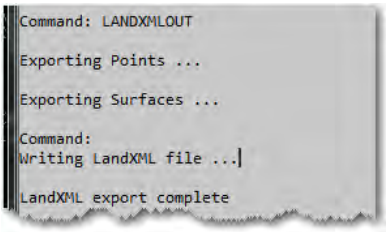


The *Export LandXML* pop-up window will appear, navigate to the appropriate location to save the .xml file, click <Save>:

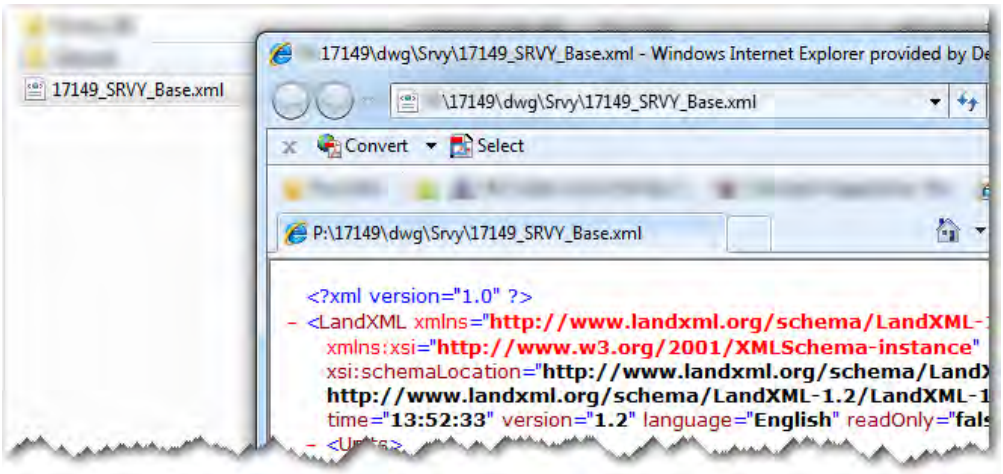


NOTE: By default the XML file will retain the same name as the .dwg the data originated from.

The command line will indicate when the export is complete:



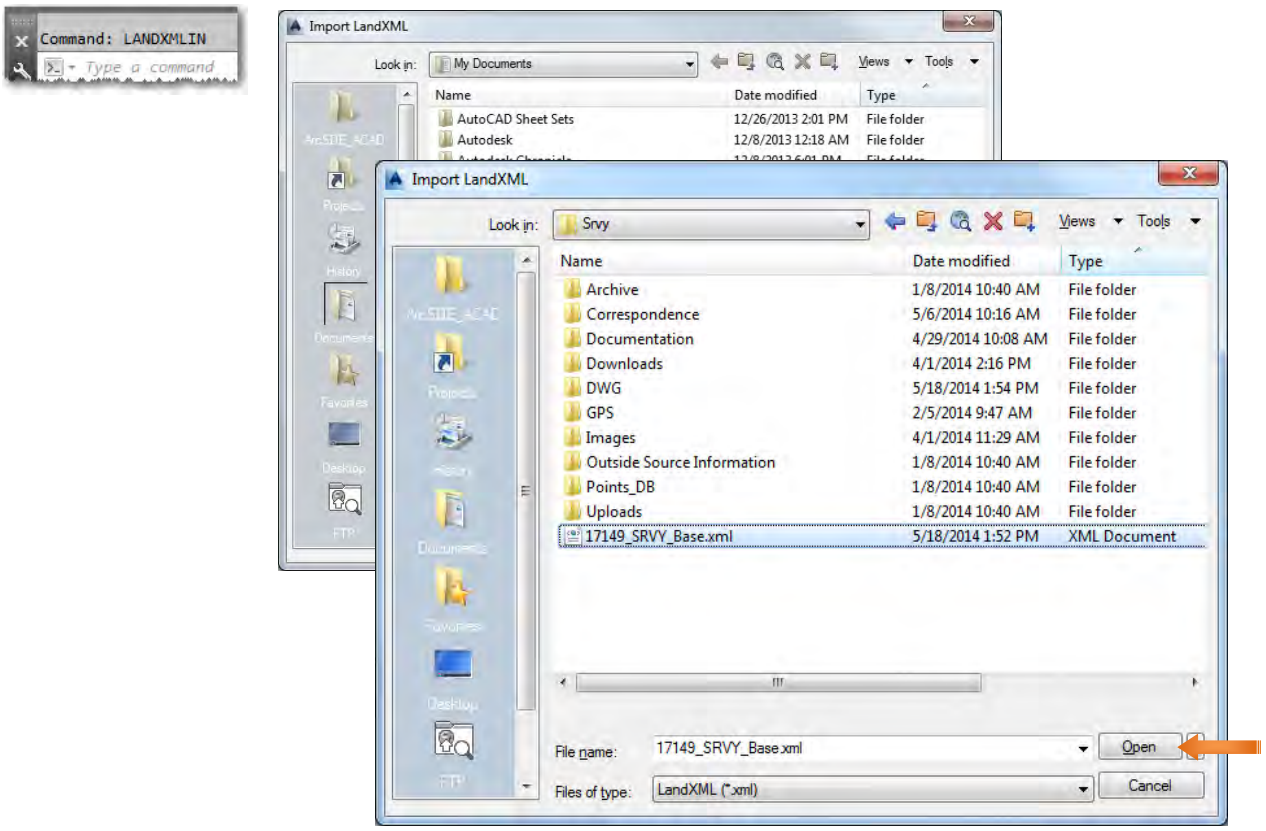
At this point the saved XML file can be shared internally or externally via email, CD, FTP, SharePoint, or other various methods:



Importing C3D Data with XML

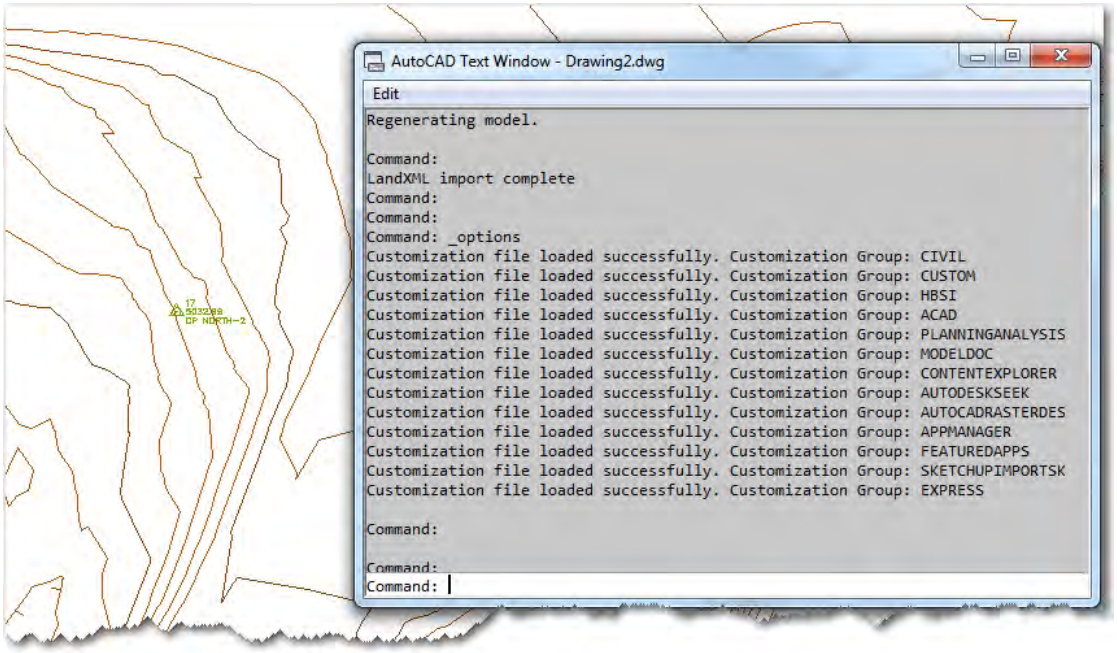
While in the drawing where the desired information is to be placed, type LANDXMLIN at the command line, this will launch the Import LandXML pop-up window.

Navigate to the location where the XML was saved, select it and click <Open>:



A new Import LandXML pop-up will appear displaying the optional data to be placed in the drawing. Use the check marks to select the applicable data and click <OK>:

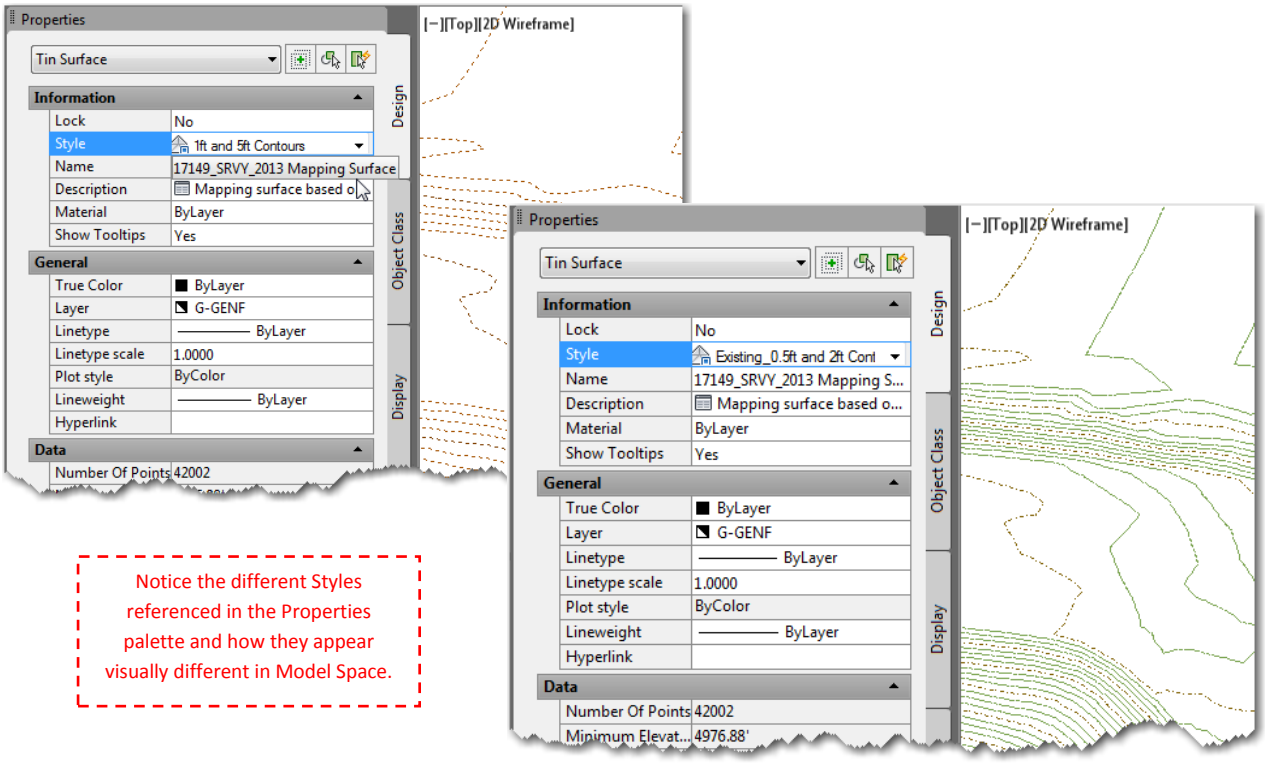
In addition to visually seeing the data added in Model Space the command line will indicate that the import is complete:



NOTE: It may be necessary to review the command window for a full description of imported data.

Any Civil 3D data (such as surfaces or points) may now be manipulated in the same manner as any other C3D entity in the drawing. Styles and data can be changed as needed, based on the C3D styles in the drawing the data was imported to.

In this example the most current DW Civil template was used, meaning the imported surface style can be changed to reflect any C3D styles embedded in the template:



Notice the different Styles referenced in the Properties palette and how they appear visually different in Model Space.

Section 9.4

eTransmit

Overview - Section 9.4

Submittals to Denver Water can be streamlined by using eTransmit, which in essence packages a set of files for easy sharing. These files should include the AutoCAD drawing files, AutoCAD line and font definition files, and all other related dependent files. eTransmit will automate this process.

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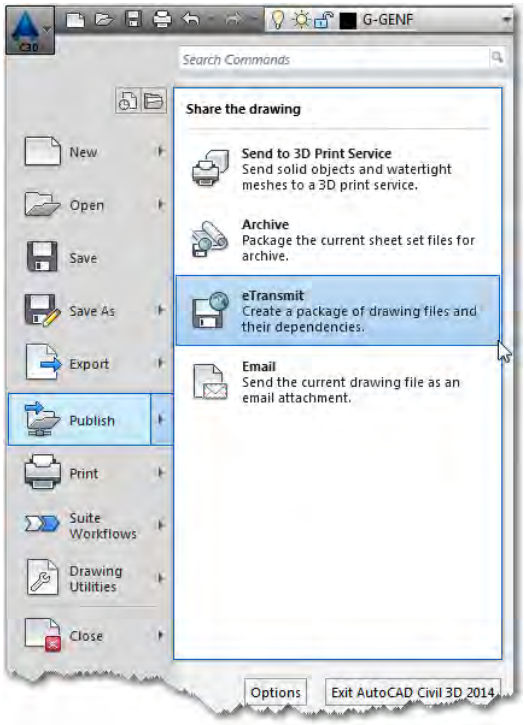
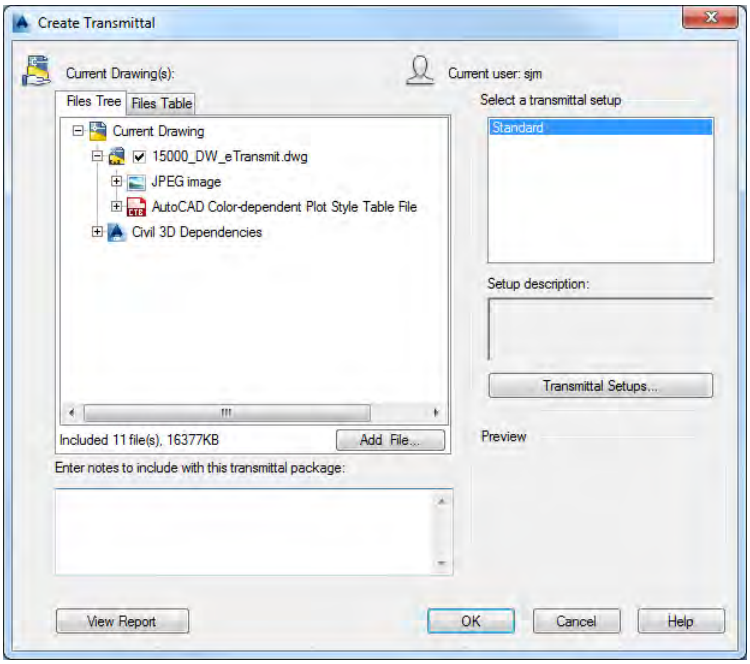
eTransmit

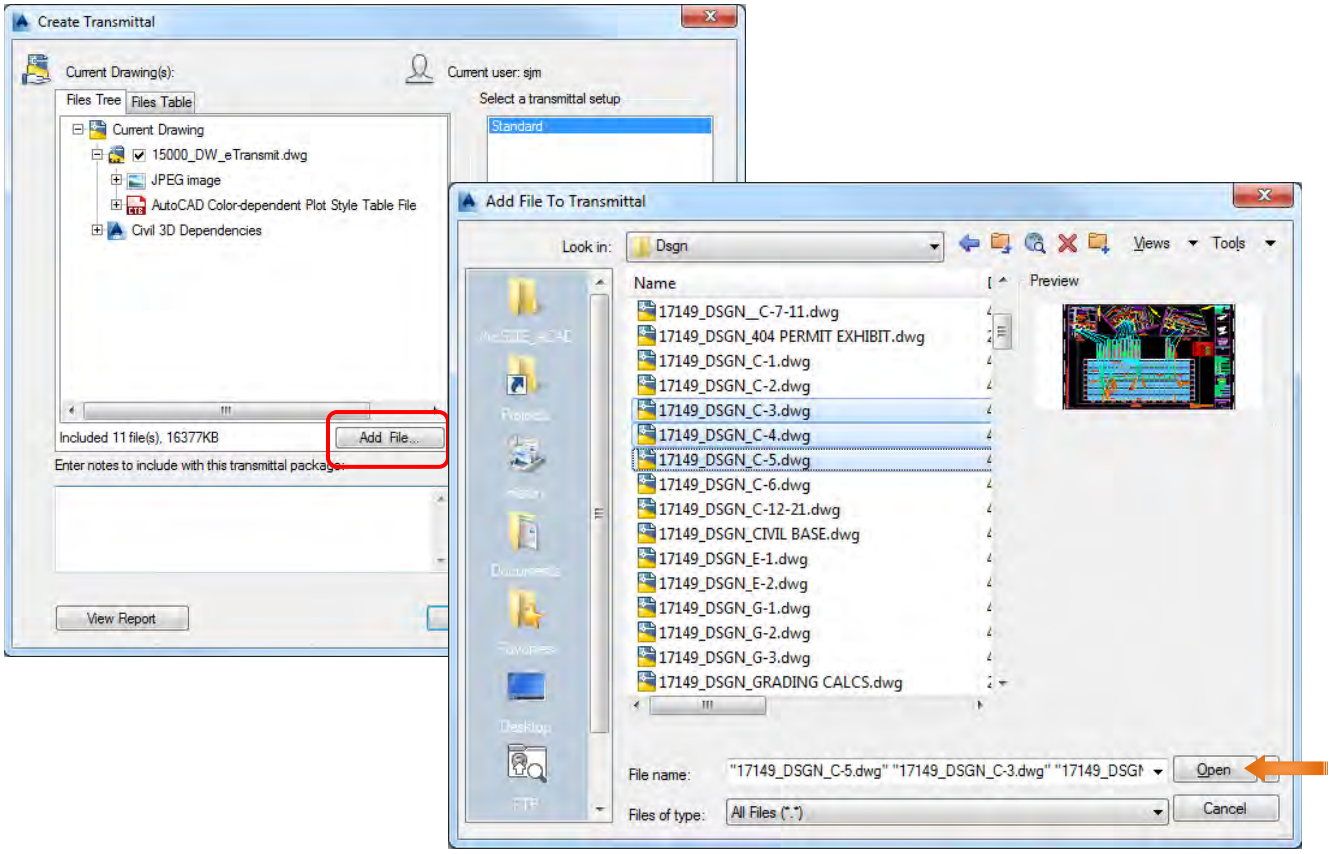
To create an eTransmit click the *Application Menu*, in the top left corner of the AutoCAD software, select *Publish* and choose *eTransmit* (alternately type **ETRANSMIT** at the command line):



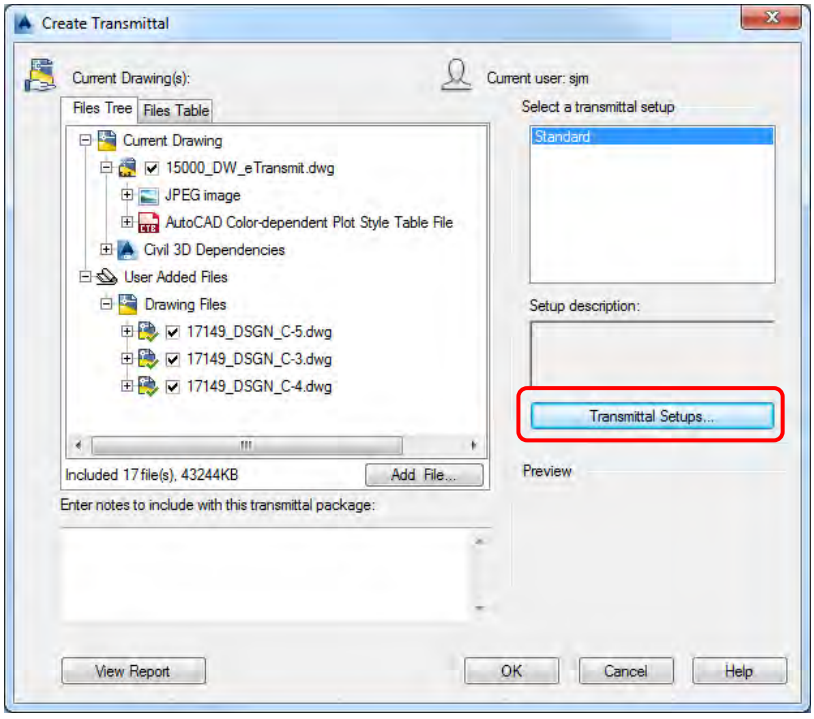
The *Create Transmittal* dialog box will appear, listing information for the current drawing only:



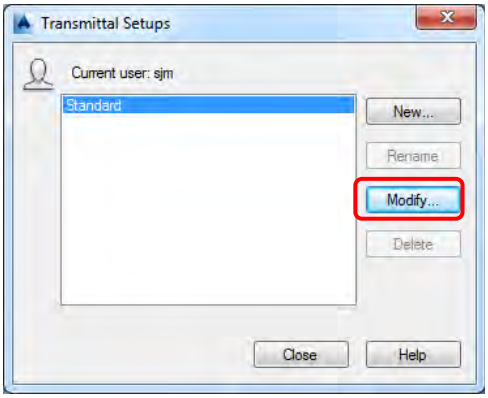
To add more drawings to the submittal click <Add File…>; the *Add File To Transmittal* dialog window will appear. Browse to the additional file location(s) and select the files to be included in the transmittal, click <Open>:



Specific settings must be maintained when submitting to Denver Water or packaging drawings before sending to outside entities. Click <Transmittal Setups…>:

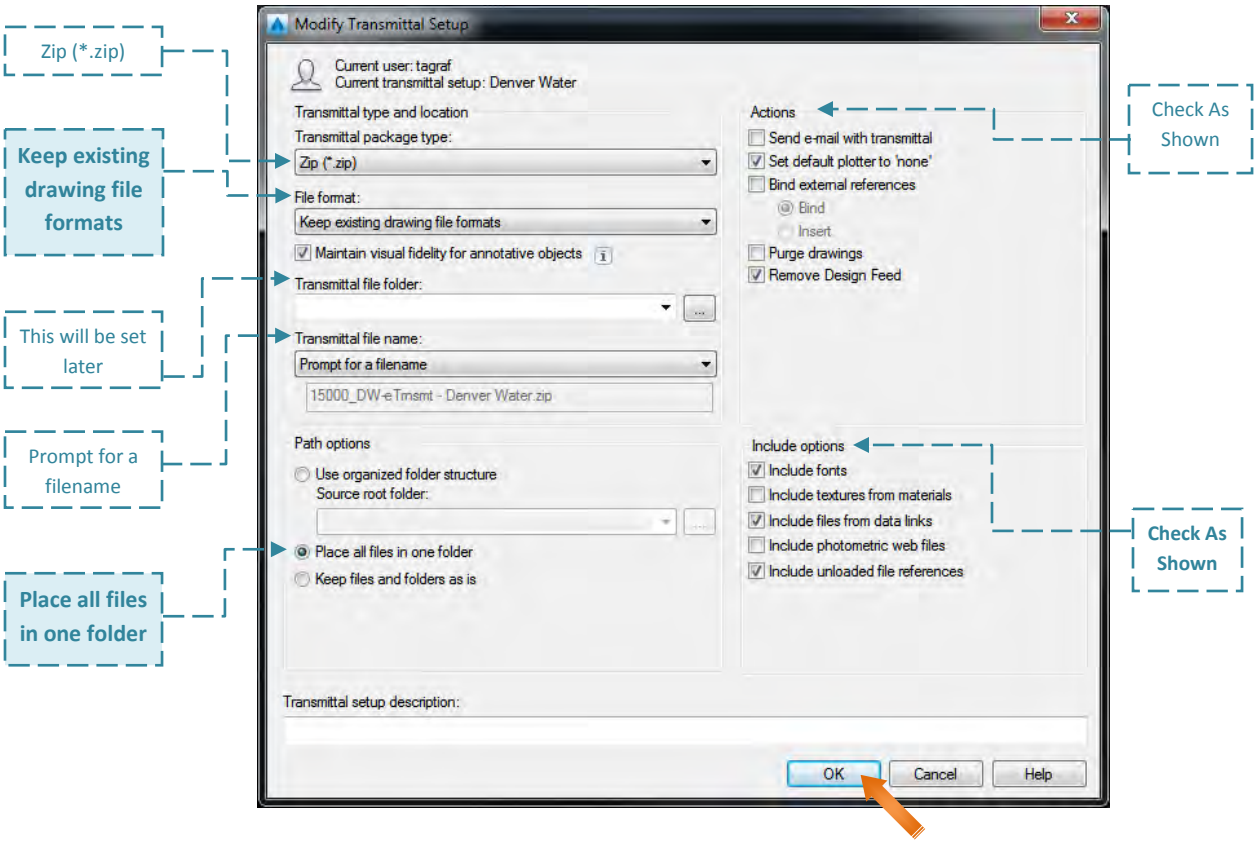


In the *Transmittal Setups* pop-up window select “Standard” and click <Modify…>:

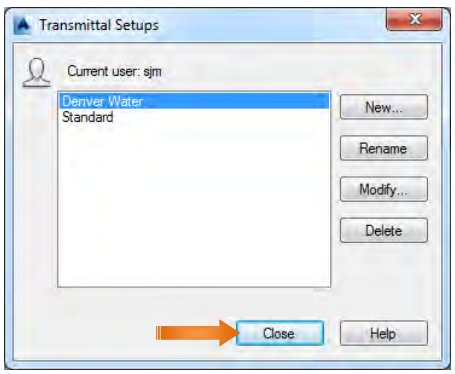


Tip: An eTransmit specific to Denver Water can be created by clicking <New…> instead.

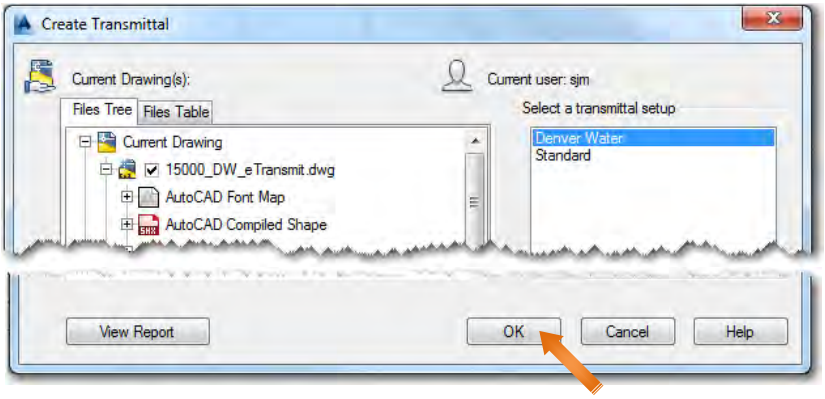
The *Modify Transmittal Setup* pop-up will appear; the example below shows the *required* options, click OK when finished:



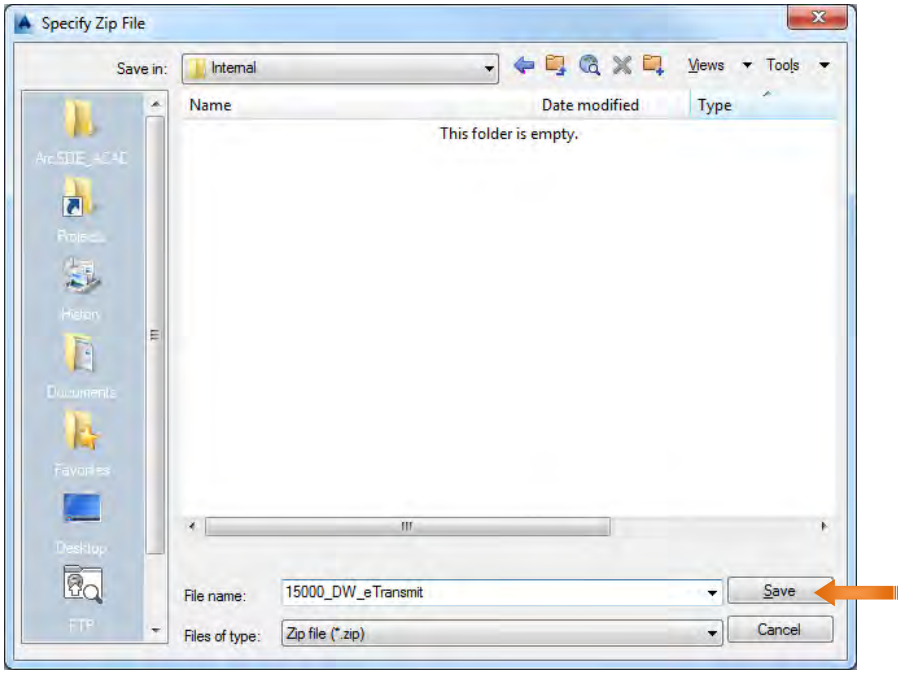
Close the *Transmittal Setups* pop-up window:



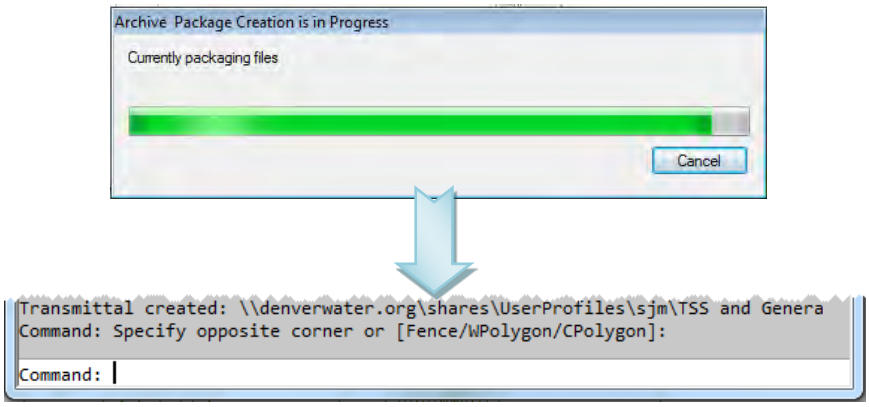
In the *Create Transmittal* window click <OK>:



The *Specify Zip File* pop-up window will appear, navigate to the location where the .zip file should be stored, and name the .zip file appropriately, click <Save>:



The *Archive Package Creation is in Progress* pop-up will appear; wait a few seconds for this to finish and review the command line, which will show the status of the transmittal package:



Section 10.0

Drawing Templates (DWT's)

Table of Contents: Section 10.0

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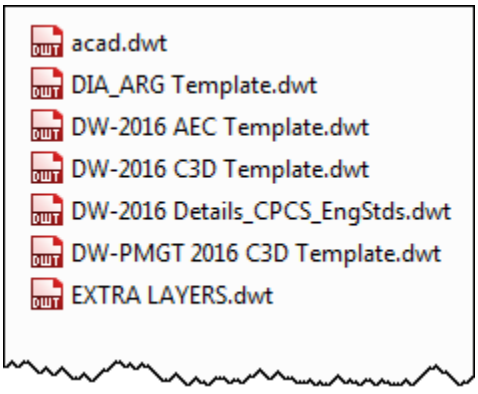
Overview - Section 10.0

It is imperative that the predefined drawing templates (.dwt) are used in the creation of CAD drawings. Located within the .dwt's are Denver Water's Standards for text styles, dimensions, layers, Civil 3D styles, etc. Compliance with these standards is required. Please contact the CAD Manager with comments or a variance request.

Internally, templates are located on the network: *DW CAD\DW Templates*. The templates are set as "read-only" for the users and are managed by the CAD Manager. The following list displays the available templates; the most frequently used are shown in **BLUE** below.

- **acad.dwt** – empty, default ACAD drawing containing no layers or styles of any sort
- **DIA_ARG Template.dwt** – used to create architecturally based drawings located at Denver International Airport (DIA) such as Architectural, Mechanical, Structural and Electrical – typically used with Capital Projects in Design Drafting
- **DW-2016 Details_CPCS_EngStds.dwt** – used to create Engineering Standard details such as Architectural, Mechanical, Structural and Electrical – typically used with Capital Projects in Design Drafting or Design in Distribution
- **EXTRA LAYERS.dwt** – requested by DW's CAD Community over time, contains layers not yet defined with line weights
- **DW-2016 AEC Template.dwt** – used to create architecturally based drawings such as Architectural, Mechanical, Structural and Electrical – typically used with Capital Projects in Design Drafting
- **DW-2016 C3D Template.dwt** – Civil 3D template to be used with all Civil work (Survey, Distribution and Design Drafting)
- **DW-PMGT 2016 C3D Template.dwt** – Civil 3D template used to create Property Management drawings/exhibits



IMPORTANT
Do NOT import, insert, WBlock, or copy/paste items from drawings created using the "old" standards without cleaning up the old drawings first.

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Section 10.1

DW-2016 C3D Template.dwt

Overview - Section 10.1

This template is a Civil 3D template containing DW Engineering sections' title blocks for Design Drafting, Distribution, and Survey. Each title block is linked to a Sheet Set Manager [see *Section 7.0 – Sheet Set Manager*] and shall be used for all Civil work [see *Section 5.0 – Example Sheets*].

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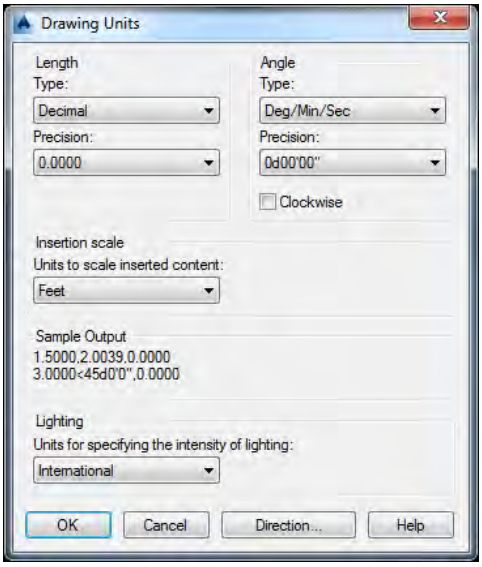
Drawing Units

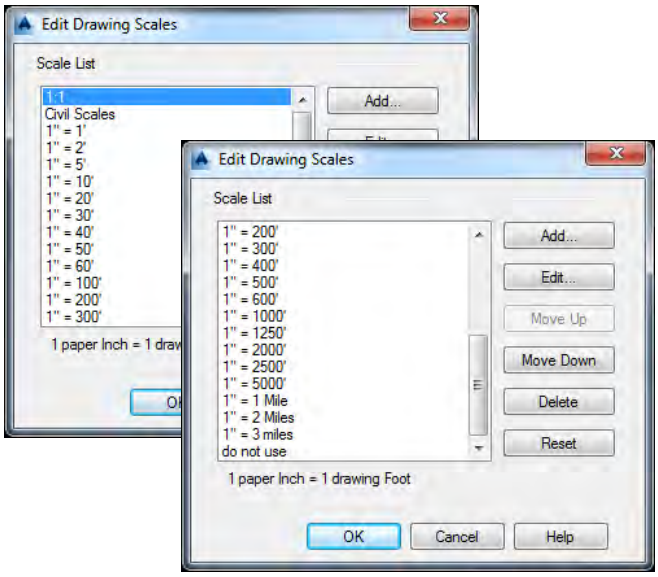
In this template the drawing units have been set to “Decimal – Feet”:



NOTE: The drawing units should not be changed for architecturally based drawings, use the “AEC” template for this purpose [see *Section 10.2 – DW-2016 AEC Template.dwt*].

Drawing Scales

Only the acceptable drawings scales [see *Section 13.1 – Model/Paper Space & Annotation Scales*] have been added to this template:



The default drawing scale 1” = 20’:

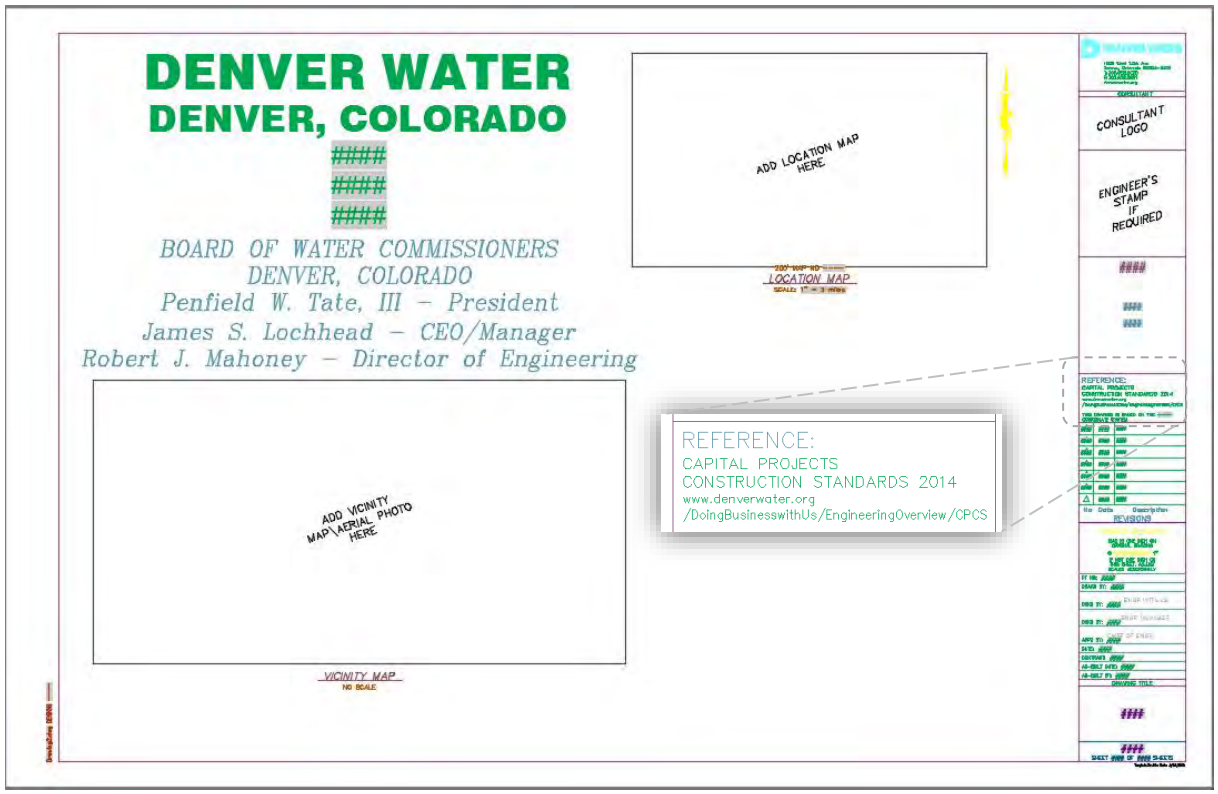
NOTE: Model Space does NOT have a Coordinate System predefined.

Layout Tabs

This template has four predefined layout tabs (Paper Space) that contain title blocks for Design Drafting, Distribution, and Survey:

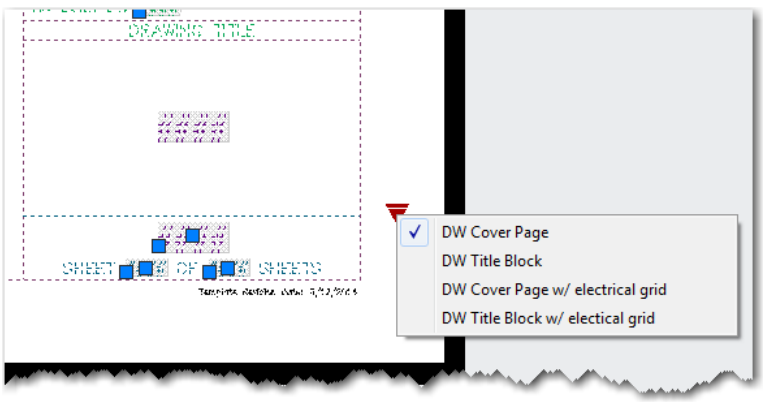
DESIGN Layout Tab

The DESIGN layout tab is for use with Design Drafting/Capital Project work; the Title Block references the Capital Projects Construction Standards (CPCS) 3rd edition:



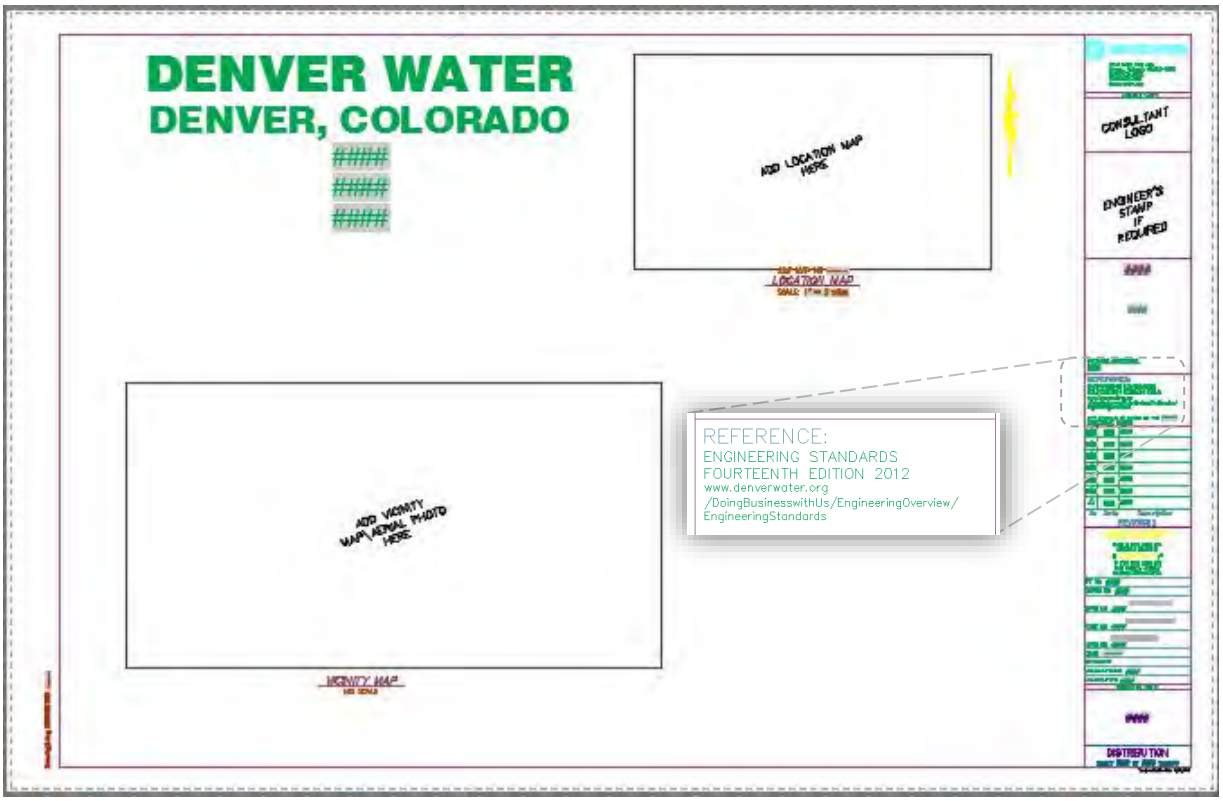
NOTE: Viewports are placed for general guidance and can be modified and deleted as needed.

The sheet size is set to 22x34 and defaulted to the Cover Sheet information. In the lower right corner of the DW_DSGN Title Block, select the Dynamic grip for Visibility States and choose the appropriate Title Block type:



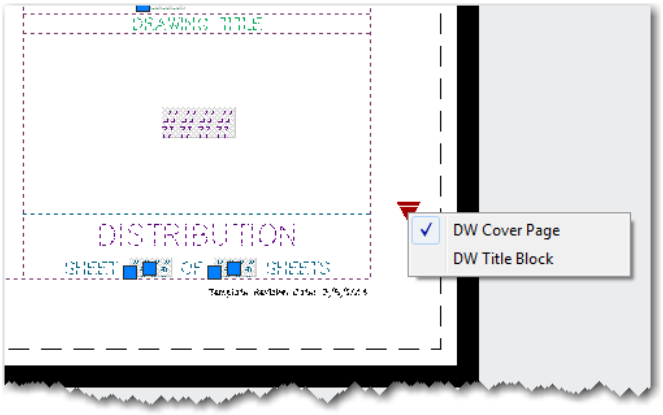
Distribution Layout Tab

The DISTRIBUTION layout tab is for use with Distribution work; the Title Block references the Engineering Standards 14th Edition 2012:



NOTE: Viewports are placed for general guidance and can be modified and deleted as needed.

The sheet size is set to 22x34 and defaulted to the Cover Sheet information. In the lower right corner of the DW_DIST Title Block select the Dynamic grip for Visibility States and choose the appropriate Title Block type:

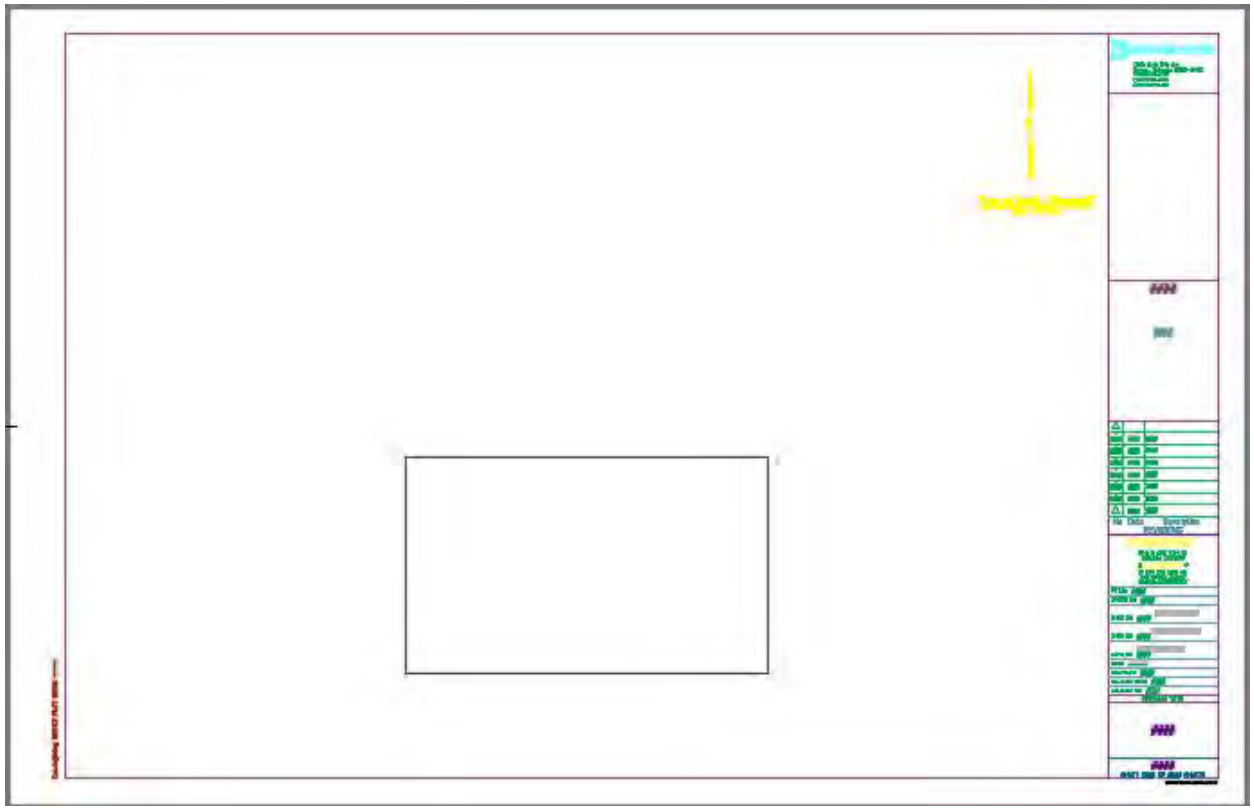


Survey Plat 18x24 Layout Tab

The Survey Plat 18x24 layout tab is for use for Survey for 18” x 24” Plats:

Survey Plat 22x34 Layout Tab

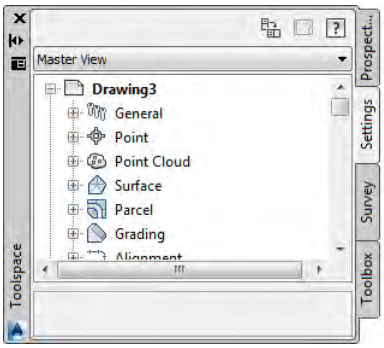
The Survey Plat 22x34 layout tab is for use for Survey for 22” x 34” Plats:



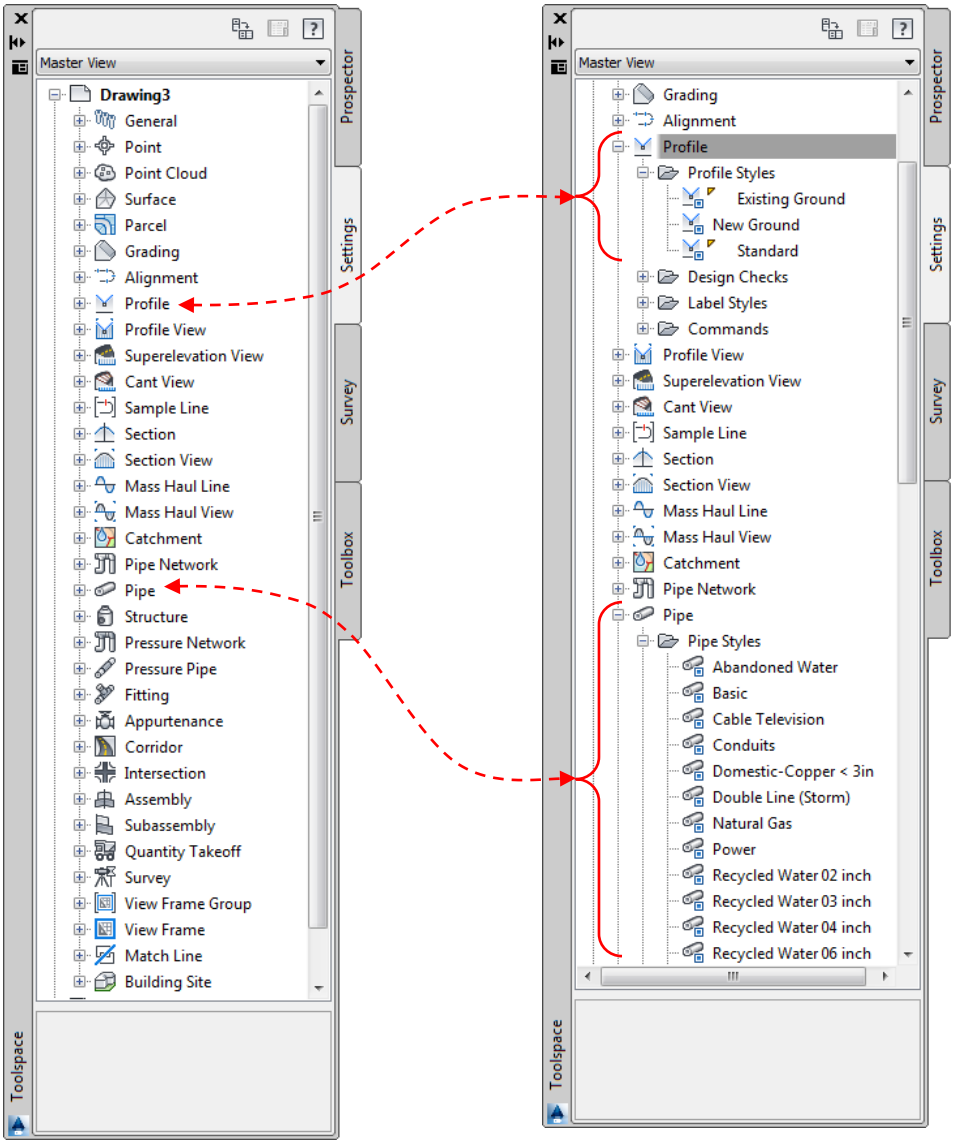
C3D Objects and Styles

Embedded within the template are customized C3D Objects and Styles that allow for standardized plan creation across DW's Engineering Division. Each section within Engineering (Design Drafting, Distribution, and Survey) will use these styles in slightly different manners. However, the basic standardization is the same for all styles, utilizing DW's standard layers, text styles, and symbols.

Navigate to the *Toolspace* palette and select the *Settings* tab to view all of the available customized C3D styles:



By expanding a category each customized style can be seen. In this example the Profile/Profile Styles and Pipe/Pipe Styles categories have been expanded showing some of the available styles:



ANNOTATION

Every sheet within a plan set requires a certain level of labeling and annotation. Contained within this template are the standard styles for use with Civil based projects, see *Section 13.0 – Labeling and Annotation* for a full explanation of the *Annotate* tab located on the Ribbon.

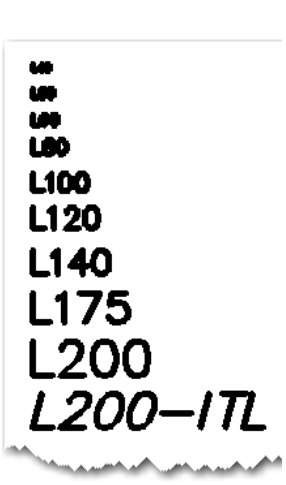
NOTE: All customized annotation styles (text styles, dim styles, etc.) have been created to be "annotative", meaning they will scale up and down automatically based on the Drawing Scale.

TEXT STYLES

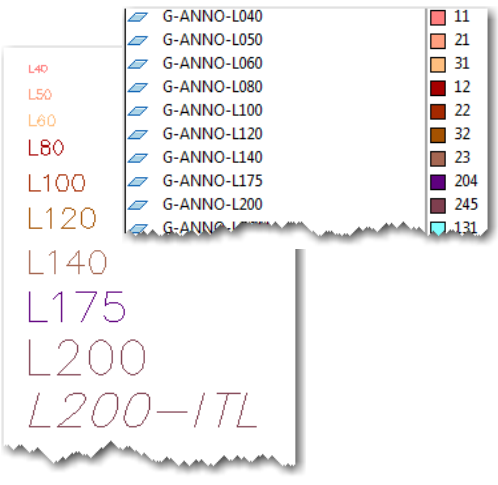
DW's custom text styles are consistent throughout all of DW's templates, most text styles are based on a "simplex" font style:

NOTE: When the Text Styles are used properly the settings above should never need to be modified.

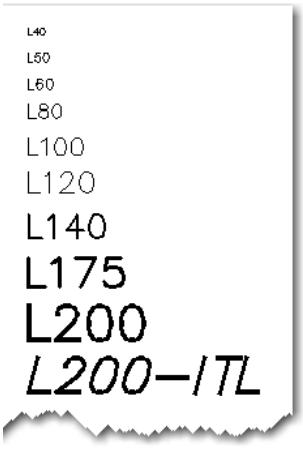
For plotting purposes, always place text on a Layer that indicates which text style was used:



Plot Preview before correct layers set.



Model Space view of text styles with correct layers set.



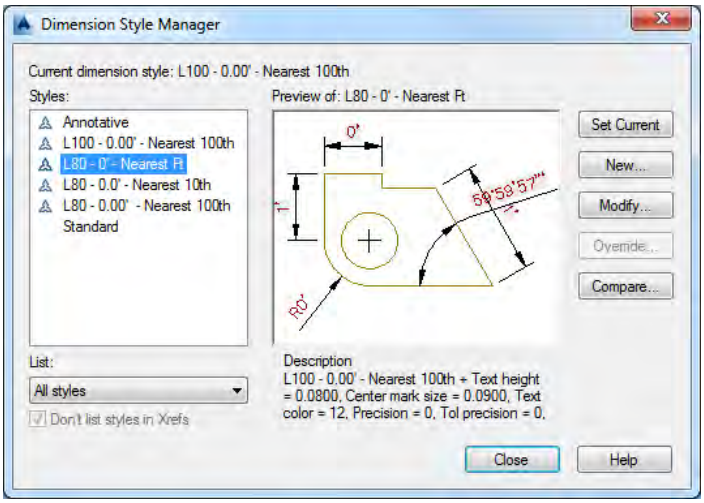
Plot Preview After correct layers set.

NOTE: Each Discipline Designator has a specific set of "text" layers.

Dimension Styles

DW's custom Dimension (Dim) Styles have been created to reference the corresponding Text Styles. All Dim Styles are based on a "simplex" font style, and text should be located above the line.

The Dim Styles located in this template are for Civil based work only:



NOTE: When the Dim Styles are used properly the settings above should never need to be modified.

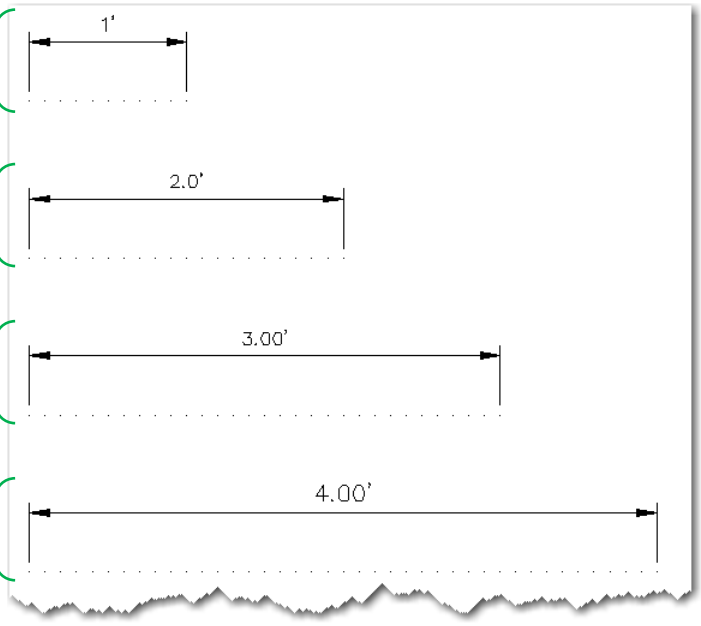
Below is a quick visual of how each Dim Style should appear:

DIM Style: L80 - 0' - Nearest Ft
Text Style: L80
Text Color: 12
Rounds distance to the nearest foot

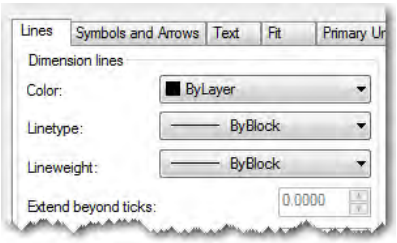
DIM Style: L80 - 0.0' - Nearest 10th
Text Style: L80
Text Color: 12
Rounds distance to the nearest tenth

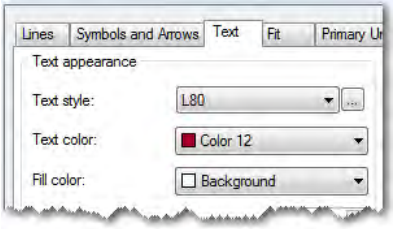
DIM Style: L80 - 0.00' - Nearest 100th
Text Style: L80
Text Color: 12
Rounds distance to the nearest hundredth

DIM Style: L100 - 0.00' - Nearest 100th
Text Style: L100
Text Color: 22
Rounds distance to the nearest hundredth

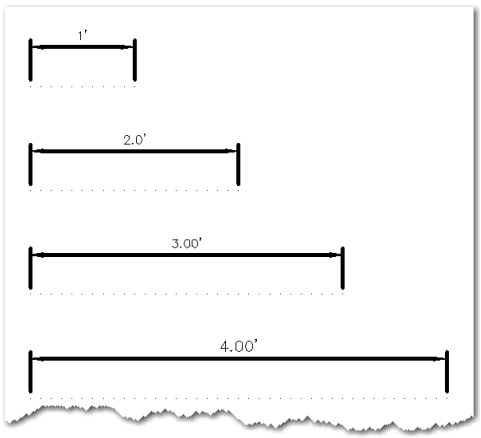


Each Dim Style has been modified so that the lines are ByLayer/ByBlock, and text is set to plot at a "Pen 2" width [see *Section 16.0 – Plot Styles (CTBs)*]:

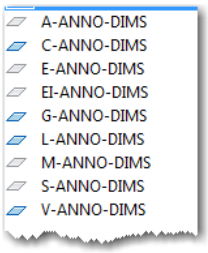




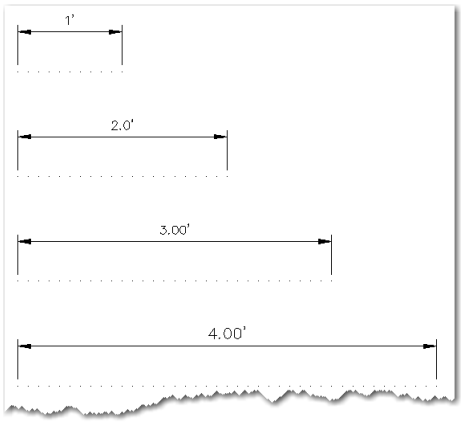
For plotting purposes, always place dimensions on the appropriate “DIMS” Layer:



Plot Preview before correct layers set.



Layer choices per Discipline Designator



Plot Preview After correct layers set.

Section 10.2

DW-2016 AEC Template.dwt

Overview - Section 10.2

This template shall be used to create detail drawings (Architectural, Mechanical, Structural, and Electrical); the title block is linked to the DW_DSGN.dst Sheet Set [see *Section 7.0 – Sheet Set Manager*]; this template is not a C3D drawing, therefore it does not contain any custom C3D styles. This template is primarily used for Capital Projects.

Always use the C3D template [see *Section 10.1 – DW-2016 C3D Template.dwt*] for site plans, including Architectural, Mechanical, Structural, and Electrical – all site plans are considered Civil drawings.

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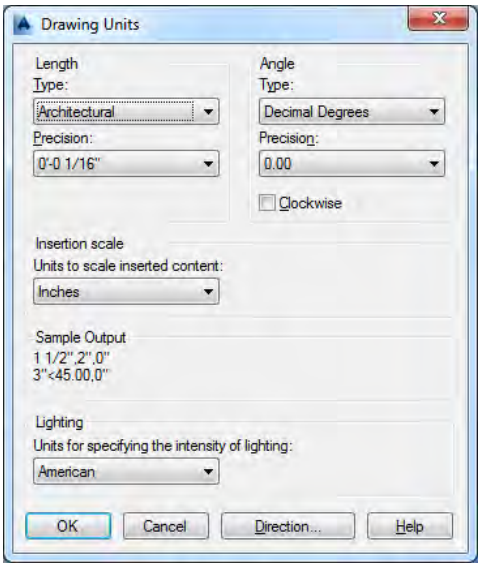
Drawing Units

In this template the drawing units have been set to “Architectural – Inches”:

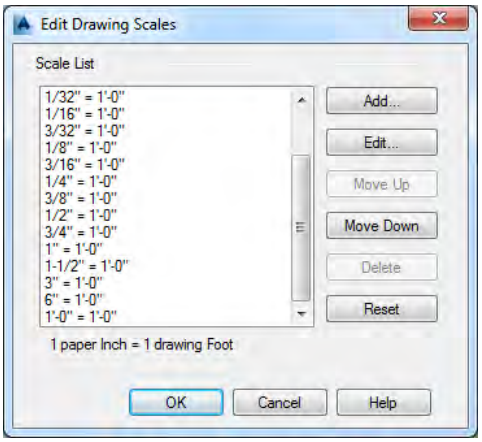


ATTENTION
The drawing units are very specific for Architecturally based work, if the units are changed it will affect everything related to scales including: dimensions, text, and plotting.

NOTE: The drawing units should not be changed for civil based drawings, use the “C3D” template for this purpose [see *Section 10.1 – DW-2016 C3D Template.dwt*].

Drawing Scales

Only the acceptable drawings scales [see *Section 4.1 – Model/Paper Space and Annotation Scales*] have been added to this template.



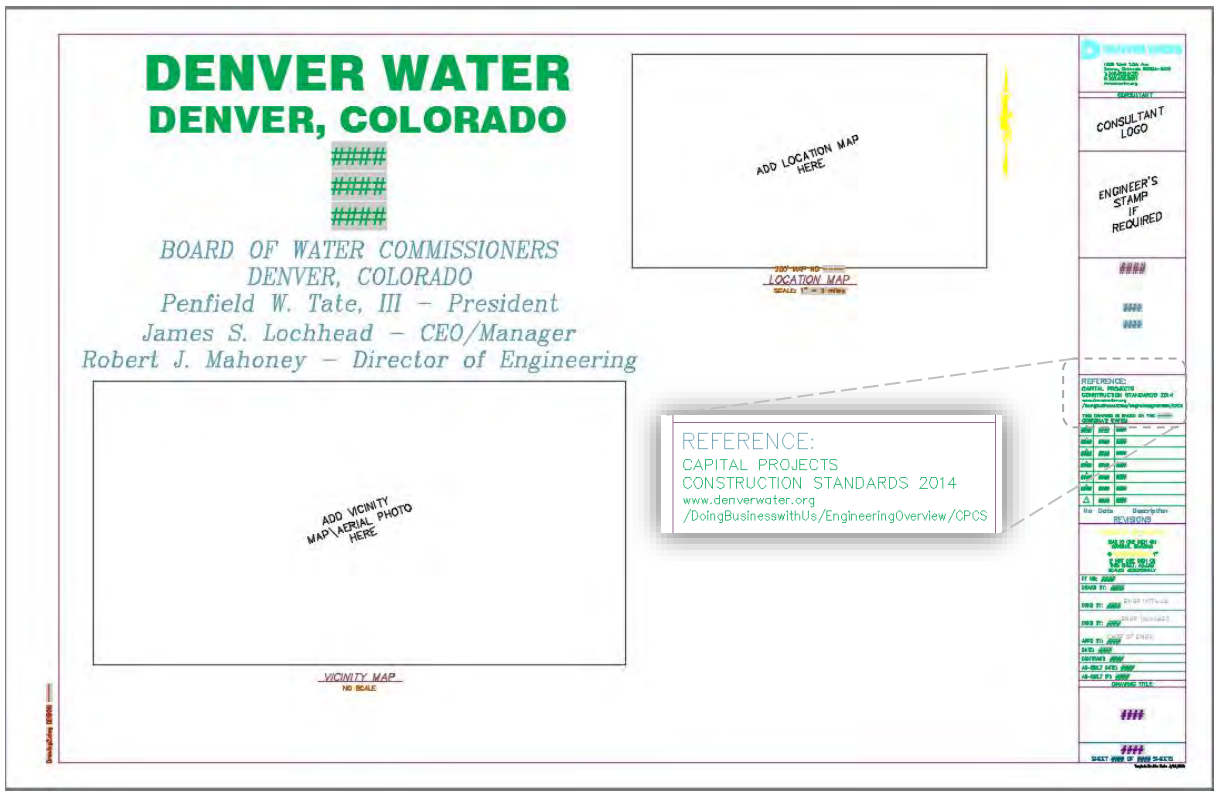
NOTE: Model Space does NOT have a Coordinate System predefined.

Layout Tab

This template has one predefined layout tab (Paper Space) that contains the title block for Design Drafting:

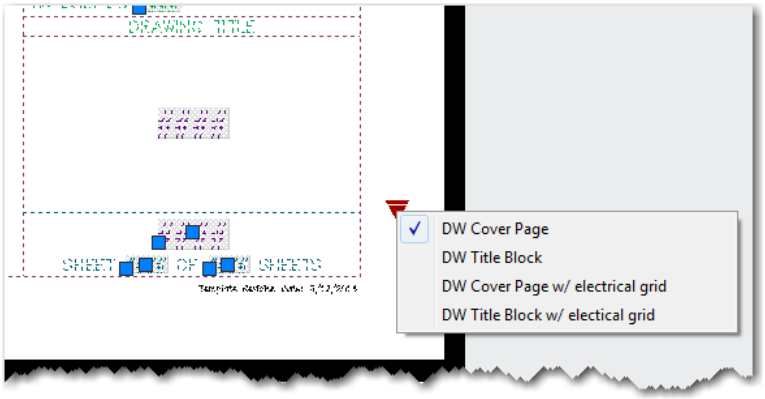
DESIGN Layout Tab

The DESIGN layout tab contains the *DW_DSGN Title Block* and references the CPCS 2nd Edition:



NOTE: Viewports are placed for general guidance and can be modified and deleted as needed.

The sheet size is set to 22x34 and defaulted to the Cover Sheet information. In the lower right corner of the *DW_DSGN Title Block* select the Dynamic grip for Visibility States and choose the appropriate Title Block type:



ANNOTATION

Every sheet within a plan set requires a certain level of labeling and annotation. Contained within this template are the standard styles for use with Architecturally based projects, see *Section 13.0 – Labeling and Annotation,* for a full explanation of the *Annotate* tab located on the Ribbon.

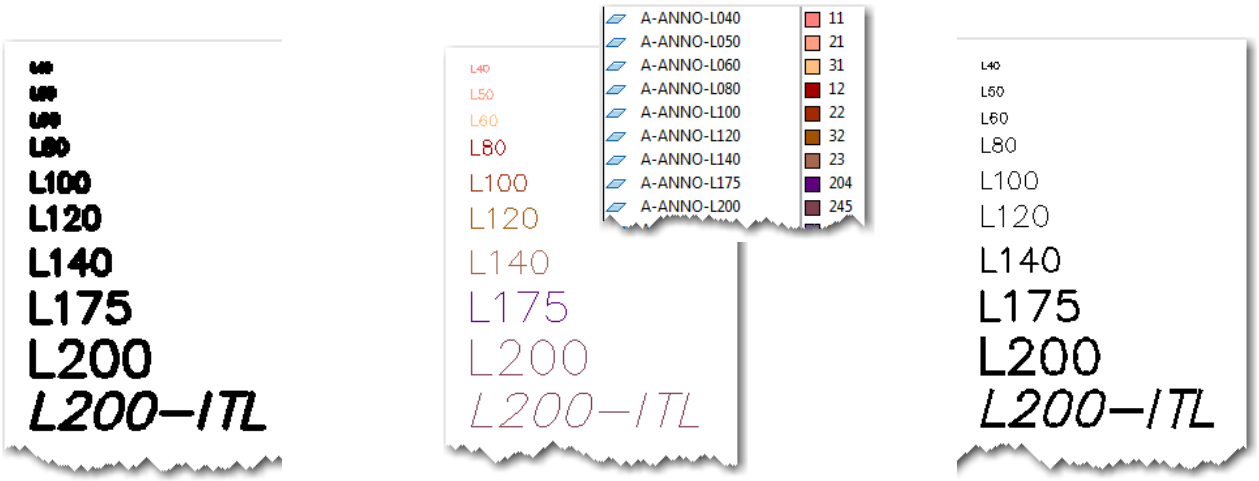
NOTE: All customized annotation styles (text styles, dim styles, etc.) have been created to be "annotative", meaning they will scale up and down automatically based on the Drawing Scale.

TEXT STYLES

DW's custom text styles are consistent throughout all of DW's templates, most text styles are based on a "simplex" font style:

NOTE: When the Text Styles are used properly the settings above should never need to be modified.

For plotting purposes, always place text on a Layer that indicates which text style was used:



Plot Preview before correct layers set.

Model Space view of text styles with correct layers set.

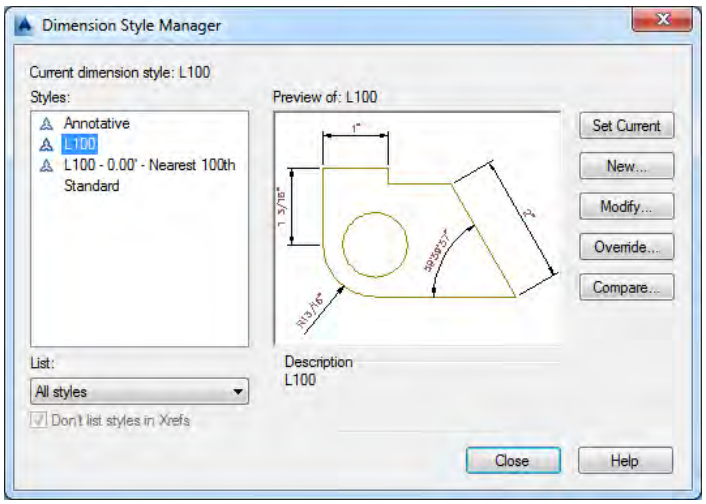
Plot Preview After correct layers set.

NOTE: Each Discipline Designator has a specific set of "text" layers.

Dimension Styles

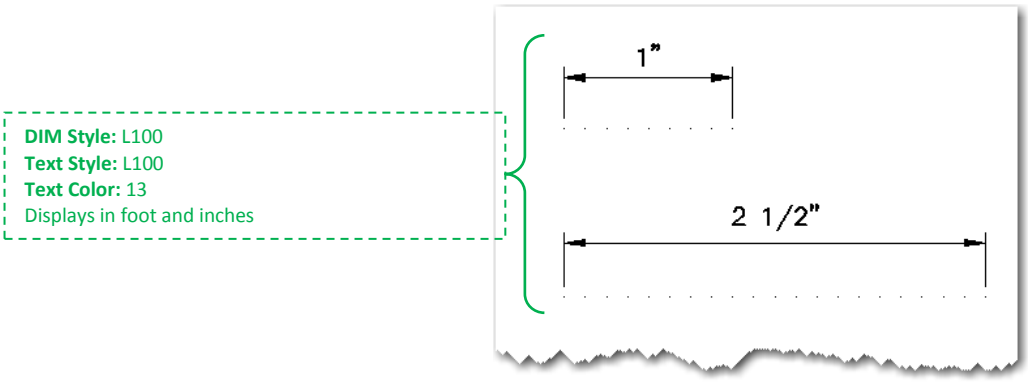
DW's custom Dimension (Dim) Styles have been created to reference the corresponding Text Styles. All Dim Styles are based on a "simplex" font style, and text should be located above the line.

The Dim Styles located in this template are for Architecturally based work only – L100 should primarily be used:

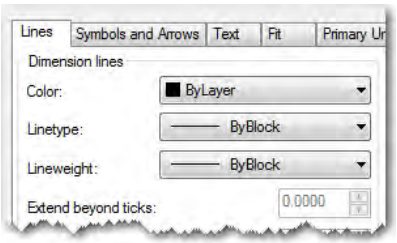


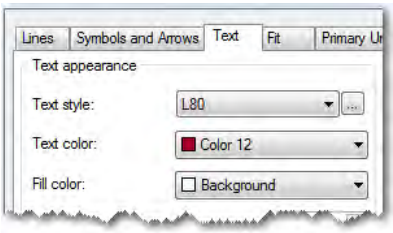
NOTE: This is a relatively new template and may be expanded on in the near future. Dim styles may also need to be modified for specific needs – contact DW's CAD Manager for template enhancement requests.

Below is a quick visual of how the L100 Dim Style should appear:

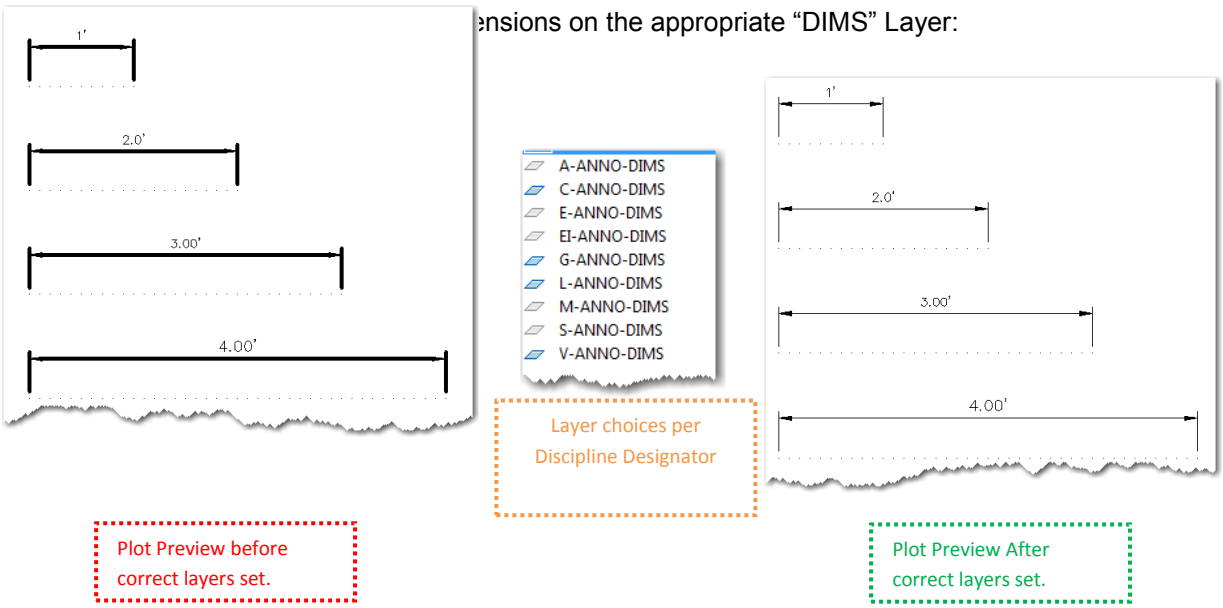


The Dim Style has been modified so that the lines are ByLayer/ByBlock, and text is set to plot at a "Pen 3" width [see *Section 17.0 – CTB's – DW's Color Charts*]:





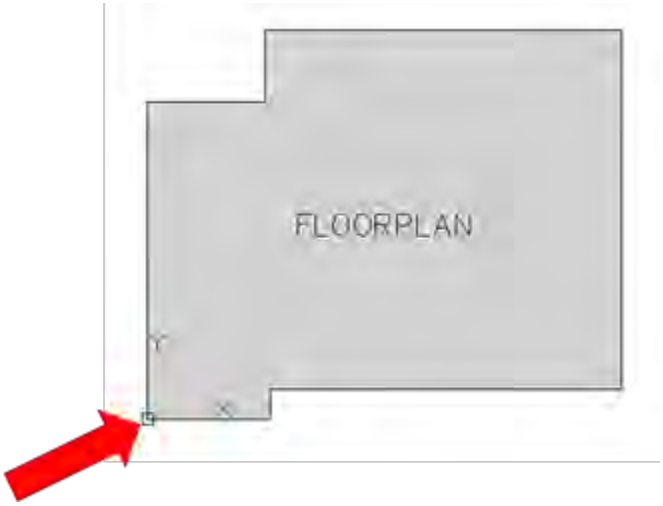
ensions on the appropriate “DIMS” Layer:



Combining AEC and Civil Drawings

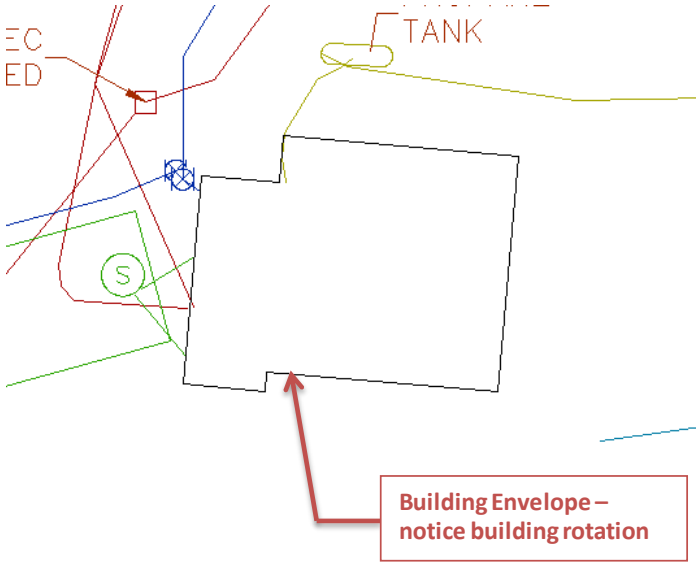
Sometimes it is necessary to have some kind of combination with Architecturally based and Civil based drawings. The best method of combining is XREF’ing, when XREF’ing the two types of plans (AEC and Civil) the AEC based drawing shall be brought INTO the Civil based drawing. For example, the floorplan should be referenced *into* the site plan, and not the other way around.

Building outlines should have one “known” building corner, such as 0, 0:

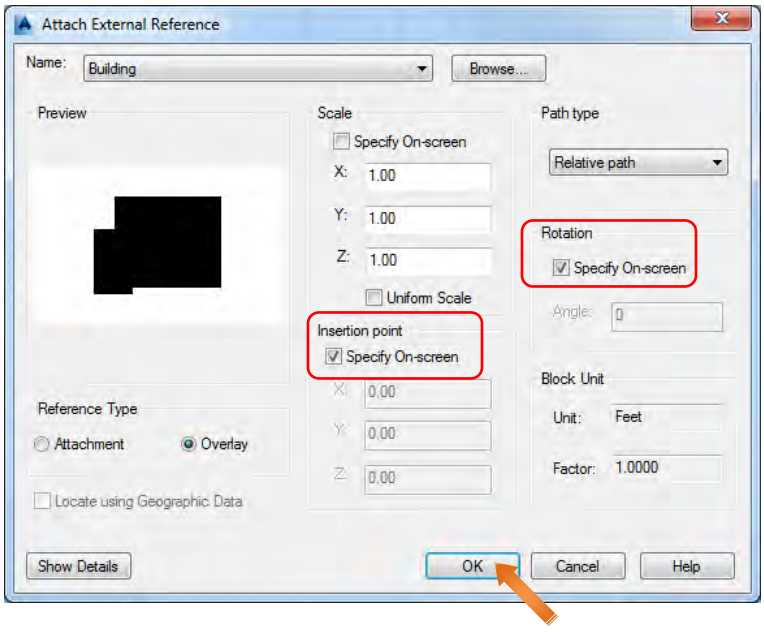


NOTE: The building outline drawing should have originated from the “AEC” template.

In the site plan, a building corner and angle must be identified (i.e. “building envelope”) before XREF’ing the floorplan:

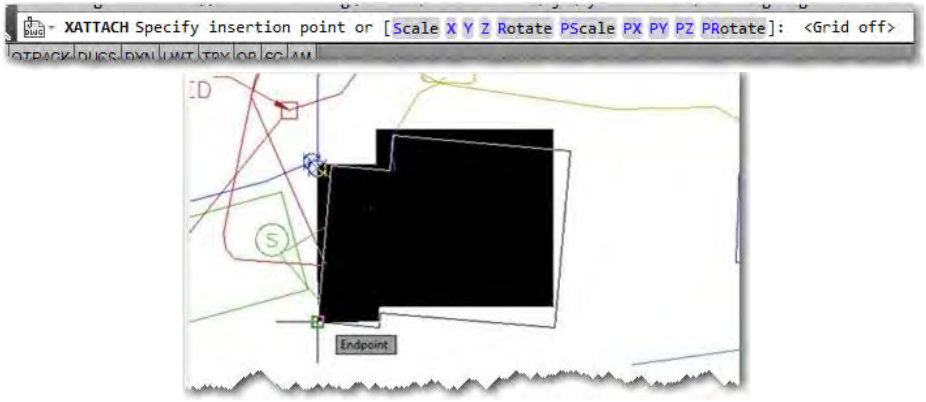


In the XREF pop-up dialog, check the options for *Insertion Point* and *Rotation* (do not check *Scale*), click <OK>:

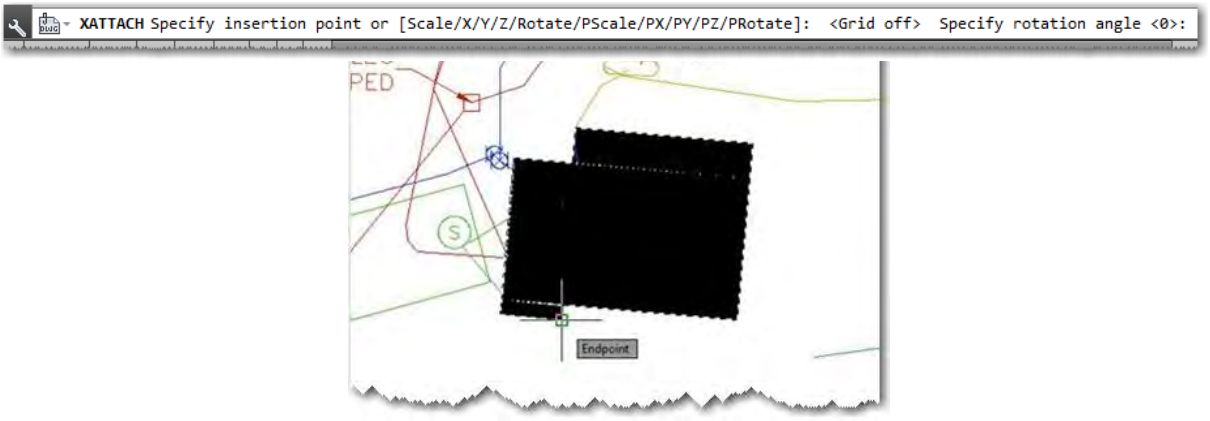


After pressing ok, place the building according to the envelope and rotate into place.

When prompted at the command line to Specify insertion point, pick the matching building corner in the “Civil” drawing:



As indicated on the command, Specify rotation angle by choosing another building corner:



NOTE: It is important to pay close attention to scales when inserting XREFs. If the above floor plan was drawn using architectural units, it needs to be scaled (1/12) to insert it into the civil drawing.

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Section 10.3

DW-PMGT 2016 C3D Template.dwt

Overview - Section 10.3

This template is a Civil 3D template and shall be used to create Property Management specific drawings and/or exhibits; title blocks are not linked to Sheet Sets. See *Section 5.4 – Property Management Example Sheets* for a full explanation of Property Management drawings.

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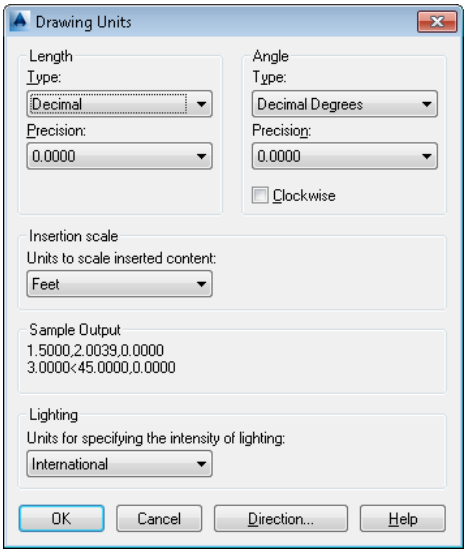
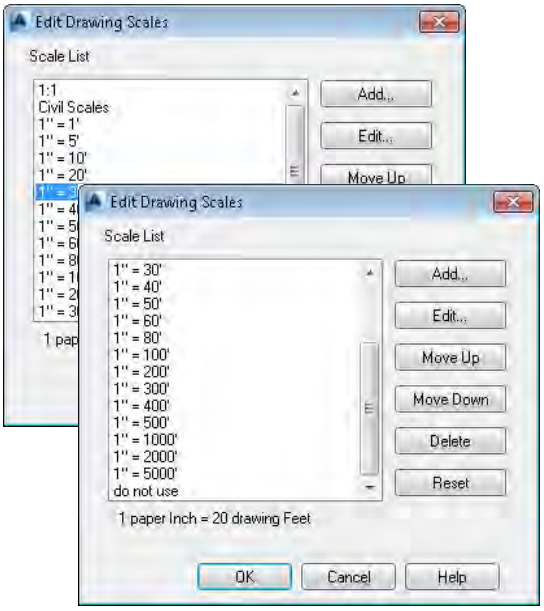
Drawing Units

In this template the drawing units have been set to “Decimal – Feet”:

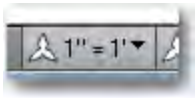


Drawing Scales

Only the acceptable drawings scales [see *Section 4.1 – Model/Paper Space and Annotation Scales*] have been added to this template;



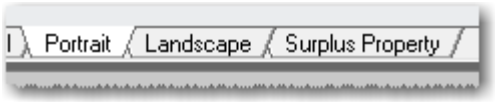
The default drawing scale 1” = 1’:



NOTE: Model Space does NOT have a Coordinate System predefined.

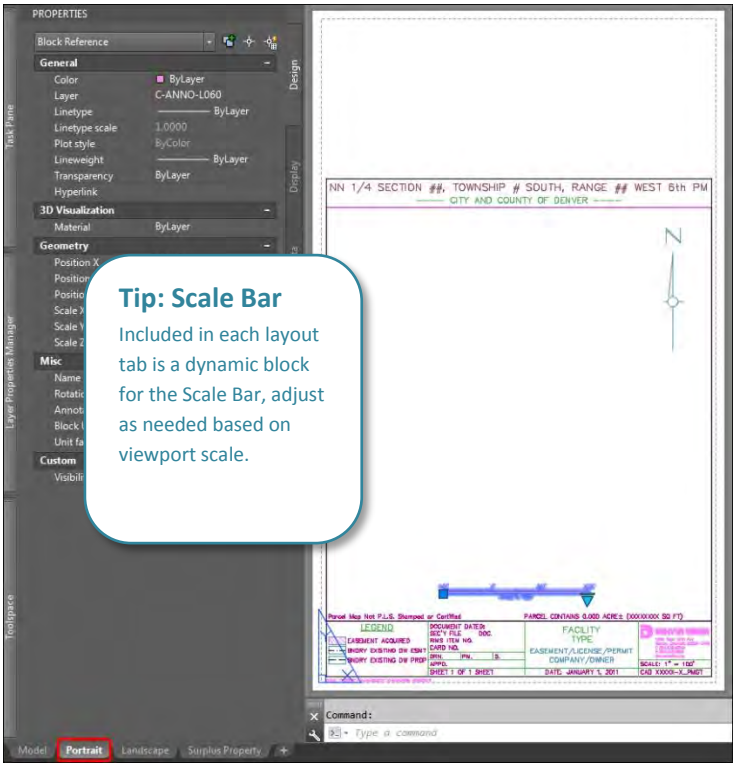
Layout Tabs

This template has three predefined layout tabs (Paper Space) that contain attributed title blocks:



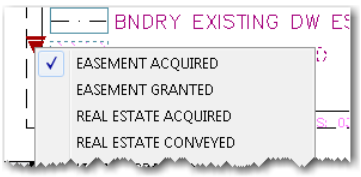
Portrait Layout Tab

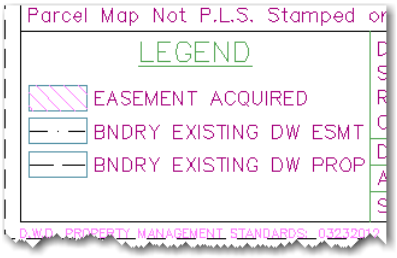
The Portrait layout tab contains an 8.5x11 vertical title block, on a “legal” sized sheet:



NOTE: DO NOT change Text Styles in the title block.

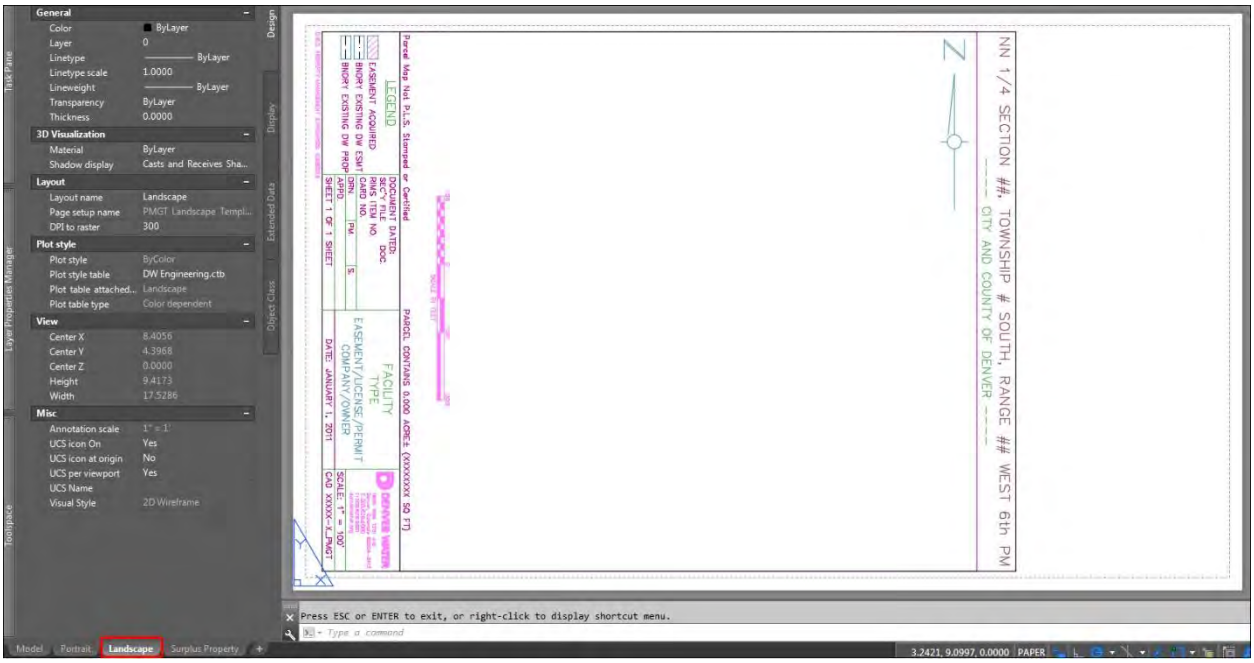
The hatch patterns and linetypes in the Legend are dynamic blocks; use the appropriate visibility state as needed for each:





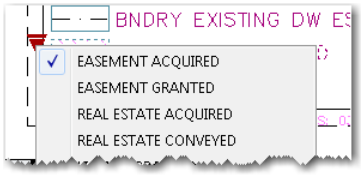
Landscape Layout Tab

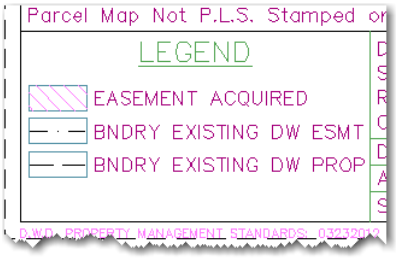
The Landscape layout tab contains an 8.5x11 horizontal title block, on a “legal” sized sheet:



NOTE: DO NOT change Text Styles in the title block.

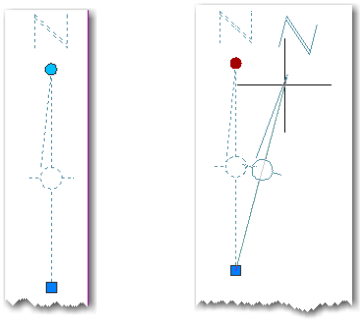
The hatch patterns and linetypes in the Legend are dynamic blocks; use the appropriate visibility state as needed for each:





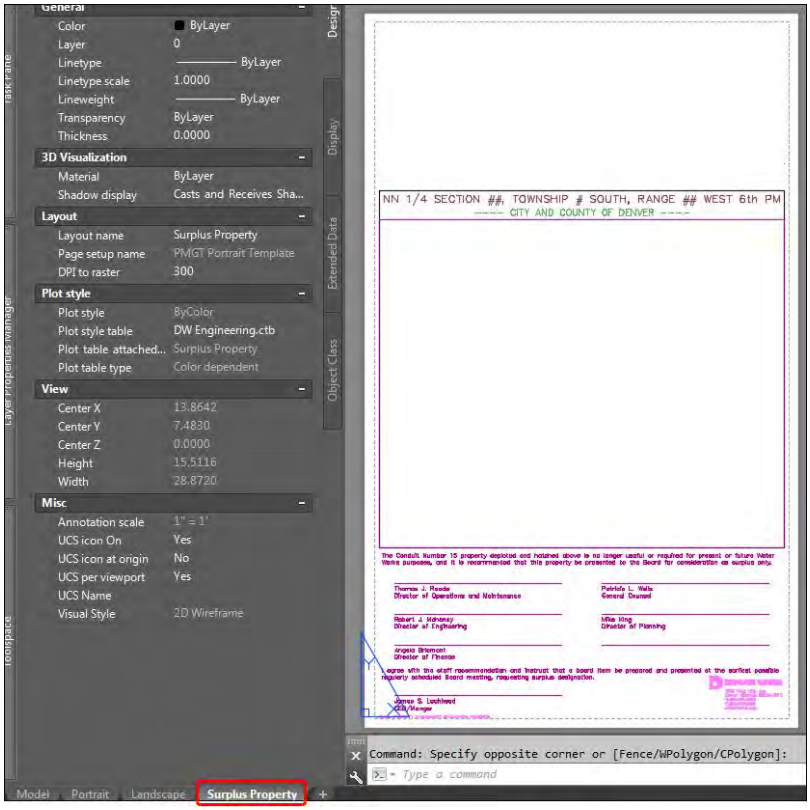
Tip: North Arrow

The North Arrow included in the layout tabs contains a rotate parameter, indicated by the round blue grip:



Surplus Property Layout Tab

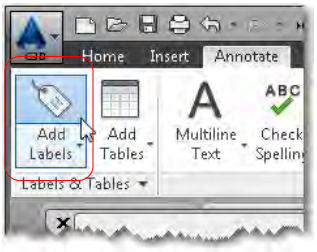
The Surplus Property layout tab contains the exhibit sheet for legal documentation:



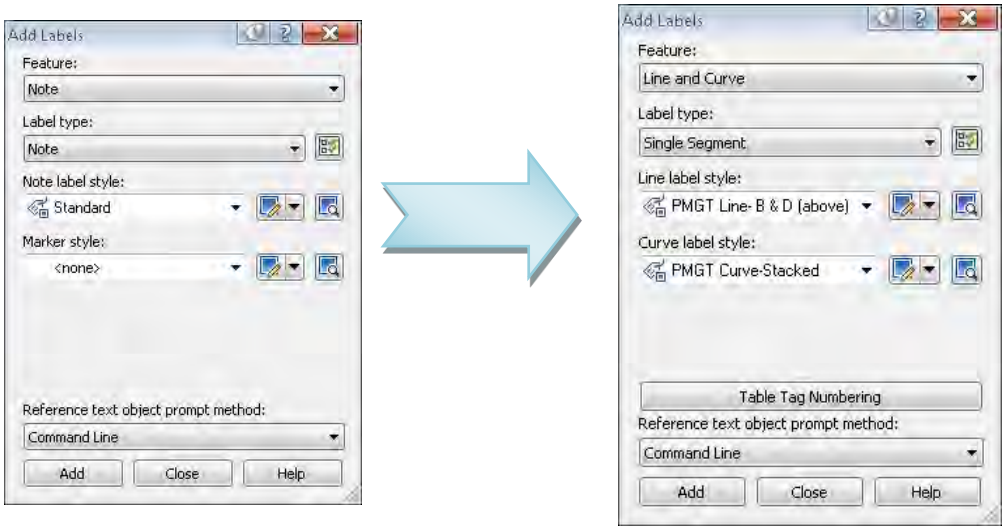
Labeling with C3D Styles

Embedded within the template are customized C3D Label Styles that allow for standardized plan creation. These C3D styles are annotative and contain the proper DW standard layers and text styles.

To utilize the appropriate Label styles click on the *Annotate* tab on the Ribbon and select the tag Icon just above the Add Labels pull-down:



The *Add Labels* pop-up window will appear. Specific label styles for Property Management are prefixed with PMGT; by choosing the desired Feature type (such as *Line and Curve*) the PMGT C3D label styles will be available for use:



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Section 10.4

DW-2016 Details_CPCS_EngStds.dwt

Overview - Section 10.4

This template shall be used to create detail drawings for DW Engineering Standards and the Capital Projects Construction Standards (CPCS) (Architectural, Mechanical, Structural, and Electrical); this template is not a C3D drawing, therefore it does not contain any custom C3D styles. This template is primarily used for Distribution and Capital Projects.

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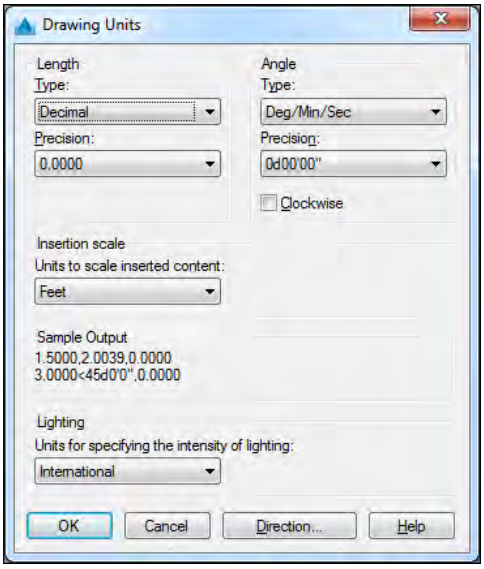
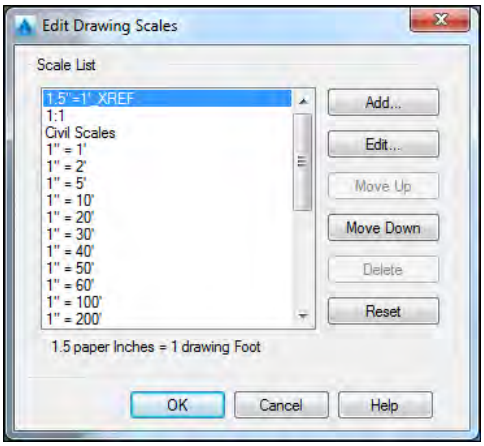
Drawing Units

In this template the drawing units have been set to “Decimal – Feet”:



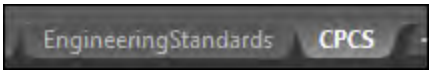
Drawing Scales

Only the acceptable drawings scales [see *Section 4.1 – Model/Paper Space and Annotation Scales*] have been added to this template.



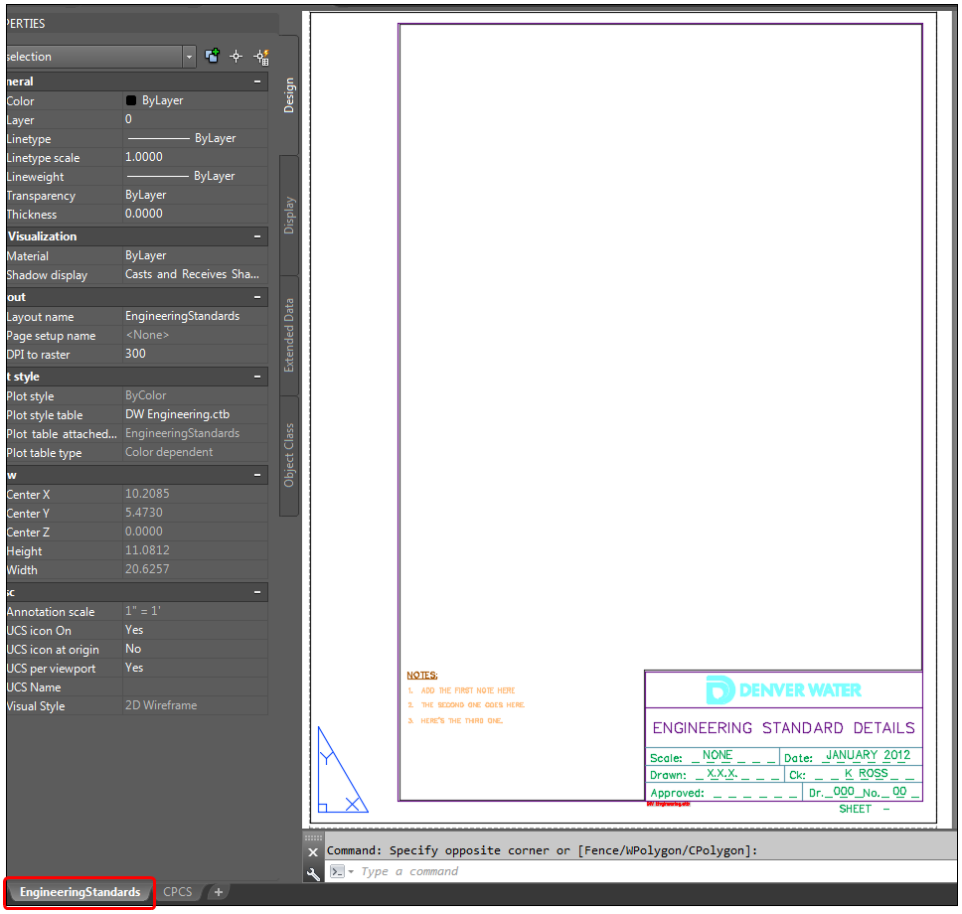
Layout Tabs

This template has two predefined layout tabs (Paper Space) that contains the title block for details for Engineering or CPCS:



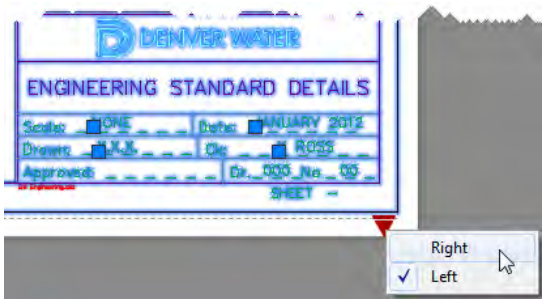
Engineering Layout Tab

The ENGINEERING layout tab references the Engineering Standards Engineering Standards 14th Edition 2012:



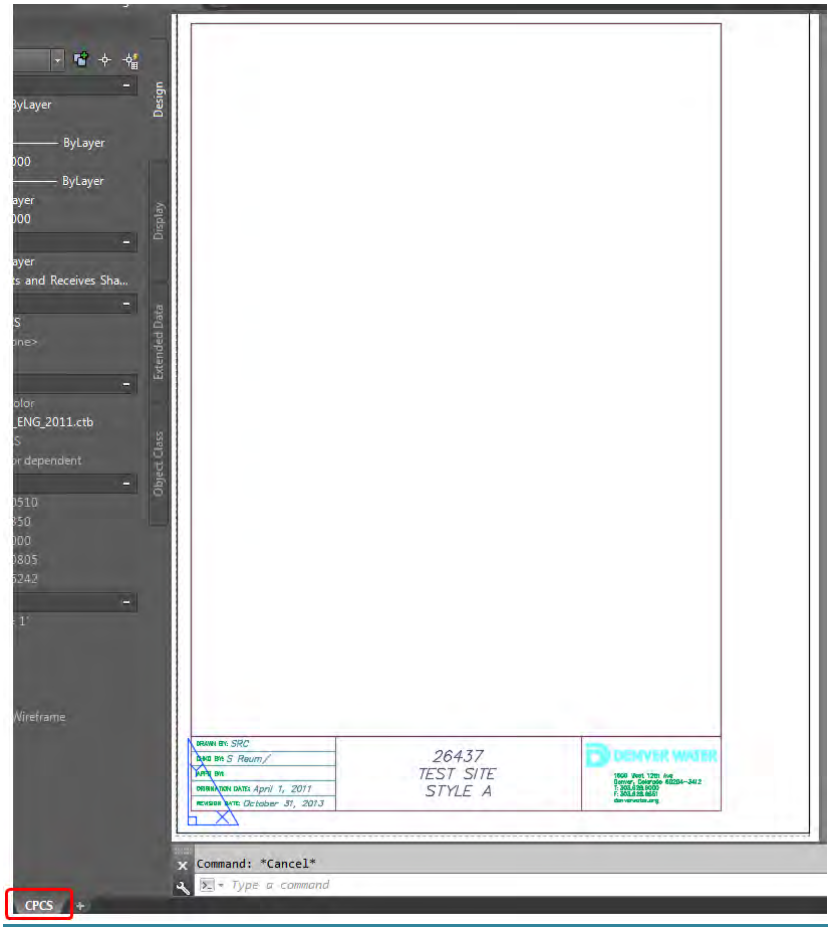
NOTE: Viewports are placed for general guidance and can be modified and deleted as needed.

In the lower right corner of the DW_ENG_STD_TB select the Dynamic grip for Visibility States and choose the appropriate Title Block type:



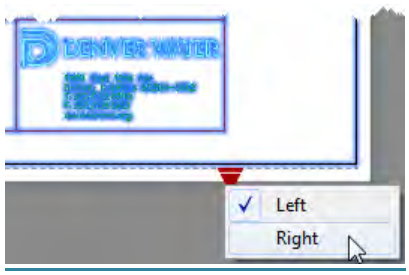
CPCS Layout Tab

The CPCS layout tab references the Capital Projects Construction Standards 2rd Edition 2014:



NOTE: Viewports are placed for general guidance and can be modified and deleted as needed.

In the lower right corner of the DW_CSPS_TB select the Dynamic grip for Visibility States and choose the appropriate Title Block type:



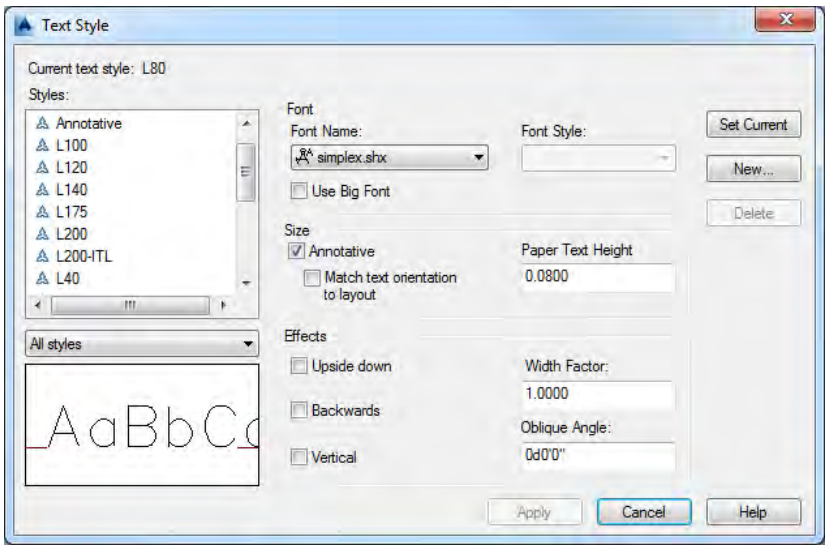
ANNOTATION

Every sheet within a plan set requires a certain level of labeling and annotation. Contained within this template are the standard styles for use with Civil based projects, see *Section 13.0 – Labeling and Annotation* for a full explanation of the *Annotate* tab located on the Ribbon.

NOTE: All customized annotation styles (text styles, dim styles, etc.) have been created to be "annotative", meaning they will scale up and down automatically based on the Drawing Scale.

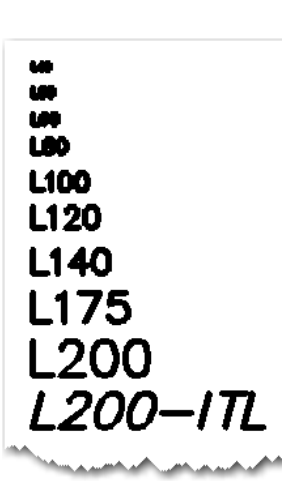
TEXT STYLES

DW's custom text styles are consistent throughout all of DW's templates, most text styles are based on a "simplex" font style:

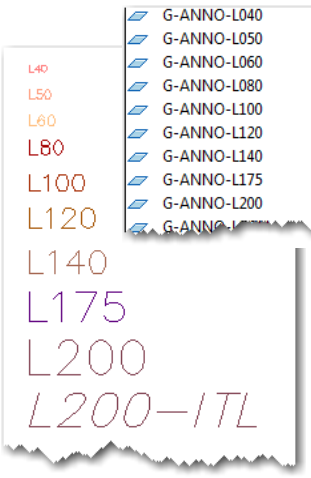


NOTE: When the Text Styles are used properly the settings above should never need to be modified.

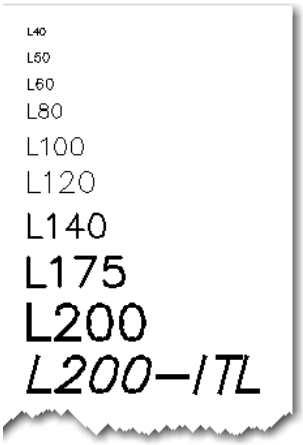
For plotting purposes, always place text on a Layer that indicates which text style was used:



Plot Preview before correct layers set.



Model Space view of text styles with correct layers set.



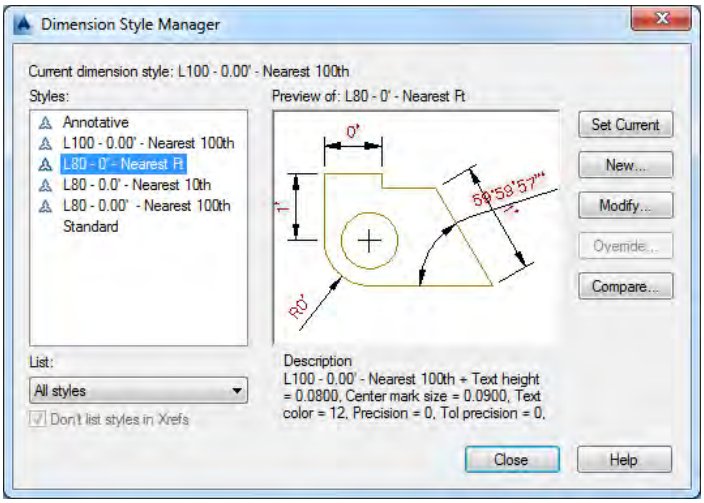
Plot Preview After correct layers set.

NOTE: Each Discipline Designator has a specific set of "text" layers.

Dimension Styles

DW's custom Dimension (Dim) Styles have been created to reference the corresponding Text Styles. All Dim Styles are based on a "simplex" font style, and text should be located above the line.

The Dim Styles located in this template are for Civil based work only:



NOTE: When the Dim Styles are used properly the settings above should never need to be modified.

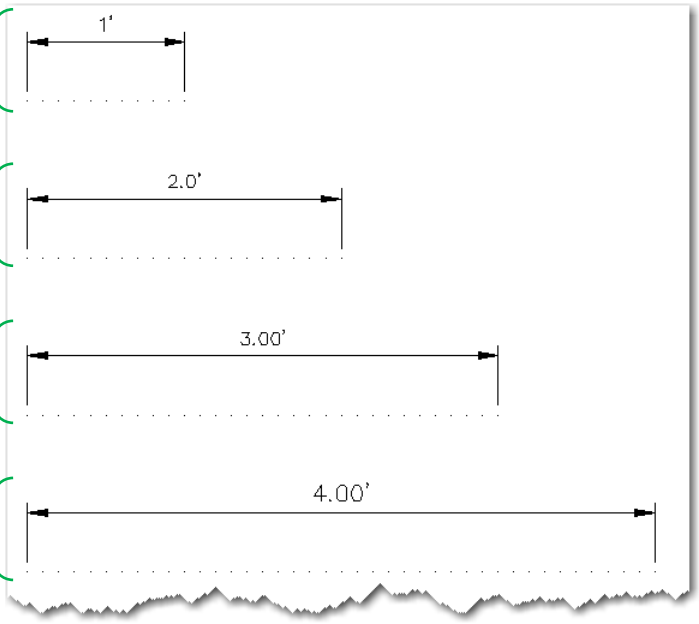
Below is a quick visual of how each Dim Style should appear:

DIM Style: L80 - 0' - Nearest Ft
Text Style: L80
Text Color: 12
Rounds distance to the nearest foot

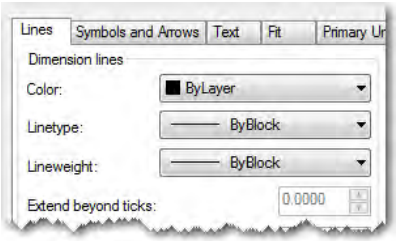
DIM Style: L80 - 0.0' - Nearest 10th
Text Style: L80
Text Color: 12
Rounds distance to the nearest tenth

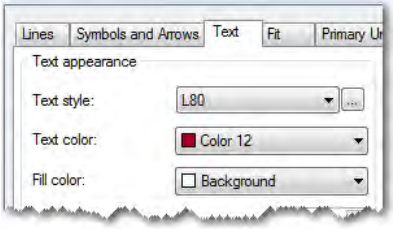
DIM Style: L80 - 0.00' - Nearest 100th
Text Style: L80
Text Color: 12
Rounds distance to the nearest hundredth

DIM Style: L100 - 0.00' - Nearest 100th
Text Style: L100
Text Color: 22
Rounds distance to the nearest hundredth

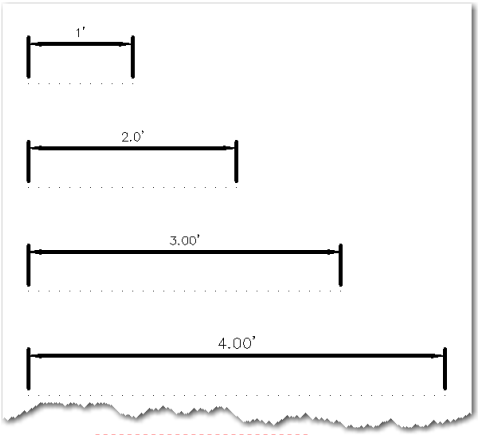


Each Dim Style has been modified so that the lines are ByLayer/ByBlock, and text is set to plot at a "Pen 2" width [see *Section 16.1 – Plot Styles (CTBs)* Charts]:

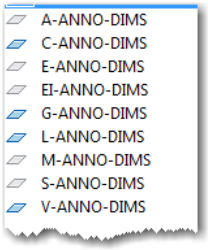




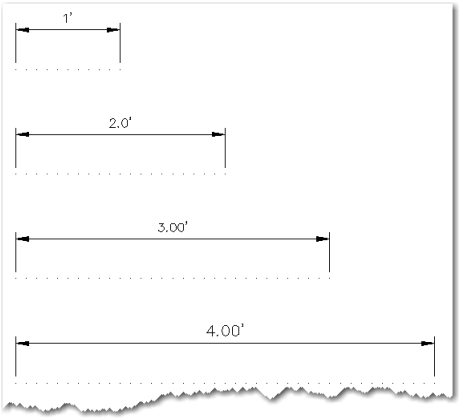
For plotting purposes, always place dimensions on the appropriate "DIMS" Layer:



Plot Preview before correct layers set.



Layer choices per Discipline Designator



Plot Preview After correct layers set.

Section 11.0

Coordinate Systems

Table of Contents: Section 11.0

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Overview - Section 11.0

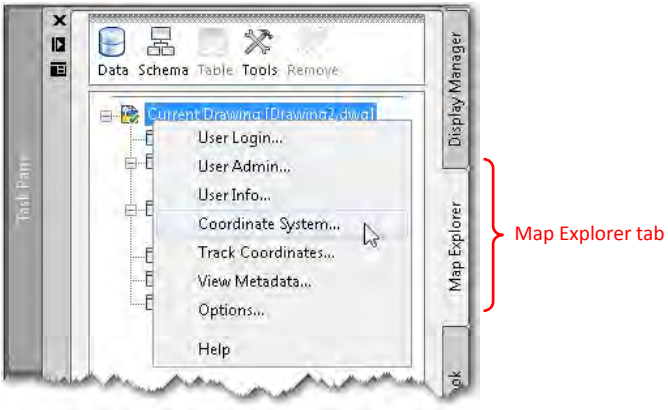
Civil based drawings will have a Coordinate System applied to it. DW Templates DO NOT have a preset Coordinate System, **this must be done by the drafter before anything is drawn in Model Space.**

Internally, DW has several custom Coordinate Systems covering various regions across Colorado; these Coordinate Systems will be used with the majority of projects.

It is NOT recommended to share empty drawings containing only a defined Coordinate System with Consultants or outside entitles. It is difficult, if not impossible, to determine if the data placed in Model Space is geographically accurate.

Setting a Coordinate System (internal use)

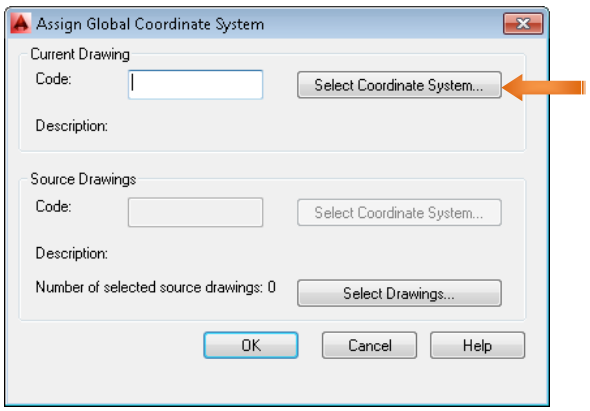
On the *Task Pane* palette select the *Map Explorer* tab; right-click on the Current Drawing name and select *Coordinate System…*:



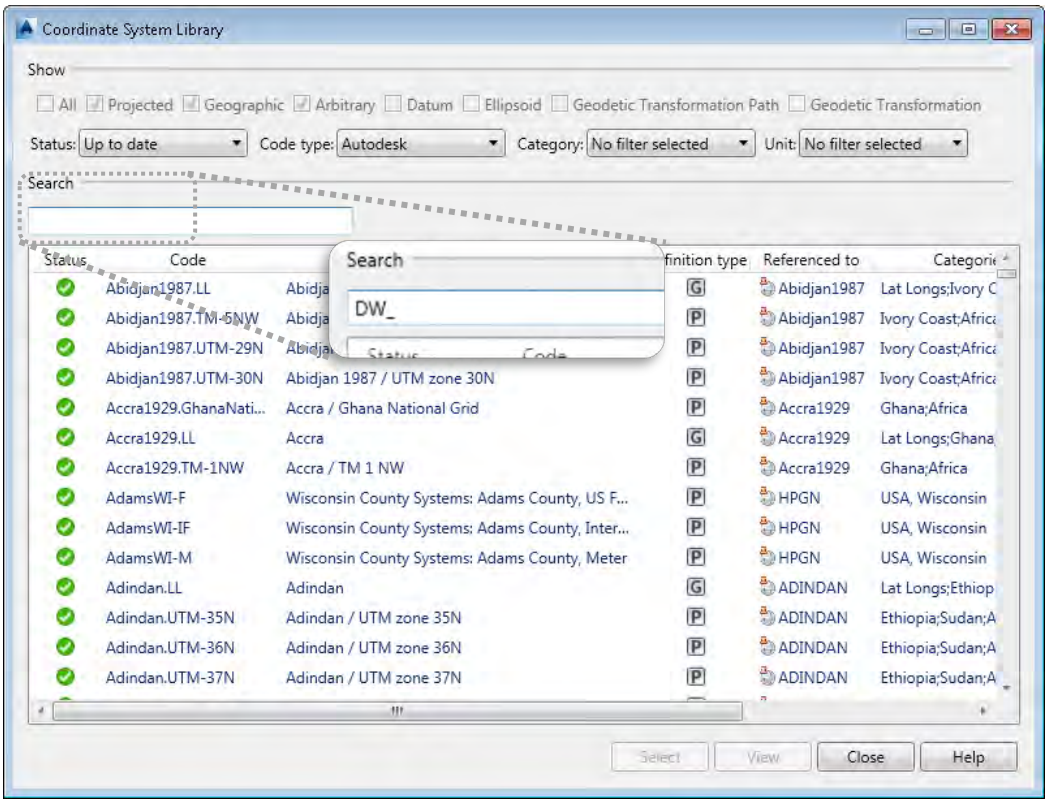
Tip: Quick Tools

A button to quickly Assign Coordinate Systems to a drawings has been added to the Quick Tools tool palette.

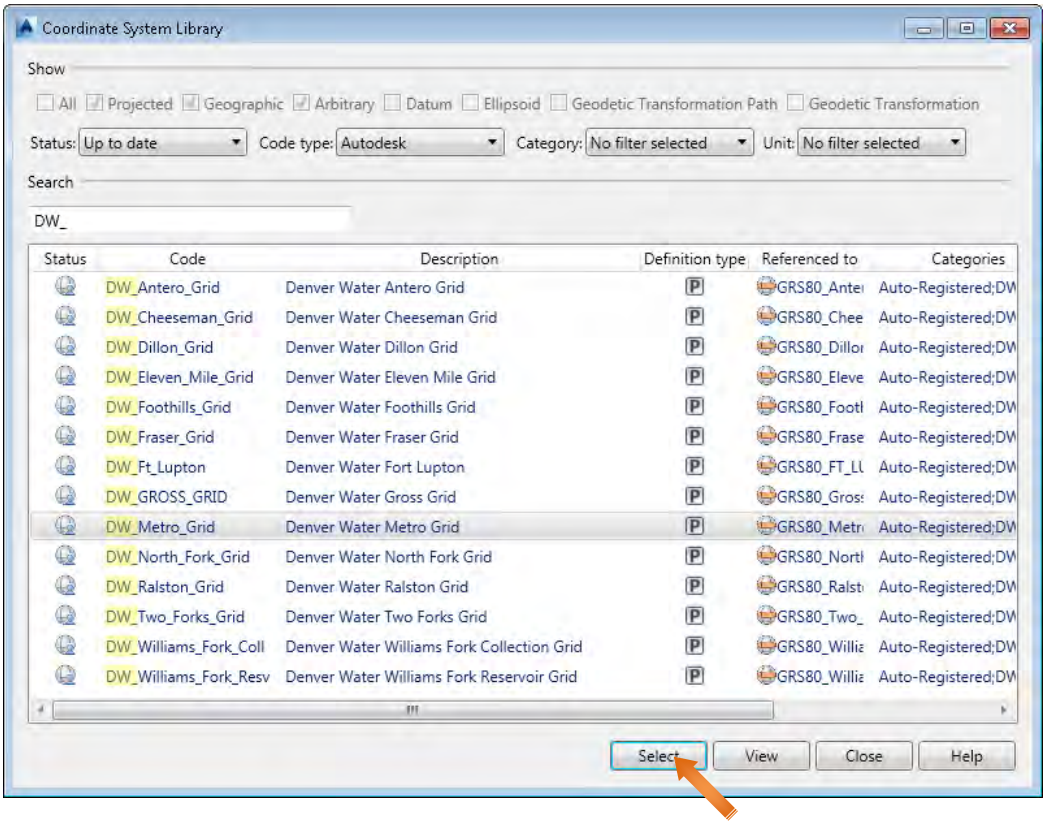
The *Assign Global Coordinate System* pop-up window will appear, click <Select Coordinate System…>:



The *Coordinate System Library* pop-up window will appear; to quickly access DW's custom Coordinate Systems type **DW_** in the empty search field:

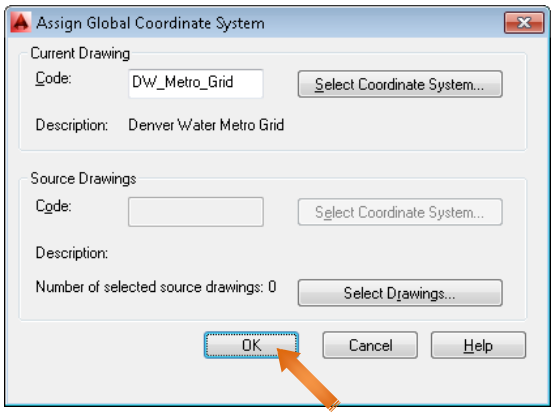


Within seconds all of DW's custom Coordinate Systems will display; *choose* the appropriate Coordinate System from the list and click <Select>:



NOTE: ALL drawings in a project must have the same coordinate system.

The *Assign Global Coordinate System* pop-up window will reappear, click <OK >:



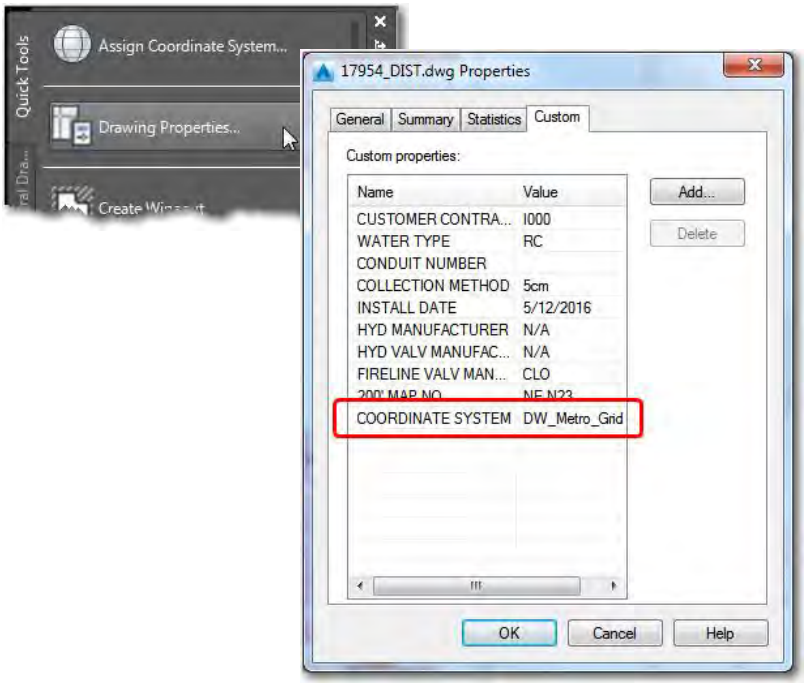
A visual indicator of the set Coordinate Systems can be seen on the Status Bar in the bottom right corner of the CAD Application (if you cannot see the current coordinate system, type MAPSTATUSBAR > ENTER; select SHOW > ENTER):

ATTENTION

A new drawing will have to be created if the Coordinate System was not set prior to objects being placed in Model Space.

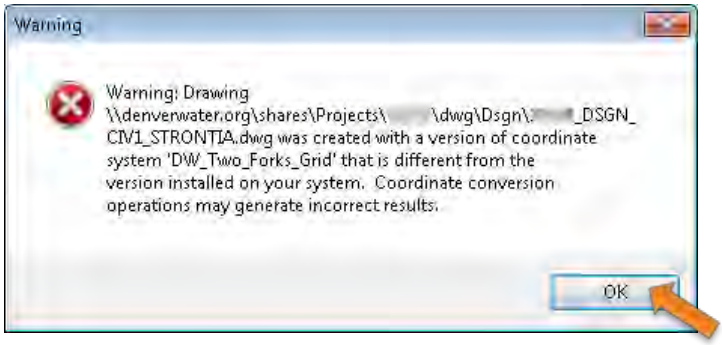
Setting Coordinate System in Sheet Set Properties (Internal Only)

You can set the coordinate system so that it is present within each sheet. To set the coordinate system within the sheet set properties, it is located on the *Quick Tools* tool palette in the *DW General* group, here:



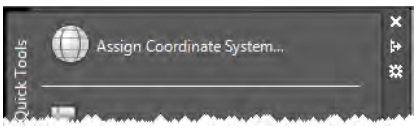
Resetting Coordinate Systems

Occasionally a Warning error may occur upon opening a drawing, indicating something is wrong with the Coordinate System within that drawing; click <OK> on the pop-up window:

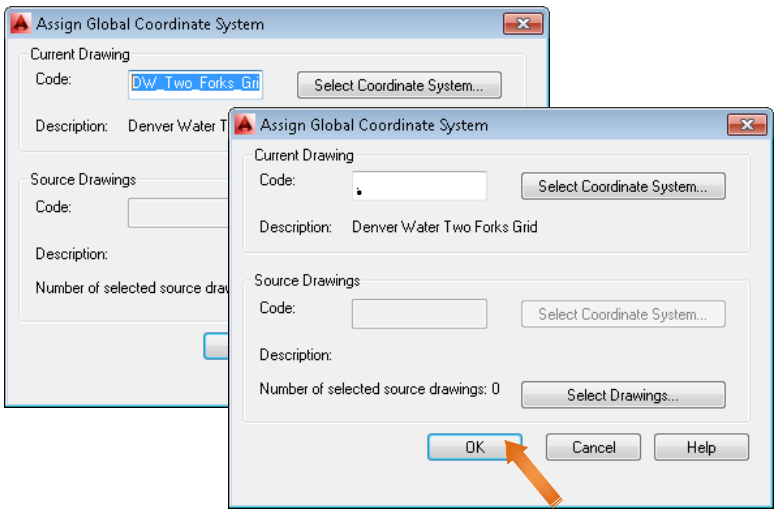


NOTE: If the Coordinate System does not get reset this error will continue to pop-up when opening the file, or during plotting and publishing.

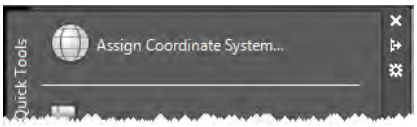
Once the drawing is open, click *Assign Coordinate System* on the *Quick Tools* tool palette; or use the Task Pane as shown previously:



The *Assign Global Coordinate System* pop-up will appear; replace the information in the "Code" field with a period (.); click <OK>:



For the second time, click *Assign Coordinate System* on the *Quick Tools* tool palette:



The *Assign Global Coordinate System* pop-up window will appear, click <Select Coordinate System…>

The *Coordinate System Library* pop-up window will appear; to quickly access DW's custom Coordinate Systems type **DW_** in the empty search field

All of DW's custom Coordinate Systems will display; choose the appropriate Coordinate System from the list and click <Select>

The *Assign Global Coordinate System* pop-up window will reappear, click <OK > NOTE: The steps shown above can be seen with screen captures on pages 11.0-3 thru 11.0-5. Please refer to *Section 18.2 ARG Drawings on Capital Projects* for additional details on Coordinate Systems.

Section 12.0

Layers & Linetypes

Table of Contents: Section 12.0

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Overview - Section 12.0

All current layers follow the United States National CAD Standard's Naming Convention and all new layers, as needed, shall as well. Also included is a list of major and minor abbreviations for layer naming conventions and layers (not ALL inclusive).

Layers

The layer name format is organized as a hierarchy and is based on the United States National CAD Standard (NCS). This arrangement allows users to select only the layers they want to see by utilizing layer *Filters*.

Layer names consist of distinct data fields separated from one another by dashes. These fields are: *Discipline Designator, Major Group, Minor Groups* (up to two), and *Status*. The Discipline Designator and Major Groups are mandatory. The Minor and Status Groups are optional.

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

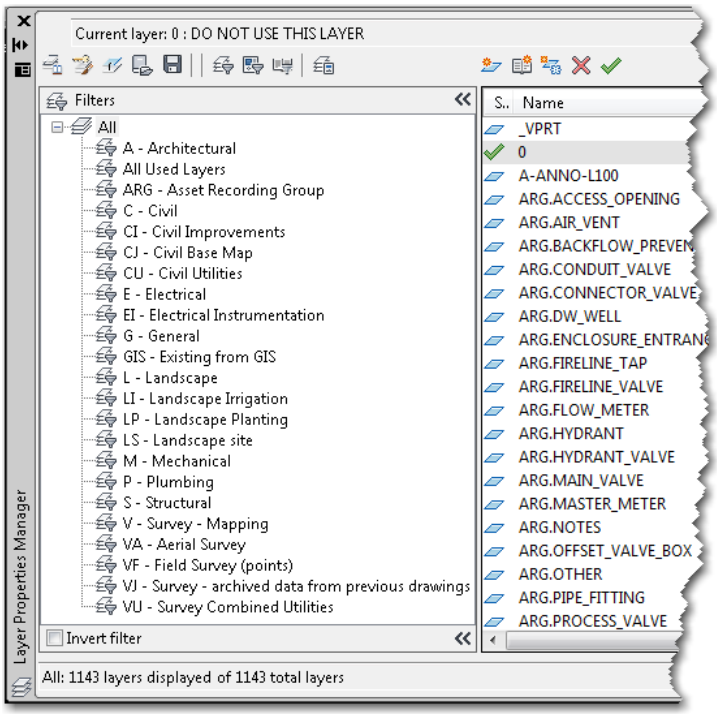
A	I	-	W	A	L	L	-	F	U	L	L	-	D	I	M	S	-	N

ATTENTION

If a new layer needs to be created, it MUST comply with the layer naming format defined in this section, including a layer description. Please refer to the NCS for a complete list of layers. If the desired layer is not found contact the DW CAD Manager.

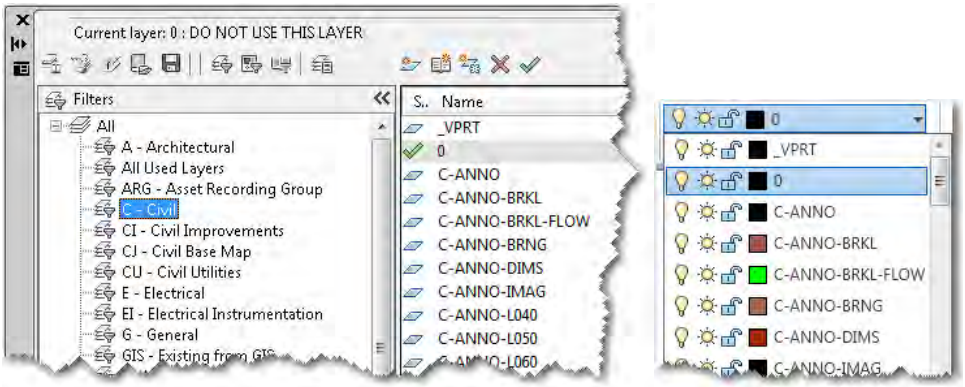
Filters

Located in the *Layer Properties Manager,* **Filters** organize all layers according to their Discipline Designators:



NOTE: All Denver Water templates contain predefined Filters.

By selecting the desired filter, the layers list will display only the layers prefixed with the corresponding Discipline Designator (A, ARG, C, etc.), with the exception of _VPRT and 0:



NOTE: Layers being used in XREF's will automatically be added to the corresponding filters.

When a new layer is created the generic name (i.e. Layer1, Layer2, etc.) will automatically be included in all filters until it is properly renamed:

Layer fields

The following lists represent NCS compliant Layer Fields (*Discipline Designators, Status (Phase), Major and Minor* abbreviation) found in Denver Water's templates.

Please note that the Major and Minor abbreviations, as well as layers, are no longer provided in this document but can be found in the provided spreadsheets at:

http://www.denverwater.org/DoingBusinesswithUs/EngineeringOverview/CADStandards/

Discipline Designators

A	Architectural
ARG	Asset Recording Group
C	Civil
CI	Civil Improvements
CJ	Civil Base Map
CU	Civil Utilities
DW	Denver Water (and Total Service area)
E	Electrical
EI	Electrical Instrumentation
G	General
GIS	Existing from GIS
L	Landscape
LI	Landscape Irrigation
LP	Landscape Planting
LS	Landscape Site
M	Mechanical
MS	Mechanical Site
P	Plumbing
S	Structural
SS	Structural Site
V	Survey / Mapping
VA	Survey / Mapping Aerial
VF	Survey / Mapping Field (points)
VJ	Archived data from previous drawings
VU	Survey / Mapping Combined Utilities

Status (Phase)

D	Existing to demolish
DW	Denver Water (and Total Service area)
E	Existing
F	Future work
ITAL	Italicized (applies to text styles)
SHAD	Shadow area (applies to text styles)
T	Temporary work

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Template Layers

DW's templates are preloaded with standard layers per discipline (see Discipline Designators). A spreadsheet has been created that lists each layer Name and also included is its Color, Linetype, Plot and Description. This was created to ease the process of updating layers within the Standards, it will be kept current and it will be available in spreadsheet format for download here:

http://www.denverwater.org/DoingBusinesswithUs/EngineeringOverview/CADStandards/

All layers' colors listed are based on the **DW Engineering.ctb** for plotting [see *Section 16.1 – Plot Styles (CTBs)*].

Common layers

These layers will exist in every drawing

Name	Color	Linetype	Plot	Description
_VPRT	251	Continuous	NO	General: Viewport
0	7	Continuous	YES	DO NOT USE THIS LAYER
Defpoints	7	Continuous	NO	DO NOT USE THIS LAYER

A – Architectural

Use these layers for architecturally based information
(found in the AEC template)

ARG – Asset Recording Group

These layers are ONLY for use with the As-Built tools for posting DW's GIS
[see *Section 18.0 – As-Builts*]
(found in the C3D template)

C - Civil

All proposed civil work, not related to water, shall go on these layers
(found in the C3D template)

CI - Civil Improvements

These layers are to be used in instances where existing utility information has been obtained from a source other than survey or GIS. They are not to be used for proposed work; however use in profiles is permissible
(found in the C3D template)

CJ - Civil Base Map

For use with DW's large Base Map projects **ONLY**
(found in the C3D template)

CU - Civil Utilities

Use these layers for all proposed waterline features
(found in the C3D template)

E - Electrical

Use these layers for all electrical work larger than instrumentation
(found in the AEC template)

EI - Electrical Instrumentation

Use these layers for all electrical instrumentation work
(found in the AEC template)

G – General

Common symbols (such as section lines, match lines, etc.) and nearly everything placed in Paper Space will be put on these layers
(found in the AEC and C3D templates)

G – General Details
All Detail symbols and lines will be put on these layers for use with the Engineering Standards and CPCS
(found in the Details template)

GIS - Existing from GIS
Internal use **ONLY**. Utilize these layers when existing information is pulled from DW's GIS system
(found in the C3D template)

L – Landscape
For use with basic landscape annotation and features
(found in the C3D template)

LI – Landscape Irrigation
For use with irrigation landscape features
(found in the C3D template)

LP – Landscape Planting
For use with landscape plant features
(found in the C3D template)

LS – Landscape Site
For use with landscape site features
(found in the C3D template)

M – Mechanical
Use these layers for all mechanical information
(found in the AEC template)

P – Plumbing
Use these layers for all plumbing information
(found in the AEC template)

S – Structural
Use these layers for all structurally based information
(found in the AEC template)

V – Survey / Mapping
All existing survey information not related to utilities shall go on these layers
(found in the C3D template)

VA - Survey / Mapping Aerial
All existing aerial survey information shall go on these layers
(found in the C3D template)

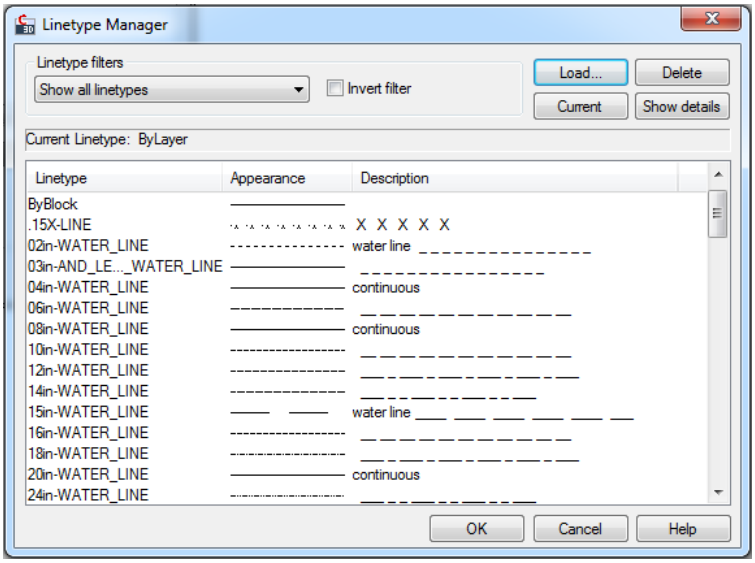
VF - Survey / Mapping Field (points)
Utilize these layers for survey points collected in the field only
(AutoCAD cogo points)
(found in the C3D template)

VJ - Survey - archived data from previous drawings
These layers are to be used when existing features have been pulled from other/older projects, i.e.: not recently surveyed
(found in the C3D template)

VU - Survey / Mapping Combined Utilities
All existing utility information shall go on these layers
(found in the C3D template)

Linetypes

Linetypes are used to help distinguish objects of different types within plan sets; all layers within DW's templates have been assigned appropriate linetypes.

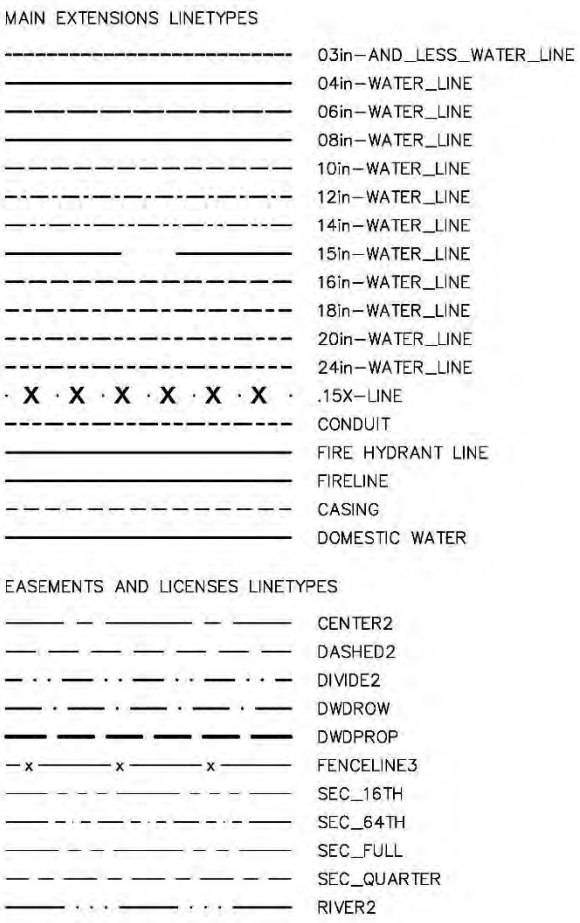


NOTE: Do not bring old linetypes, from previous projects, into new drawings unless approved

Tip: .LIN file location

The *DW_LINETYPES.LIN* file is located:

DW CAD\DW Linetypes



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Section 13.0

Labeling & Annotation Tools

Table of Contents: Section 13.0

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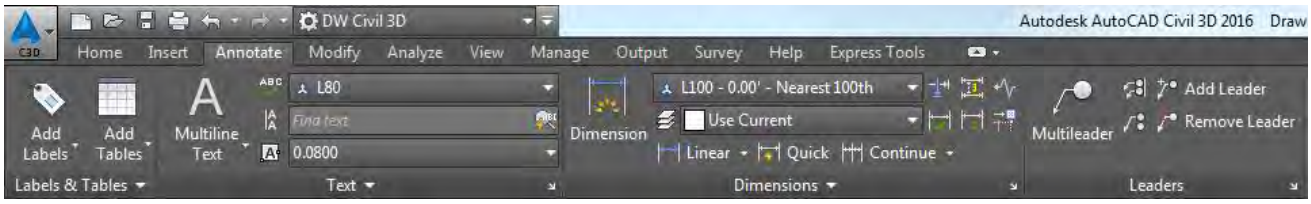
Overview - Section 13.0

Text, notes, labeling, and symbols are all considered “Annotation.” Each of these features have been predefined in the 2016 DW templates, with corresponding annotative scales. By selecting the proper styles, all text, notes, labels, and symbols should plot at the correct height and size based on the drawing scale (see *Section 13.1 – Model/Paper Space & Annotation Scales*).

This section only covers CAD functions related to labeling, for annotative symbols see *Section 14.0 – Standard Symbols (Blocks)*.

Annotate Tab

With the exception of symbols, all annotation features can be found on the *Annotate* tab located on the ribbon; the graphic below describes the most common features utilized on each panel:



Civil 3D Label & Table styles

Single and multiline text, text styles, and spell check

Dimensioning and dimension styles

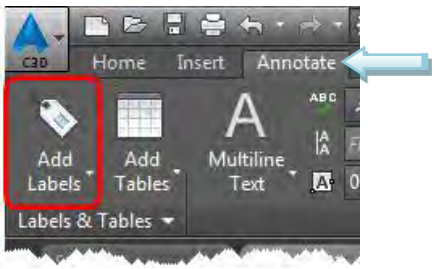
Multileaders and leader styles

NOTE: Typically all labeling and dimensioning shall be placed in Model Space. Exceptions include, but are not limited to, general notes, section call-outs, titles etc. Example sheets provided in this document can be referenced for further clarification (see *Section 5.0 – Example Sheets*).

Labels & Tables panel

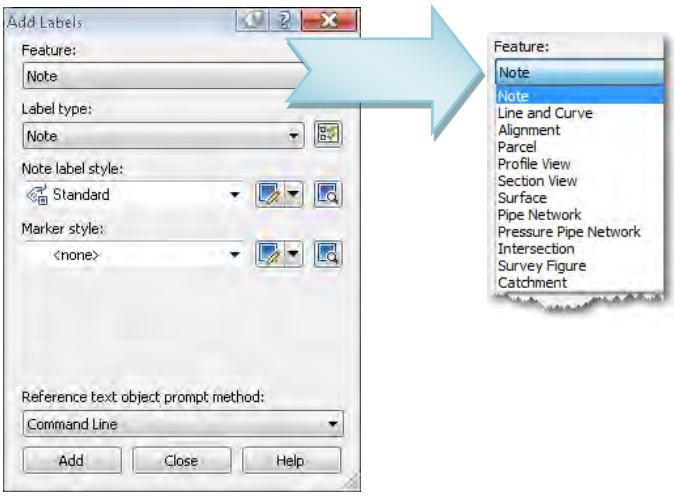
Linework should be labeled using the customized styles embeded within DW’s templates (i.e. 12” W, gas, electric, etc.); use the *Labels and Tables Panel* to utilize these label styles.

To utilize the appropriate Label styles, click on the *Annotate* tab on the Ribbon and select the tag icon, just above the *Add Labels* pull-down:

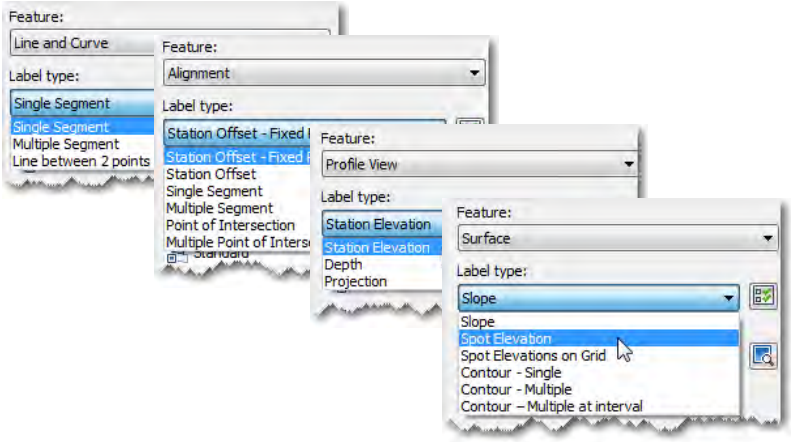


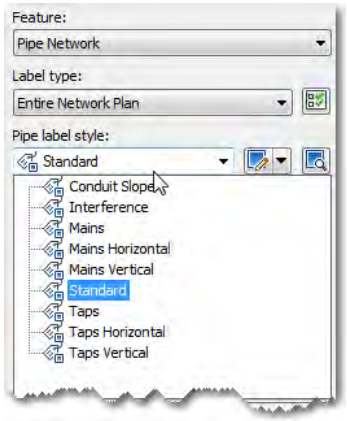
NOTE: C3D labels are present only in C3D templates; the AEC template will not contain customized label styles.

The *Add Labels* pop-up window will appear. Choose the type of *Feature* to be labeled:

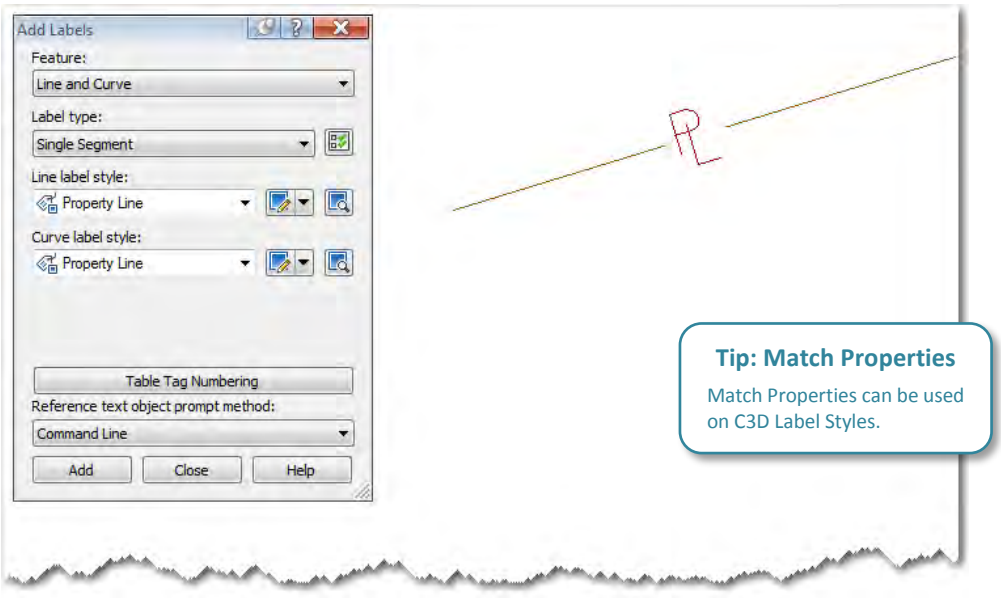


The *Label type* options will be different depending on the type of *Feature* previously chosen. The examples below show a few of the common Feature types labeled with C3D labels:





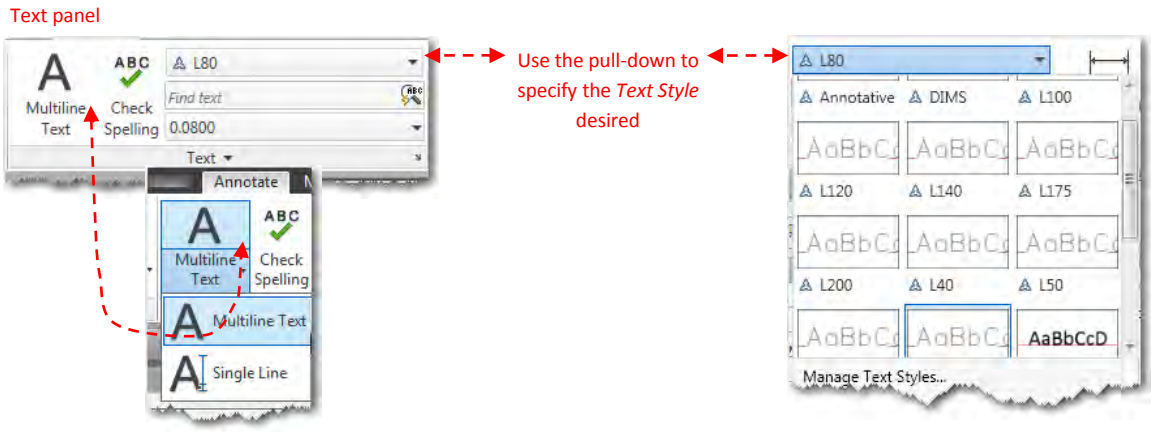
This example shows *Line and Curve* as the *Feature* selected, *Single Segment* as the *Label* type, and *Property Line* as the *Line and Curve* label styles:



Text Panel

The 2016 DW templates have been preloaded with acceptable, annotative *Text Styles* (see *Section 10.0 – Drawing Templates (DWTs)*. Text shall be placed on the appropriate layers (see *Section 12.0 – Layers & Linetypes*) based on discipline of work (architectural, civil, etc…) and corresponding Text Style. The *Text* panel also houses the *Check Spelling* function.

From the *Text* panel single line (DTEXT) and multiline (MTEXT) text can be added to the drawings by clicking the pull-down arrow under the capital A icon. The desired *Text Style* can also be defined at this time:

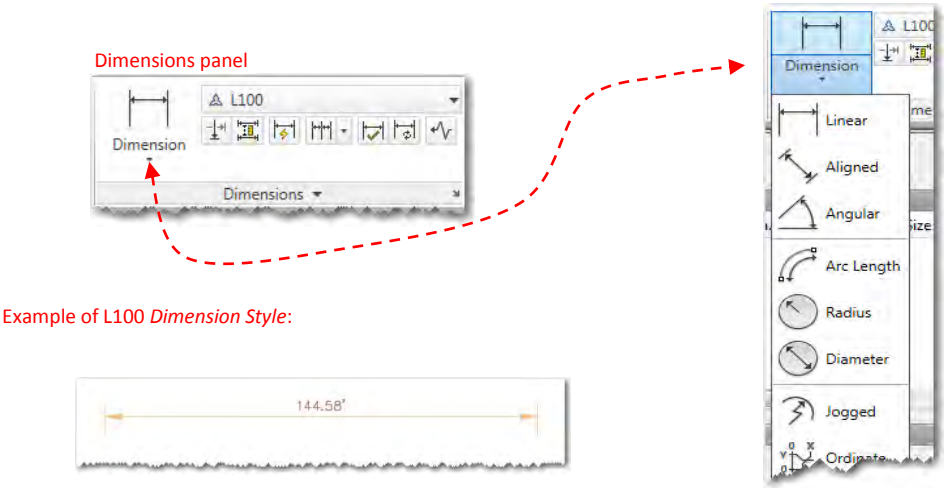


Due to enhanced editing capabilities multiline text is preferred over the use of single line text. The difference between the two is apparent by the number of grips shown when the text is selected:

Dimensions Panel

The 2016 DW templates have been preloaded with acceptable, annotative *Dimension Styles* (see *Section 10.0 – Drawing Templates (DWTs)*. Dimensions shall be placed on appropriate layers (see *Section 12.0 – Layers & Linetypes*) based on discipline of work (architectural, civil, etc…). All customized dimension styles have a "forced" color for text, and should not be changed.

Different types of dimensions can be added by clicking the pull-down arrow underneath the *Dimension* icon:

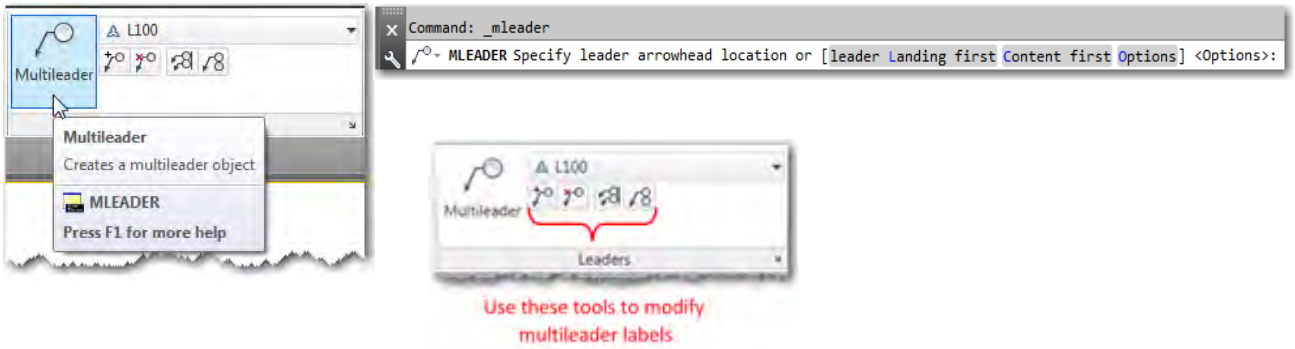


NOTE: Dimensioning should not be added on top of viewports in paper space. Measurements should not be revised except in special cases.

Leaders Panel – (Multileaders)

Multileaders, leaders with attached MTEXT box, can be added to drawings from the *Leaders* panel. The 2016 DW templates have been preloaded with acceptable, annotative styles (see *Section 10.0 – Drawing Templates (DWTs)*).

On the *Leaders* panel click the *Multileader* icon and follow the command line prompts. Multileader labels shall be placed on the appropriate layers (see *Section 12.0 – Layers & Linetypes*) based on discipline of work (architectural, civil, etc…) and corresponding *Text Style*:

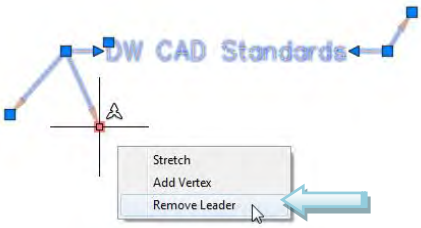


Adding Leaders

A quick way to add additional leaders to a Multileader label, select and right-click the desired leader and select *Add Leader* as seen below:

Removing Leaders

A quick way to remove an individual leader from a Multileader label, select and right-click the desired leader and select *Remove Leader* as seen below:



Section 13.1

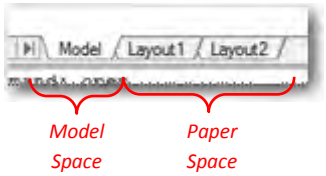
Model/Paper Space & Annotation Scales

Overview - Section 13.1

All drafting shall be done in Model Space with the annotation scales set accordingly. Plotting shall be done from Paper Space using the plot layout tools located in the SSM [see *Section 16.0 – Plotting & Publishing*].

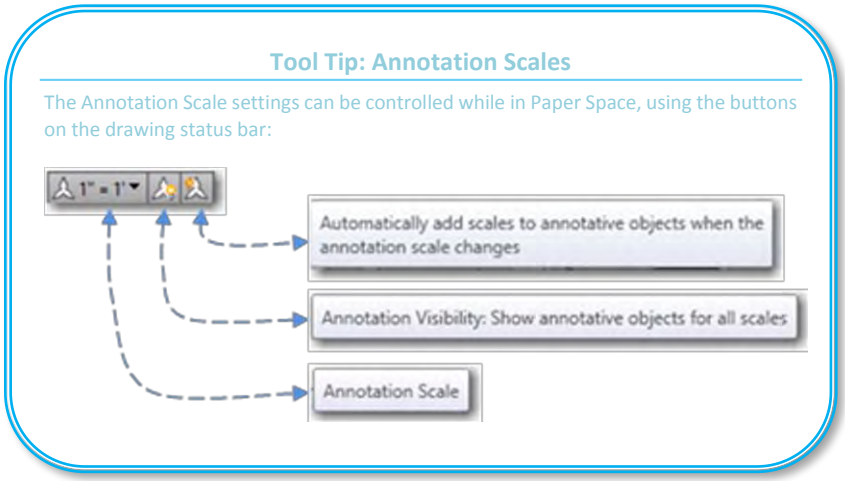
Use of Model Space & Paper Space

Every drawing has a Model Space tab and at least one Paper Space tab:



Annotation Scales

The *Annotation Scale* (also known as Drawing Scale) must be set for Model Space and for each viewport in Paper Space, respectively. Acceptable scales have been predefined within the 2016 templates [see *Section 13.0 – Labeling & Annotation Tools*].



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Section 13.2

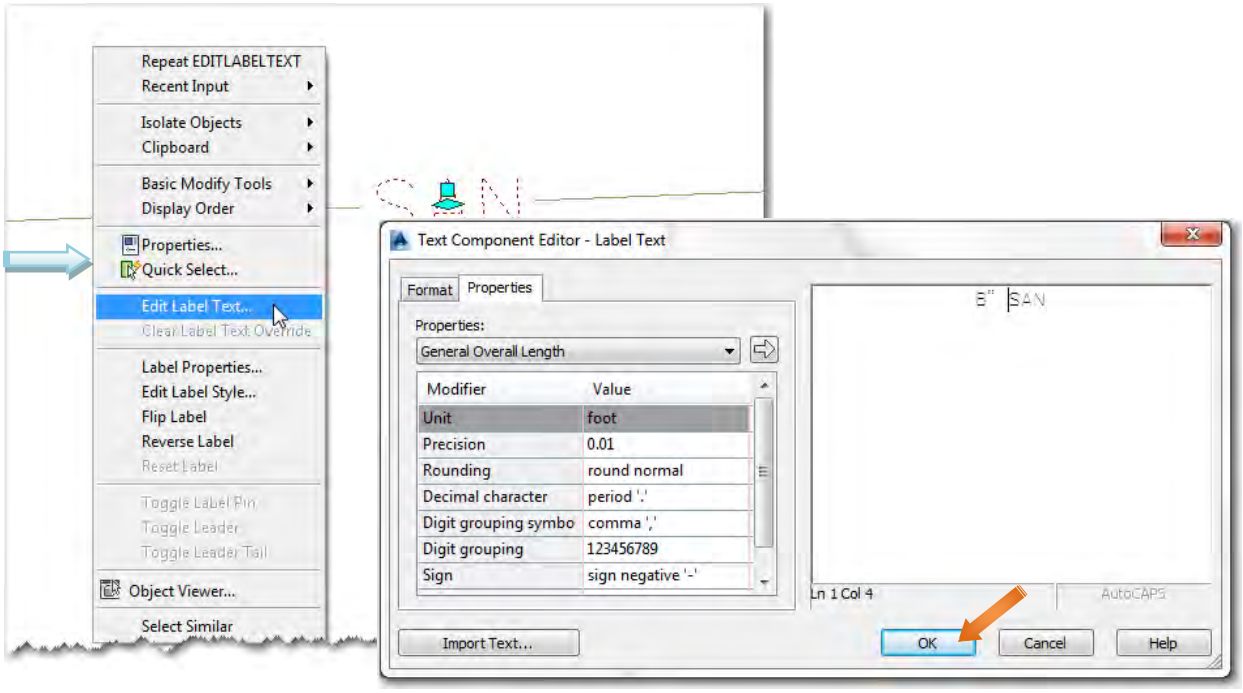
Civil 3D Labels

Overview - Section 13.2

It is typically necessary to edit Civil 3D Label text for Labels that have already been created.

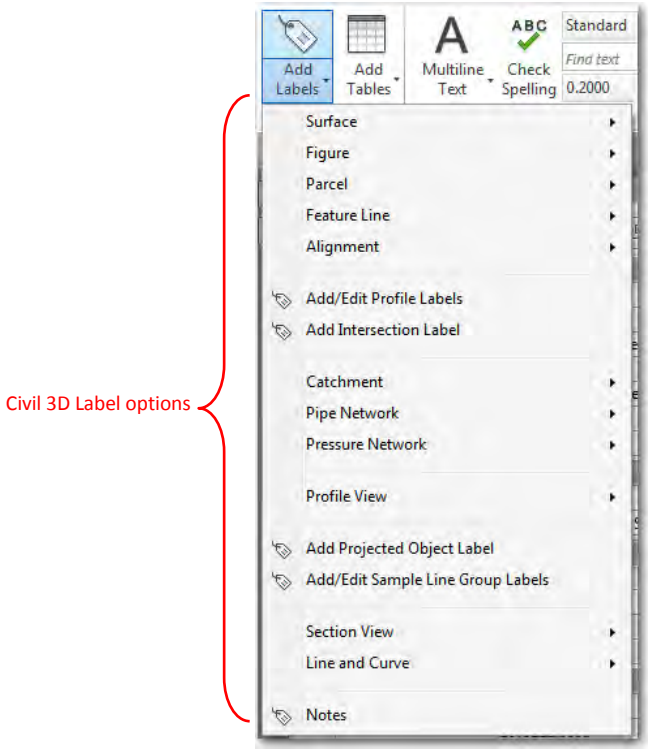
Editing Civil 3D Labels (Internal Only)

To edit a Civil 3D label, select the desired label, right-click, and select *Edit Label Text…* the *Text Component Editor* dialog box will appear. The text used in the C3D label appears in an editable text field on the right. By clicking in this text field the current label can be revised. Click <OK> when finished:



NOTE: Many label styles have more than one component. After selecting *Edit Label Text…* a pick-box will appear to select a specific component of the selected label.

Alternately, clicking the down arrow next to *Add Labels*, the user can choose the type of labels desired. Any feature in AutoCAD can be labeled using the Civil 3D labels, such as basic lines and curves, alignments, pipe networks, surfaces, etc.:



Section 14.0

Standard Symbols (Blocks)

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Overview - Section 14.0

Denver Water has developed a customized set of symbols and blocks that shall be used when doing work with or for DW. When developing Civil plans, most of the symbols have already been applied to Civil 3D styles contained within the applicable DW templates [see *Section 10.0 – Drawing Templates (DWTs)*].

Symbols have also been developed as basic AutoCAD blocks; internally these blocks can be accessed through the tool palette [see *Section 15.0 – Tool Palettes*].

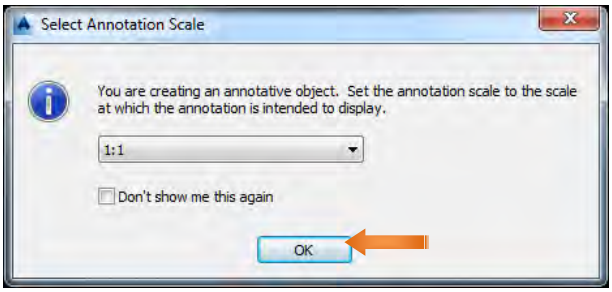
Key Points

When using DW's standard symbols and blocks it is important to keep the following key points in mind: *Annotative Scaling*, *Dynamic Grips*, *Wipeout*, and *Attributes*.

Annotative Scaling

Most blocks are intended to plot at the same size regardless of drawing scale. Blocks have been created to be annotative, which will automatically scale up or down based on the specified drawing/viewport scale. These blocks should not be scaled manually. An annotative feature can be easily recognized by the "scale" symbol  that appears when hovering over an object.

Click <OK> if the following pop-up appears when inserting a block:

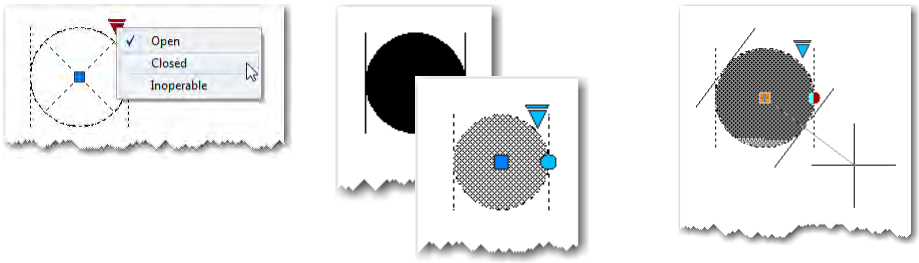


Dynamic Grips

Many blocks have dynamic properties that can be recognized by the additional grips. Use this table for descriptions of each Dynamic Grip and what they do:

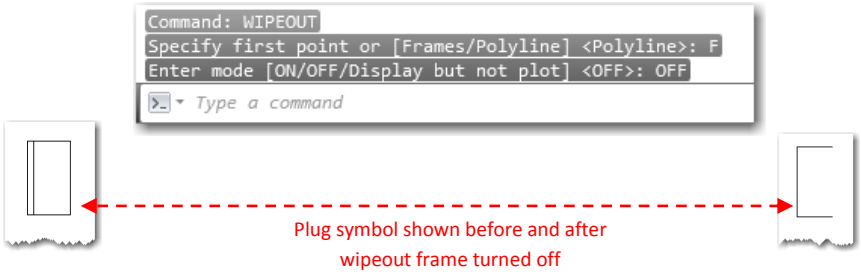
Grip Type		How the Grip Can Be Manipulated in a Drawing	Associated Parameters
Standard		Within a plane in any direction	Base, Point, Polar, and XY
Linear		Back and forth in a defined direction or along an axis	Linear
Rotation		Around an axis	Rotation
Flip		Click to flip the dynamic block reference	Flip
Alignment		Within a plane in any direction; when moved over an object, triggers the block reference to align with the object	Alignment
Lookup		Click to display a list of items	Visibility, Lookup

It is best to select the Visibility State before rotating or using other dynamic properties:



WIPEOUTS

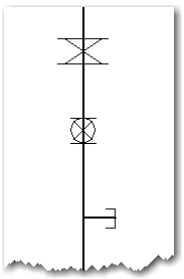
Several symbols and blocks contain wipeouts that will plot if the frames are not turned off:



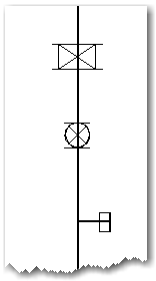
Plug symbol shown before and after wipeout frame turned off

Symbols and blocks with wipeouts must be placed on top of linework to be effective:

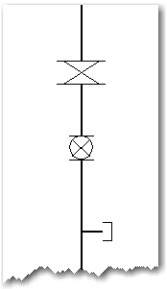
Wrong display order



Wipeout frames are still on

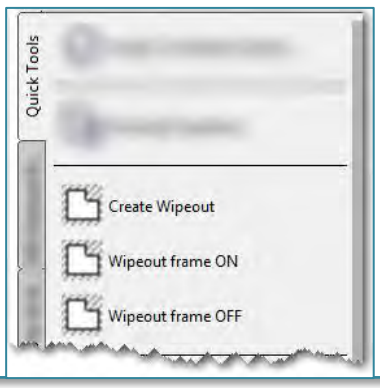


Wipeout frames are off and display order is correct



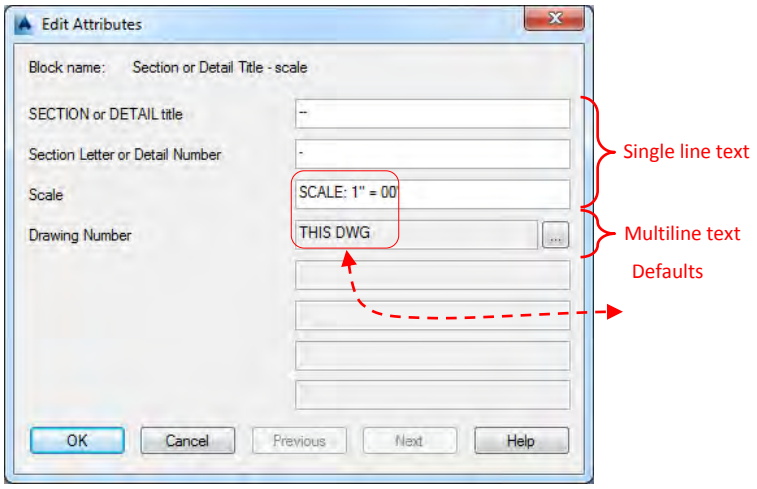
Tip: Tool Palette

Internally, quick access for turning wipeout frames on and off has been added to the *Quick Tools* tool palette:

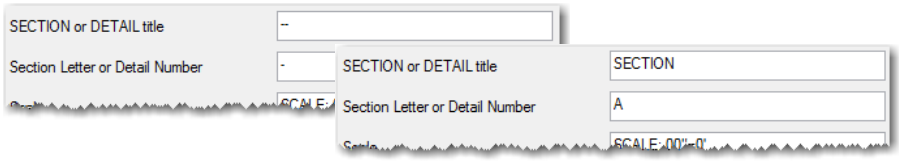


Attributes

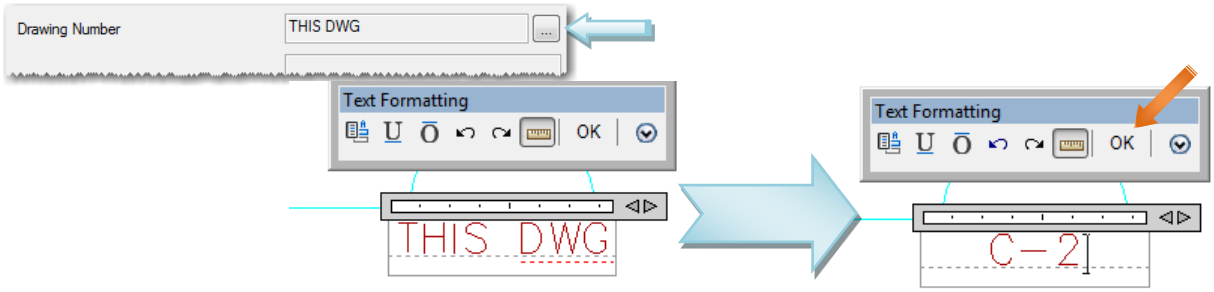
When a block contains attributes, a pop-up window will appear upon insertion, similar to the example shown below. Some of the values may contain defaults, be single line text, or may be multiline text:



To edit the single line text click in the open value field and begin typing; defaults (such as dashes) can be removed and/or modified as needed:



To edit multiline text, click the ellipsis button; the Edit Attributes window will close and a Text Formatting tool bar will appear in the drawing area, indicating the text can now be edited. Once the text has been edited click <OK>:



The Edit Attributes window will reappear, once all desired values have been completed click <OK>:

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Section 15.0

Tool Palettes

Table of Contents: Section 15.0

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Overview - Section 15.0

Internally, Tool Palettes have been created to reference commonly used tools, commands and DW's customized symbols and blocks. This section describes DW's *Palette Groups* and *Tool Palettes*, and the tools and functions found on each palette. See *Section 14.0 – Standard Symbology (Blocks)* for a full description of individual symbols and blocks

ATTENTION
DW's Tool Palettes are considered "live" and may be updated at any time.

DW's *Tool Palettes* have been subdivided into *Palette Groups*. These groups are based on scope of work and are intended to help the end-users quickly locate the tools needed for standardizing drawings and processes. The following list outlines DW's *Palette Groups* and the *Tool Palettes* contained within each:

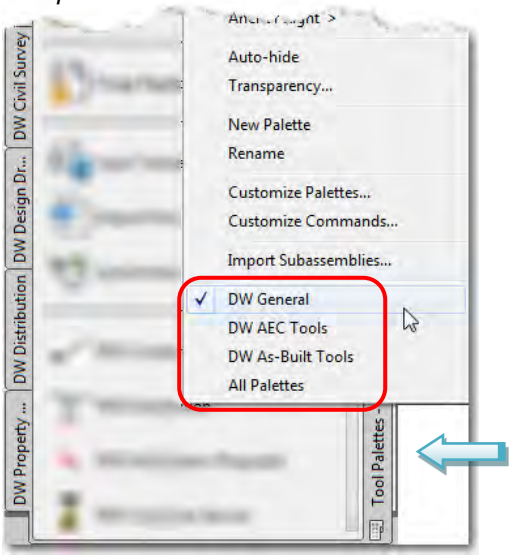
DW General
- Quick Tools
- DW General Drafting
- DW Notes & Stamps
- DW Civil
- DW Civil Survey
- DW Design Drafting
- DW Distribution
- DW Property Management

DW AEC Tools
- DW Architectural
- DW Electrical
- DW Electrical Switches
- DW Mechanical
- DW Structural

DW As-Built Tools
- CAD to ARG
- DIA - CAD to ARG

Tip: Info
Additional information, such as layers, may be found by hovering over a button located on a *Tool Palette*.

The Palette Groups can be accessed by right-clicking on the name bar of the *Tool Palette*; choose the desired *Palette Group* - the active *Palette Group* will have a check mark next to it:



NOTE: The additional *Palette Group* named *All Palettes* contains all of AutoCAD and C3D's "out of the box" *Tool Palettes*, in addition to DW's custom palettes.

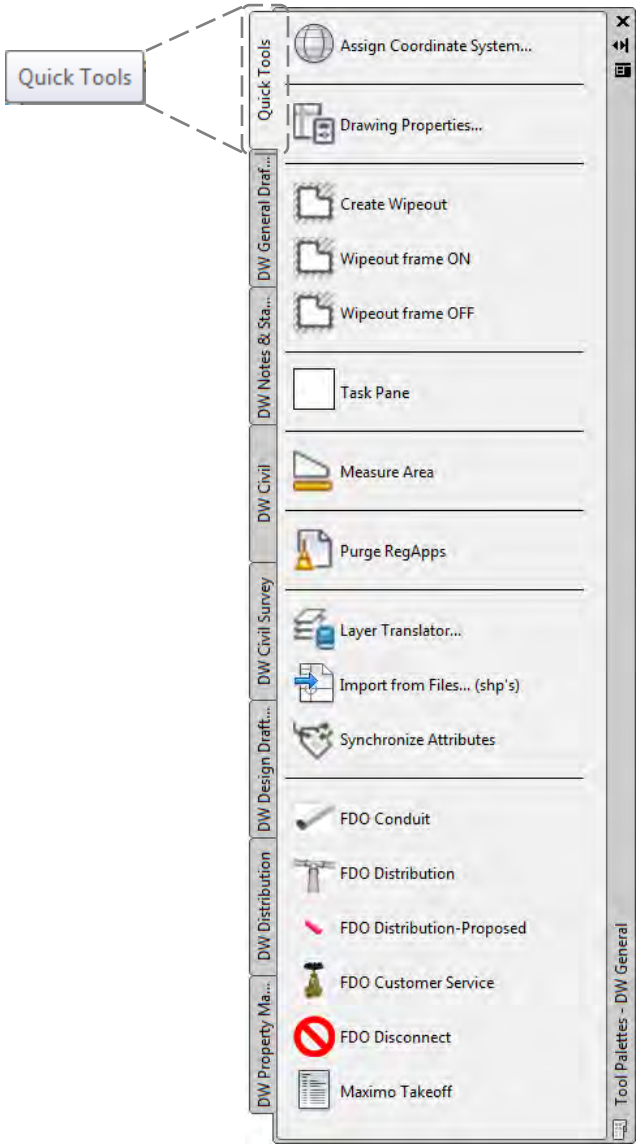
DW General Palette Group

The *DW General Palette Group* contains *Tool Palettes* intended for general use across the Engineering Division, Civil symbology and section specific palettes:

- Quick Tools
- DW General Drafting
- DW Notes & Stamps
- DW Civil
- DW Civil Survey
- DW Design Drafting
- DW Distribution
- DW Property Management

Quick Tools

The *Quick Tools Tool Palette* contains a series of commonly used commands and tools not directly related to plan output:



Accesses the coordinate system library to set the appropriate coordinate system.

Edits the drawing properties that auto populate.

Creates/edits the wipeout properties of text/objects.

Opens the Task Pane.

Measures a specified area.

Removed used Applications (for drawing cleanup).

Layer Translator translates layers from imported GIS data. *Import from Files…* used for importing shape files (.shp). *Synchronize Attributes* used for updating ARG block data to current Drawing Properties.

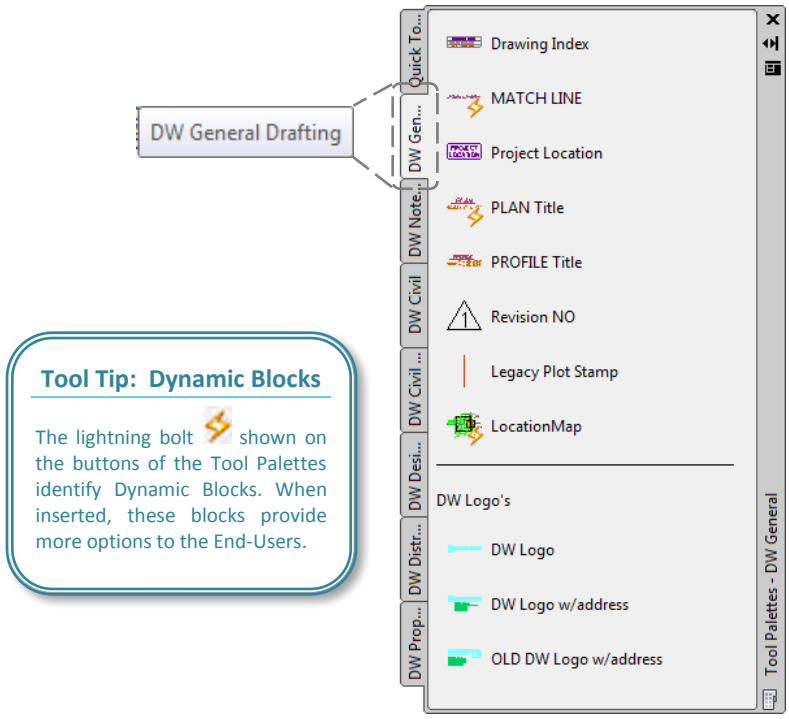
FDO Conduit, FDO Distribution, FDO Distribution-Proposed, etc. open GIS layers related to each.

FDO Disconnect disconnects from the SDE connection. It is necessary to disconnect when finished.

Maximo Takeoff exports inventory data to Maximo software for estimating costs.

DW General Drafting

The *DW General Drafting Tool Palette* houses symbols and blocks that are commonly found on plan sets. Most of the symbols and blocks found on this palette are not *Annotative* and are intended to be inserted in Paper Space on predetermined layers:

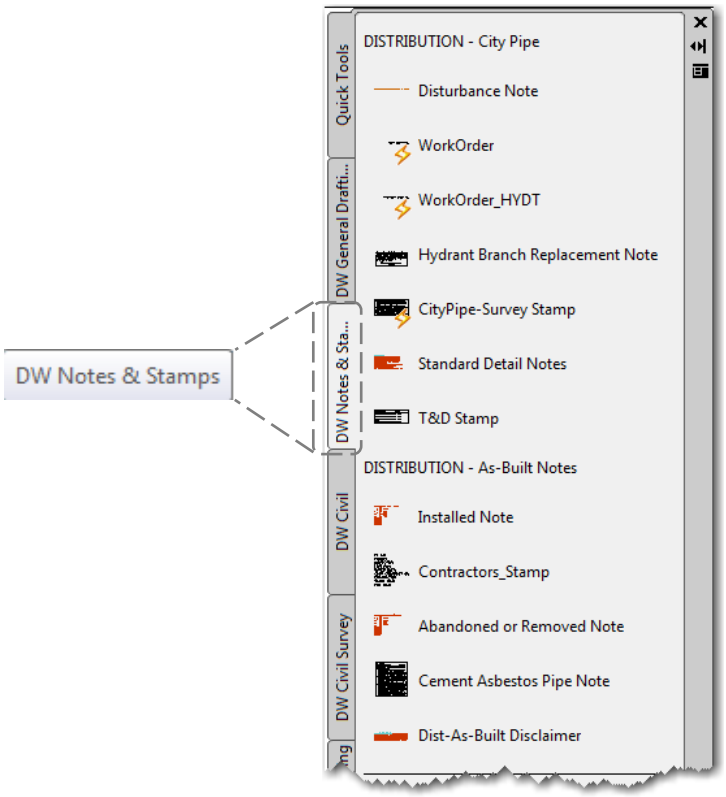


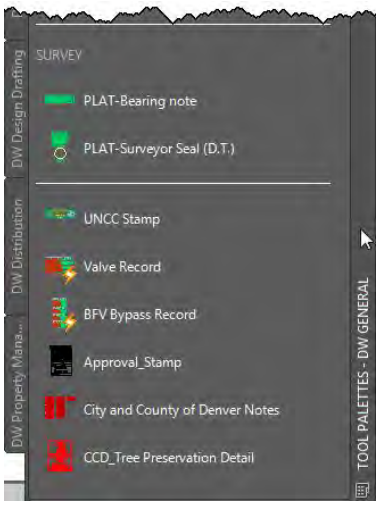
Tool Tip: Dynamic Blocks

The lightning bolt shown on the buttons of the Tool Palettes identify Dynamic Blocks. When inserted, these blocks provide more options to the End-Users.

DW Notes & Stamps

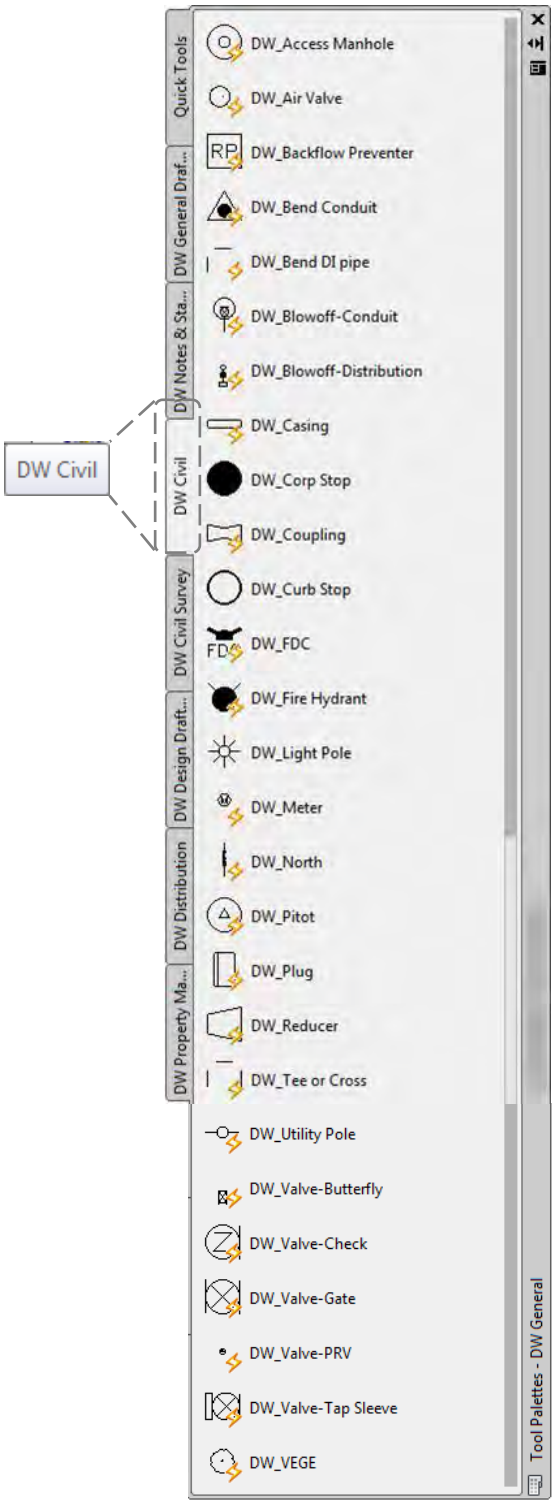
The *DW Notes & Stamps* Tool Palette houses commonly used notes/stamps found on many type of plan sets. This palette has been broken out by categories separated by a simple line:





DW Civil

The *DW Civil Tool Palette* contains DW's customized Civil symbols; these symbols are Annotative and are intended to be inserted in Model Space and shall be used within drawings created from DW's C3D template [see *Section 10.1 – DW-2016 C3D Template.dwt*]:



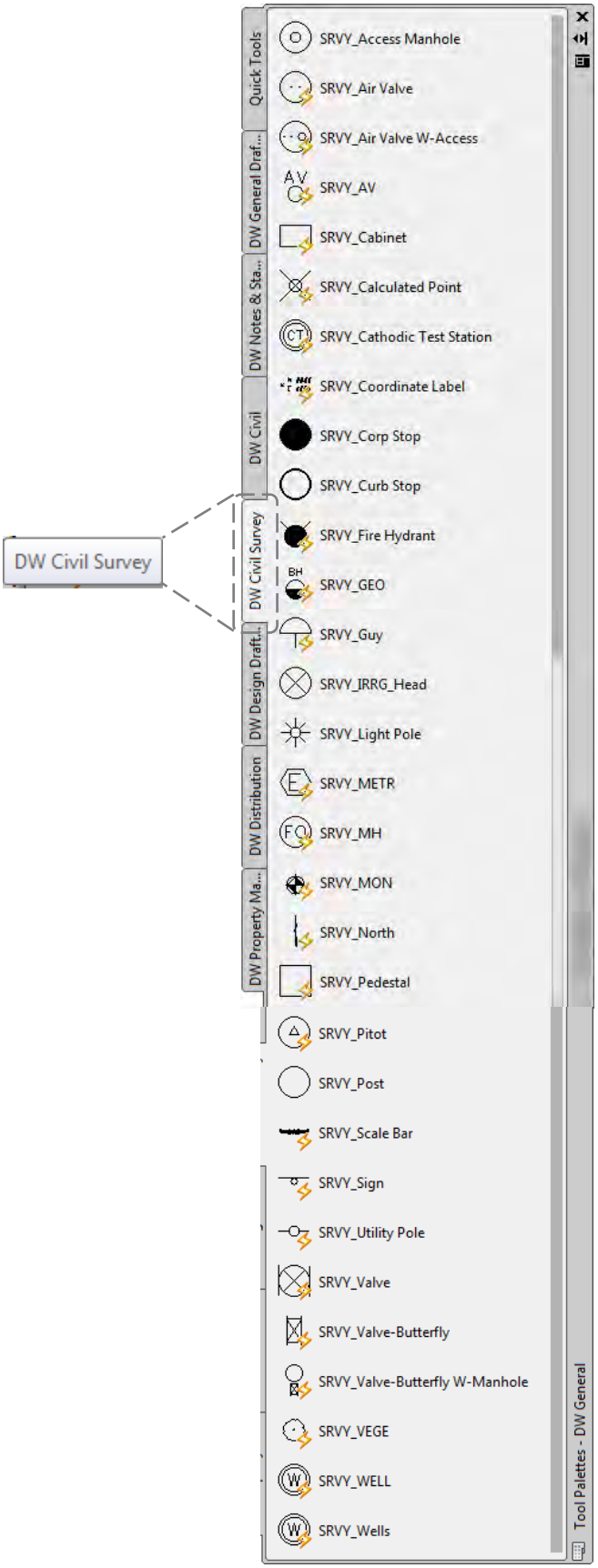
Tip: Info

Additional information, such as layers, may be found by hovering over a button located on a *Tool Palette*.

NOTE: Symbols on this palette are primarily water related, other Civil symbology can be found on the *DW Civil Survey Tool Palette*.

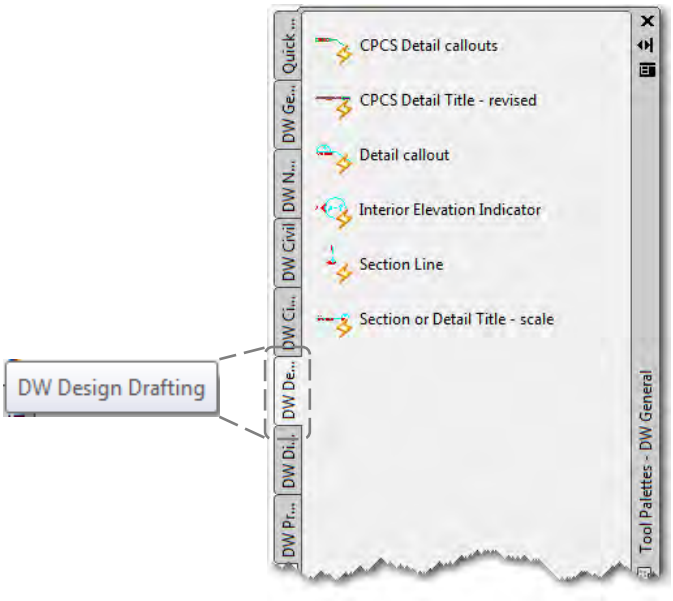
DW Civil Survey

The *DW Civil Survey Tool Palette* contains DW's customized Civil symbols used on Survey drawings; these symbols are Annotative and are intended to be inserted in Model Space and shall be used within drawings created from DW's C3D template [see *Section 10.1 – DW-2016 C3D Template.dwt*]:



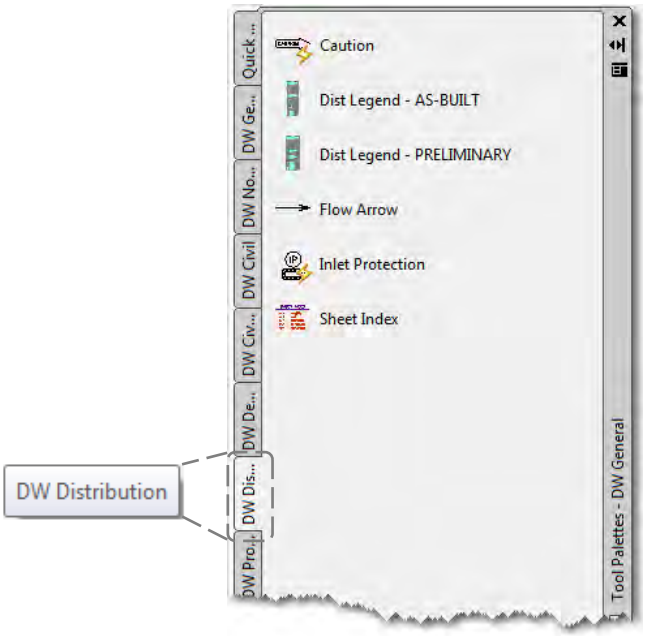
DW Design Drafting

The *DW Design Drafting Tool Palette* contains symbols typically used within DW's Design Drafting section, most blocks for used for standard callouts on Capital Projects:



DW Distribution

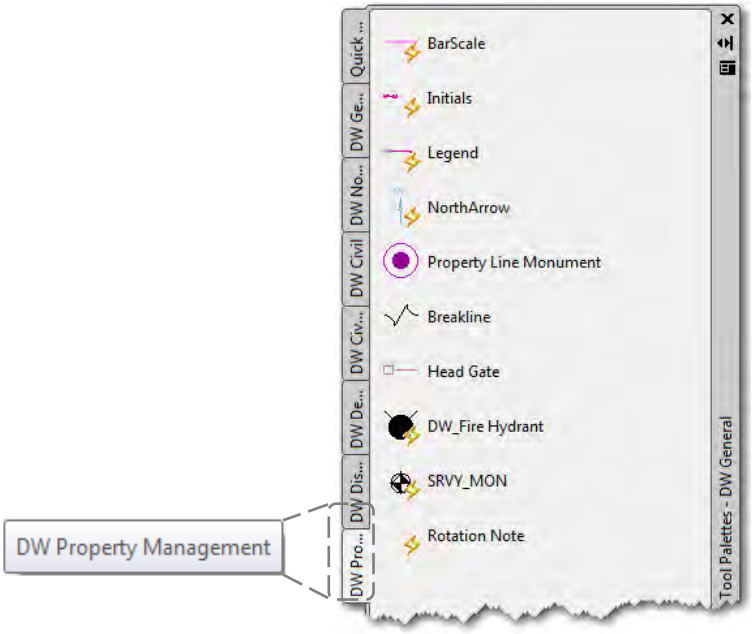
The *DW Distribution Tool Palette* contains symbols typically used within DW's Distribution section:



Also included is the *DW Erosion Control Palette* only accessible by DW's Distribution section:

DW Property Management

The *DW Property Management Tool Palette* contains custom blocks and symbols for use within the Property Management section:



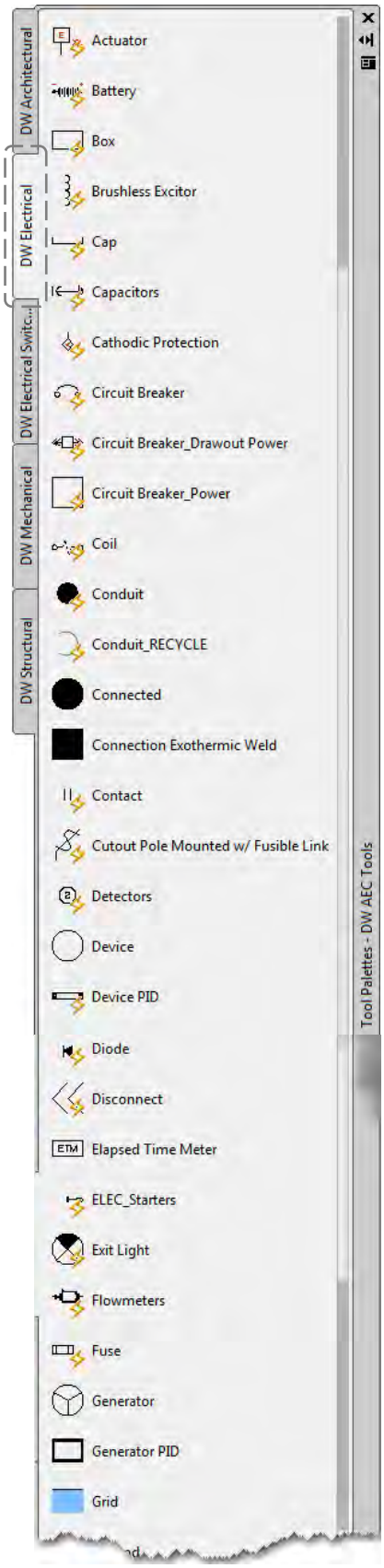
DW AEC Tools Palette Group

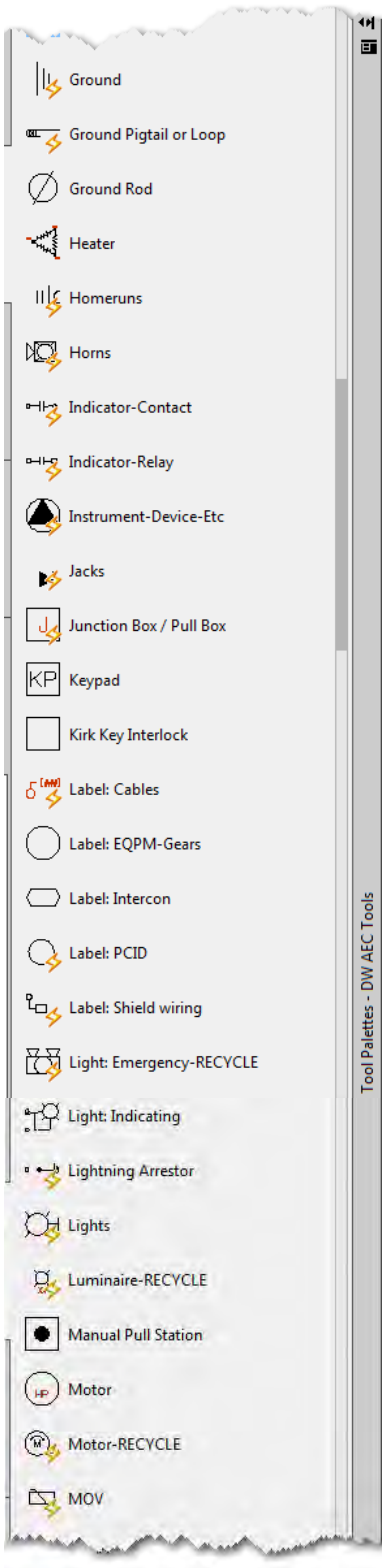
The *DW AEC Tools Palette Group* contains *Tool Palettes* intended for use with Architecturally based drawings (drawings created from the *DW-2016 AEC Template.dwt*). Many of these palettes are (nearly) empty and have been created to be placeholders for related symbols and blocks as they are added:

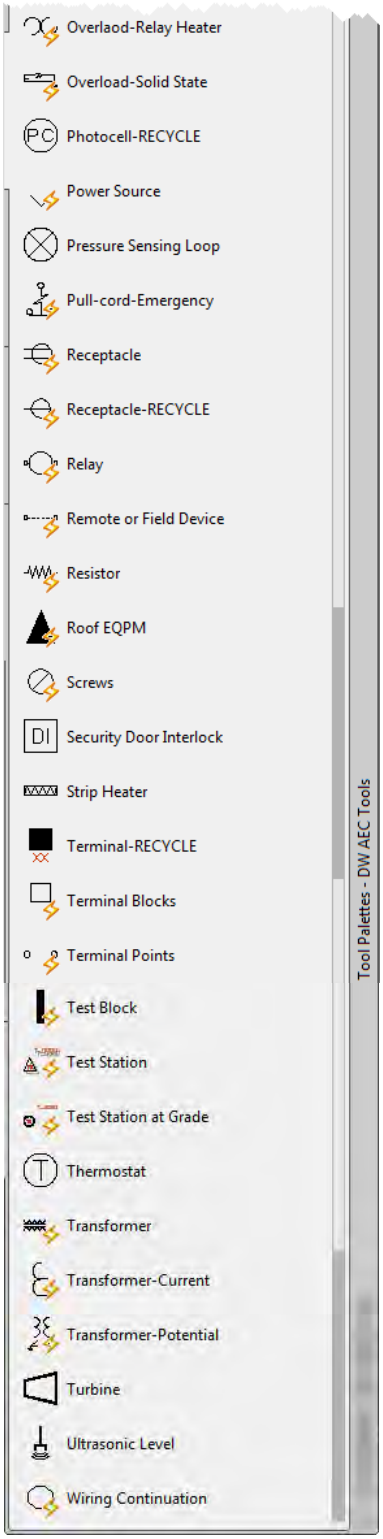
- DW Architectural (empty)
- DW Electrical
- DW Electrical Switches
- DW Mechanical
- DW Structural (empty)

DW Electrical

The *DW Electrical Tool Palette* contains customized Electrical symbols intended for use with Electrical drawings. These symbols are drawn in “inches”, are not Annotative, and are intended to be inserted in Model Space of drawings created from DW’s AEC template [see *Section 10.2 – DW-2016 AEC Template.dwt*]:

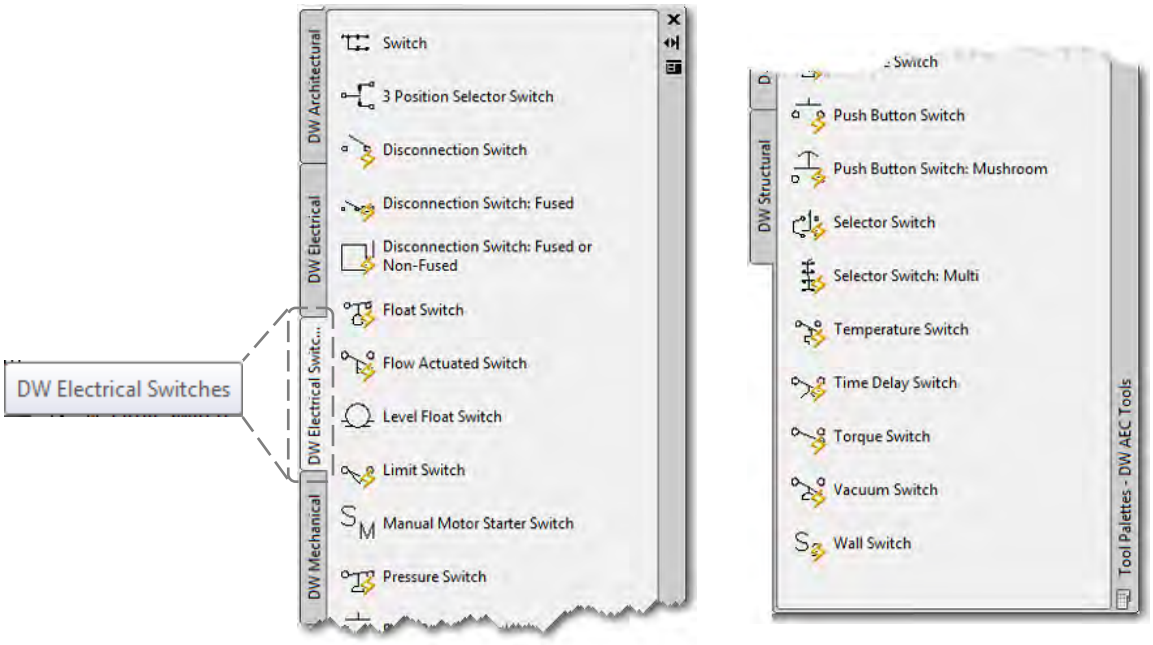






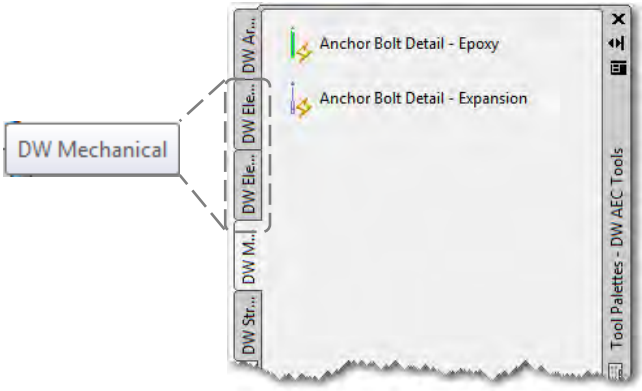
DW Electrical Switches

The *DW Electrical Switches Tool Palette* contains customized Electrical symbols intended for use with Electrical drawings. These symbols are drawn in "inches", are not Annotative, and are intended to be inserted in Model Space of drawings created from DW's AEC template [see *Section 10.2 – DW-2016 AEC Template.dwt*]:



DW Mechanical

The *DW Mechanical Tool Palette* contains customized Mechanical symbols intended for use with Mechanical drawings. These symbols are drawn in "inches", are not Annotative, and are intended to be inserted in Model Space of drawings created from DW's AEC template [see *Section 10.2 – DW-2016 AEC Template.dwt*]:



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Section 16.0

Plotting & Publishing

Table of Contents: Section 16.0

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Overview - Section 16.0

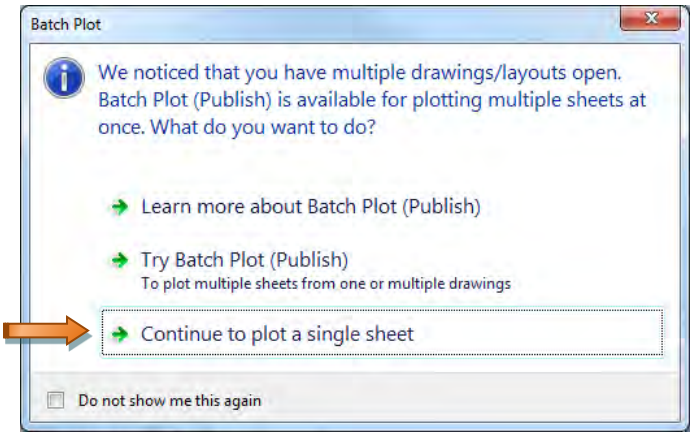
Plotting and Publishing is essential to standardized plan output for both electronic copies and hard copies. Plotting (PLOT) is the most common method used to print individual sheets and/or user specified areas directly from Model Space or Paper Space. Publishing (PUBLISH) is the best method for printing multiple sheets all at one time and is most commonly used for printing full sets associated with Sheet Set's [see *Section 7.0 – Sheet Set Manager*].

This section describes both methods of Plotting and Publishing.

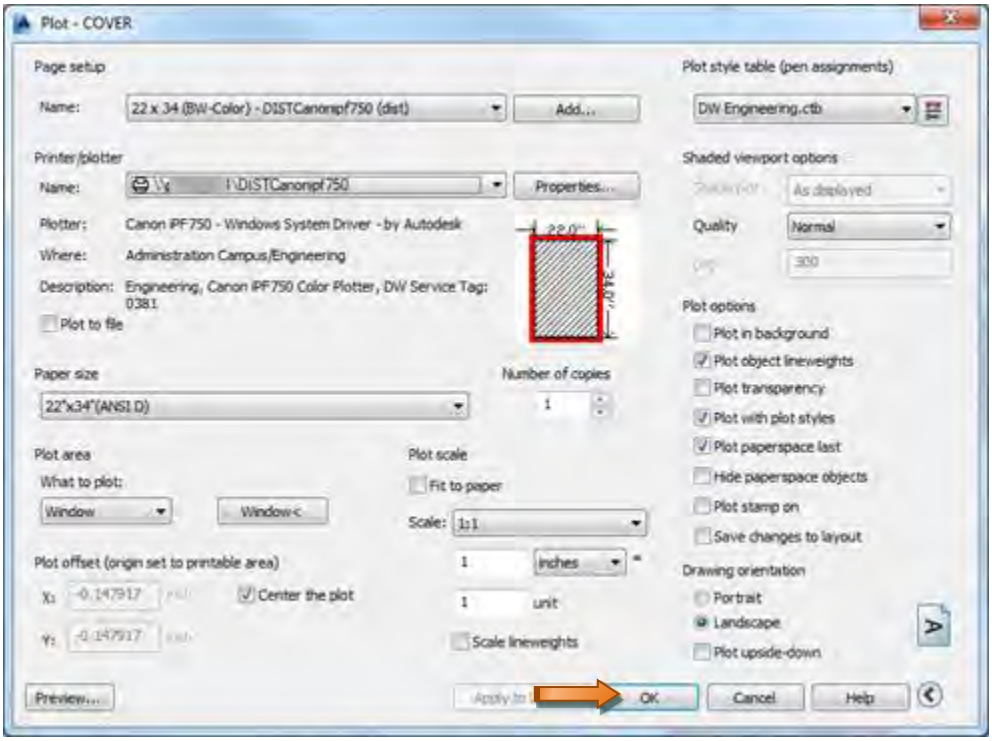
Plotting Single Sheets

The key component when plotting is the *Plot Dialog Box*; this dialog box allows the user to assign specific settings each time they plot or to apply those settings to a *Named Page Setup* for repetitive use [see *Section 16.2 – Named Page Setups*].

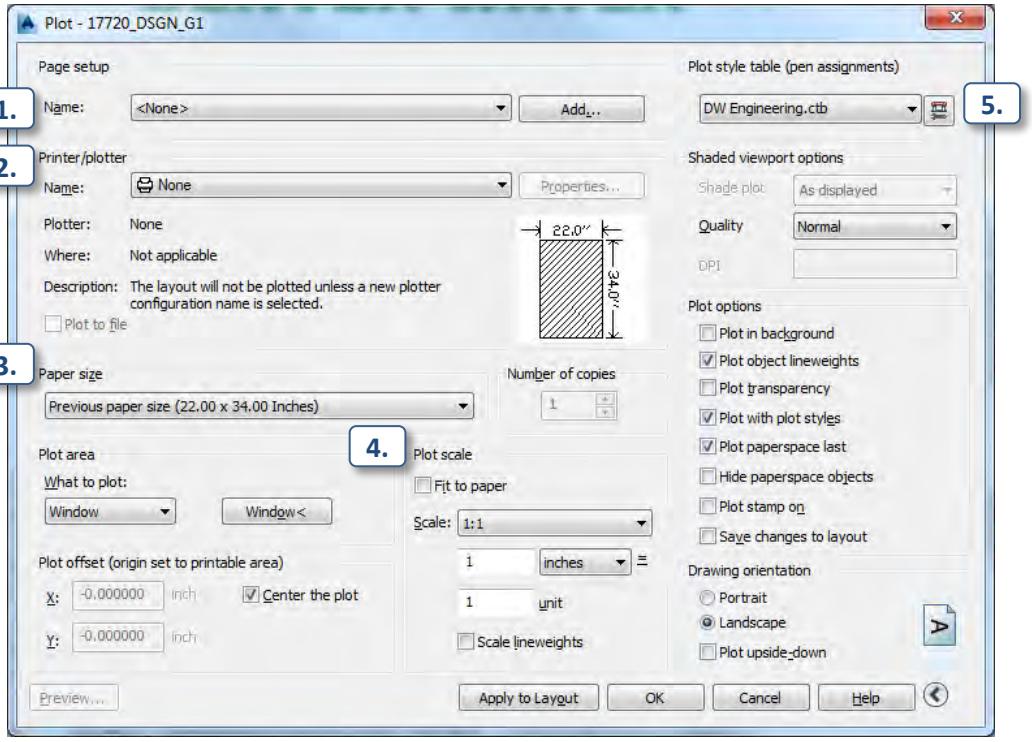
Plotting can be accomplished by typing PLOT at the Command Line prompt; select *Continue to plot a single sheet* in the *Batch Plot* pop-up window if it appears, otherwise continue to the next step:



Select the appropriate settings have been identified and selected click <OK> to print:



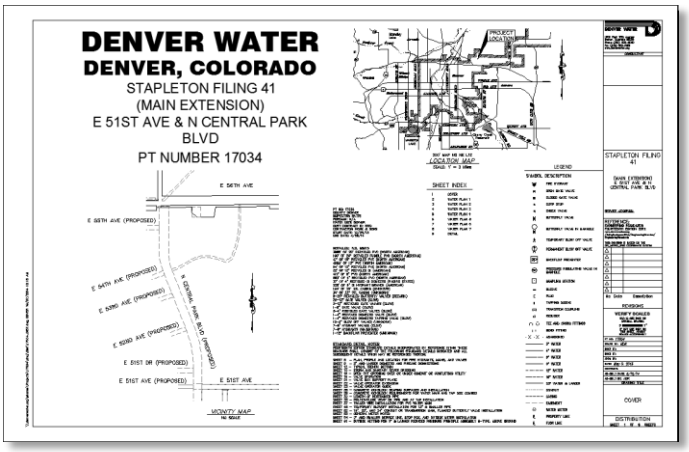
The example below shows the *Plot Dialog Box* and some of the settings typically used for plotting DW's drawings:



NOTE: Denver Water does not utilize AutoCAD's Plot Stamp settings; instead customized Plot Stamps have been embedded in most DW Title Blocks.

1. **Page Setup:** to speed up the plotting process, DW's templates contain predefined *Named Page Setups* [see *Section: 16.2 – Named Page Setups*]; pc3 files are not typically used for plotting
2. **Printer/plotter:** in lieu of .pc3 files, DW utilizes printers and plotters directly
3. **Paper size:** typical full sized sheets are 22 x 34, and half sized are 11 x 17
4. **Plot Scale:** full sized plots shall use 1:1 as the scale; half sized plots shall use 1:2 as the scale with the Scale lineweights checked
5. **Plot style table (pen assignments):** DW's current CAD Standards utilize CTB files for plotting, specifically the *DW Engineering.ctb* [see *16.1 – Plot Styles (CTBs)*]

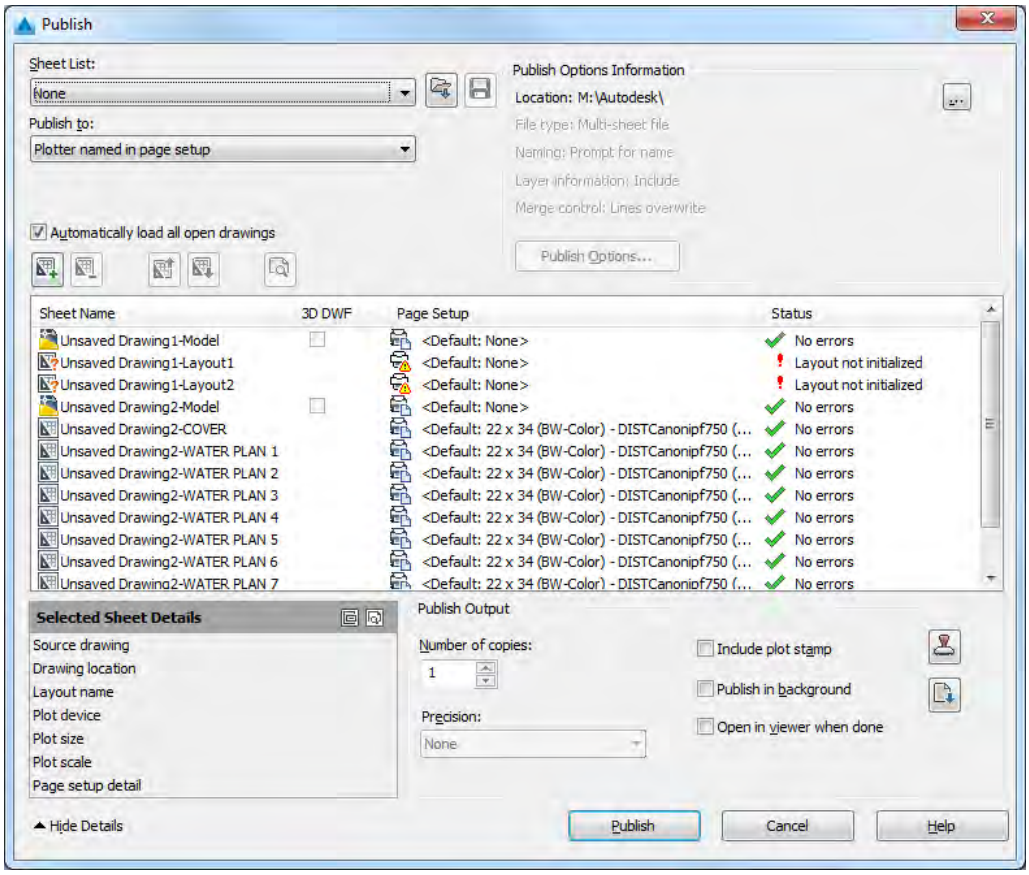
Additionally, the *Preview* (or type PRE) button can be used to verify plan output:



PUBLISHING

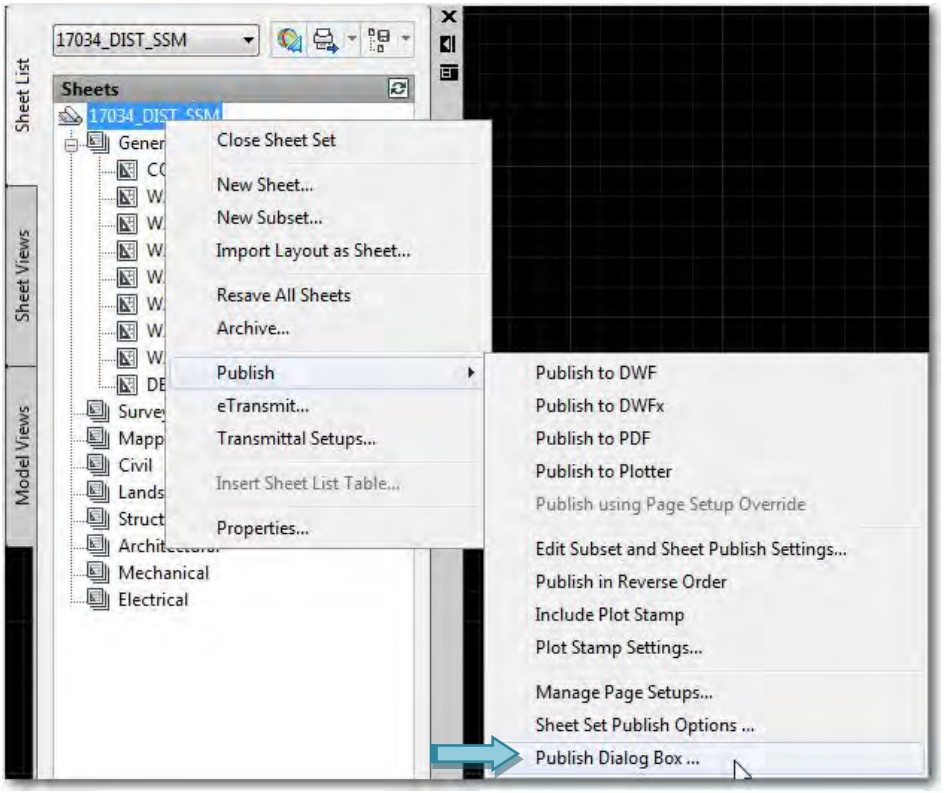
Publishing allows the user to plot individual sheets, multiple sheets and/or electronic plans all at once, this is also known as batch plotting. DW typically utilizes the **Publish** command in conjunction with Sheet Sets.

Type PUBLISH at the Command Line prompt, this will open the *Publish* dialog box:

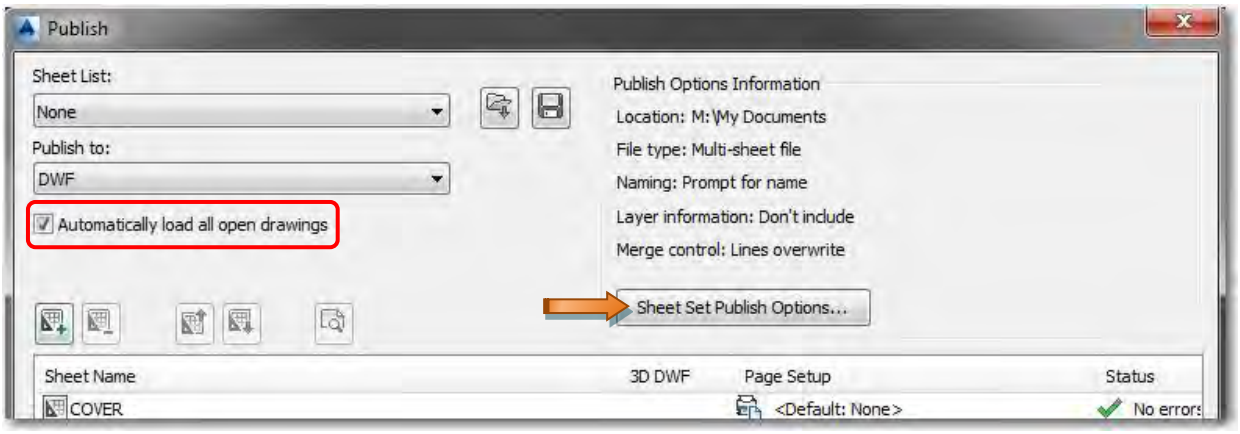


CREATING DWF'S OR PDF'S (WITH SHEET SETS)

In the SSM, right-click on the Sheet Set name, navigate to *Publish*, then select *Publish Dialog Box…*:

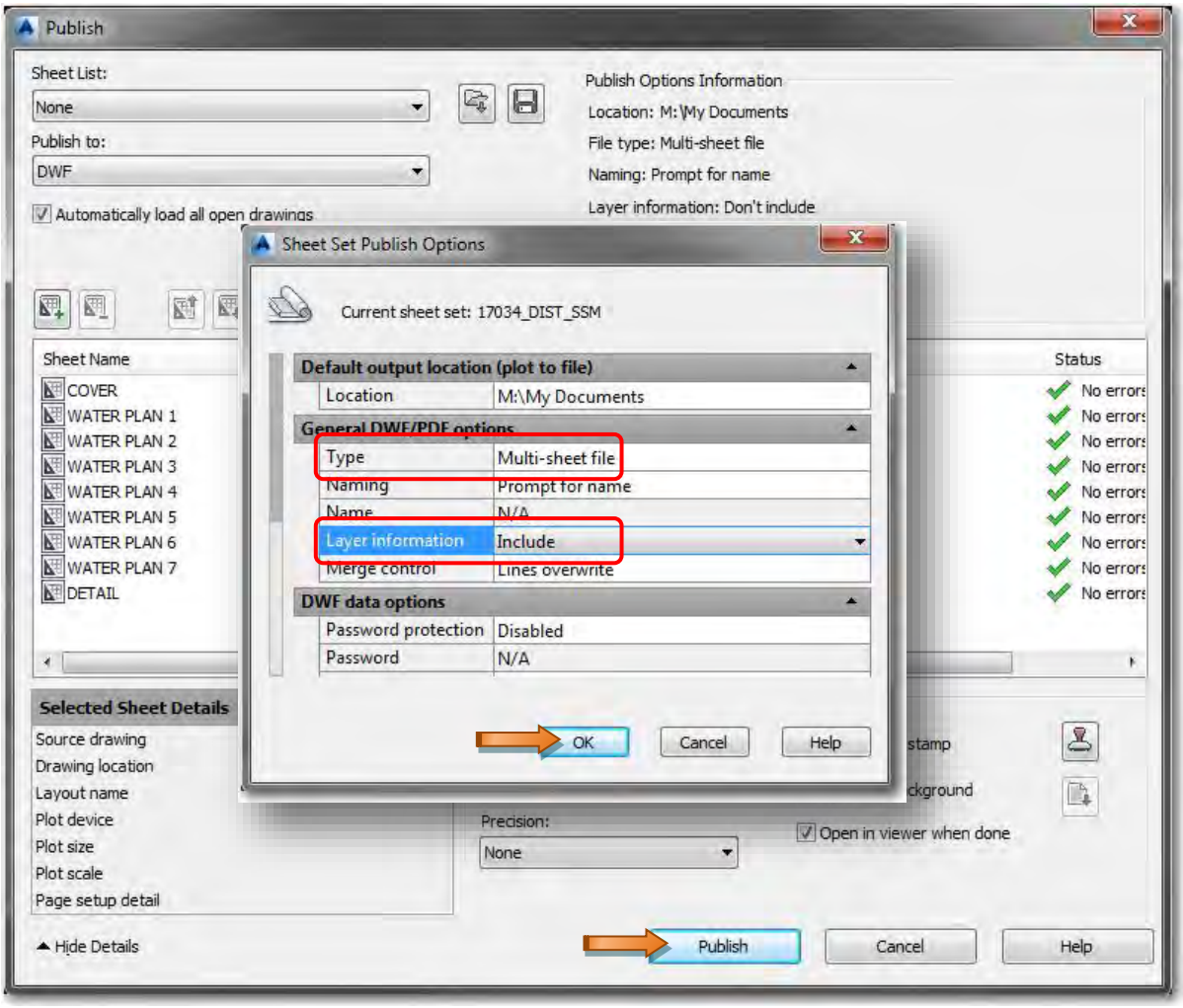


The *Publish* dialog box will then appear, in the **Publish to:** pull-down, choose *DWF* or *PDF* depending on the desired electronic plan output. In the **Publish Options Information** area, click the <Sheet Set Publish Options…> button:

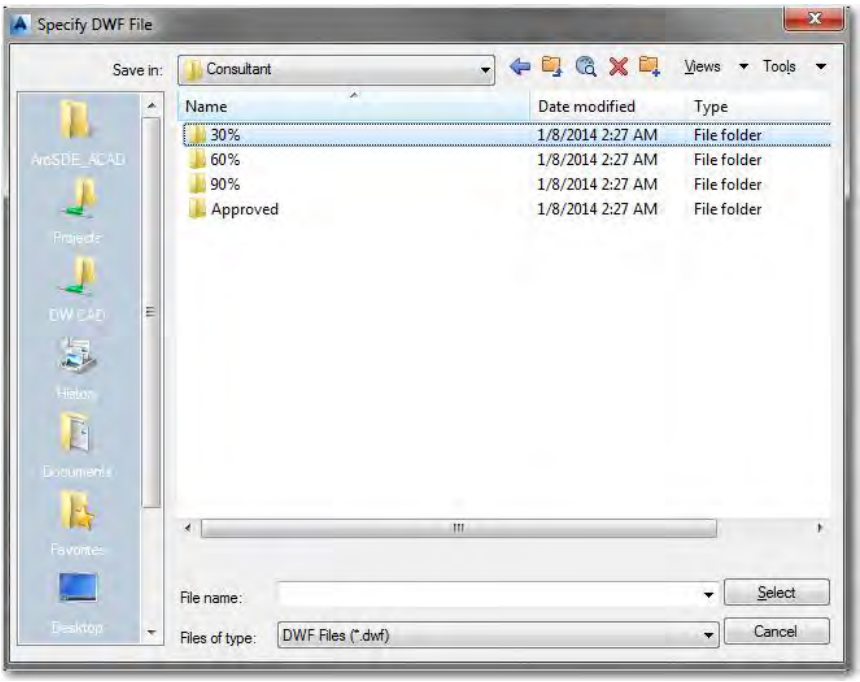


NOTE: By using the default page setup the plan set will plot to whatever settings are applied to the layout at the top of this list, alternately a name Page Setup may be picked.

The *Sheet Set Publish Options* pop-up will appear, be sure the **Type** is Multi-sheet file or Single Sheet and the **Layer** information is set to Include, and click <OK>. Then click <Publish> in the Publish dialog window:



The *Specify DWF (or PDF) File* pop-up will appear, navigate to the appropriate folder [see *Section 6.1 – File Management*]:



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Section 16.1

Plot Styles (CTBs)

Overview - Section 16.1

CTB's are customizable color tables used with AutoCAD. These tables allow specific lineweights to be applied to each color for desired plotting results (hard copy & electronic), including grayscale and color plotting.

Since the publication of the 2011 DW CAD Standards in August of 2011, the (.ctb) file was revised to cover a broader spectrum of lineweights. Historically, DW's title block colors have changed with each revision of the standard (.ctb) file used for plotting.

In the examples of this document, three different title block colors are described to help quickly identify which (.ctb) file to use when plotting.

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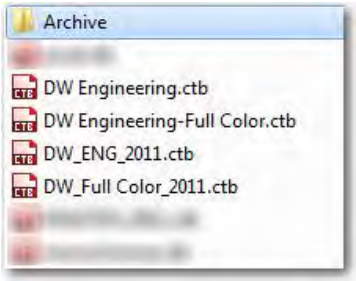
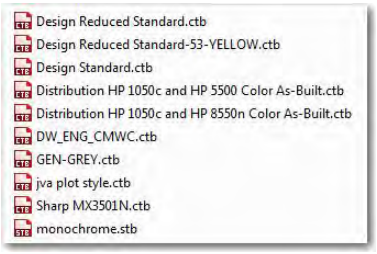
.ctb (AutoCAD Color-dependent Plot Style Table File)

Internally, the (.ctb) files used for plotting DW drawings are saved on the network (*…DW CAD\DW Plot Styles-CTBs*) Using the wrong (.ctb) could result in plots with unexpected lineweights, colors, plots and incorrect plan output. Following is a description of all commonly used (.ctb) files:

- **DW Engineering.ctb** – applied to all name page setups in DW's templates, used with all newly created drawings and/or drawings that have been migrated to the current CAD Standards. Typically indicated by a purple title block
- **DW Engineering-Full Color.ctb –** used when full color plots are desired, all linework plots in color and maintains pen settings defined in the *DW Engineering.ctb* file
- **DW Engineering-PMGT.ctb –** used for all Property Management related drawings
- **DW_ENG_2011.ctb –** used to plot drawings created between August 2011 and August 2013, typically indicated by a magenta title block
- **DW_Full Color_2011.ctb –** used to plot drawings created between August 2011 and August 2013 in full color, maintains pen settings defined in the *DW_ENG_2011.ctb*



All other (.ctb) files in the archive folder are used for plotting Legacy (Pre August 2011) or "outside" drawings; title block colors will vary.



Note: When selecting (.ctb) files for plotting, this list will contain contents of Archive folder- these are used on occasion for specialized plotting.

Title Block Examples

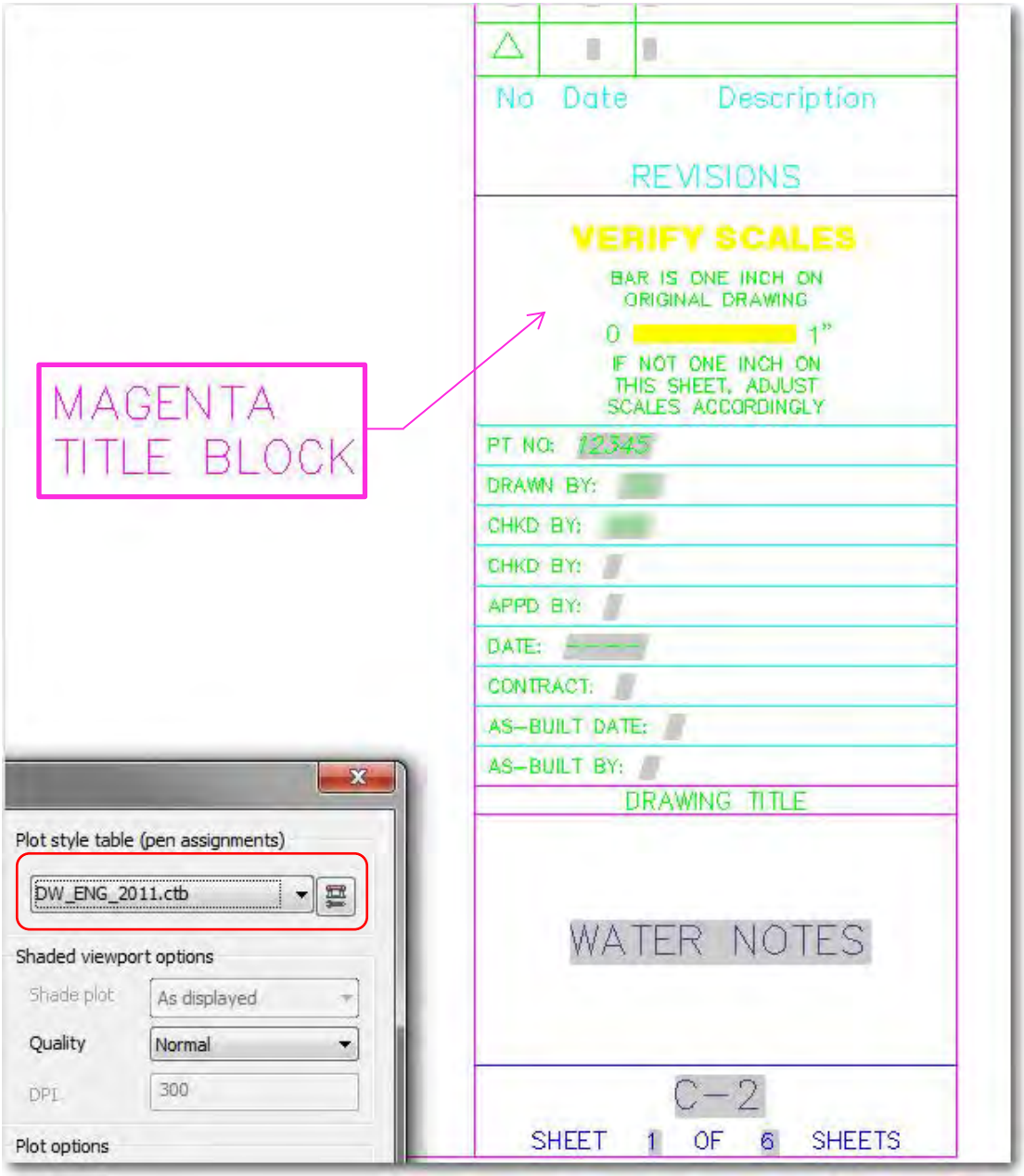
The following examples are intended to give a visual representation of DW's Title Blocks and which (.ctb) to use for the best plotting results.

Orange Title Blocks

Drawings with an orange Title Block indicate the files were created pre August 2011 and typically use the Design Standard.ctb for plotting full sized plans and the Design Reduced Standard.ctb for half sized (11 x 17) plans.

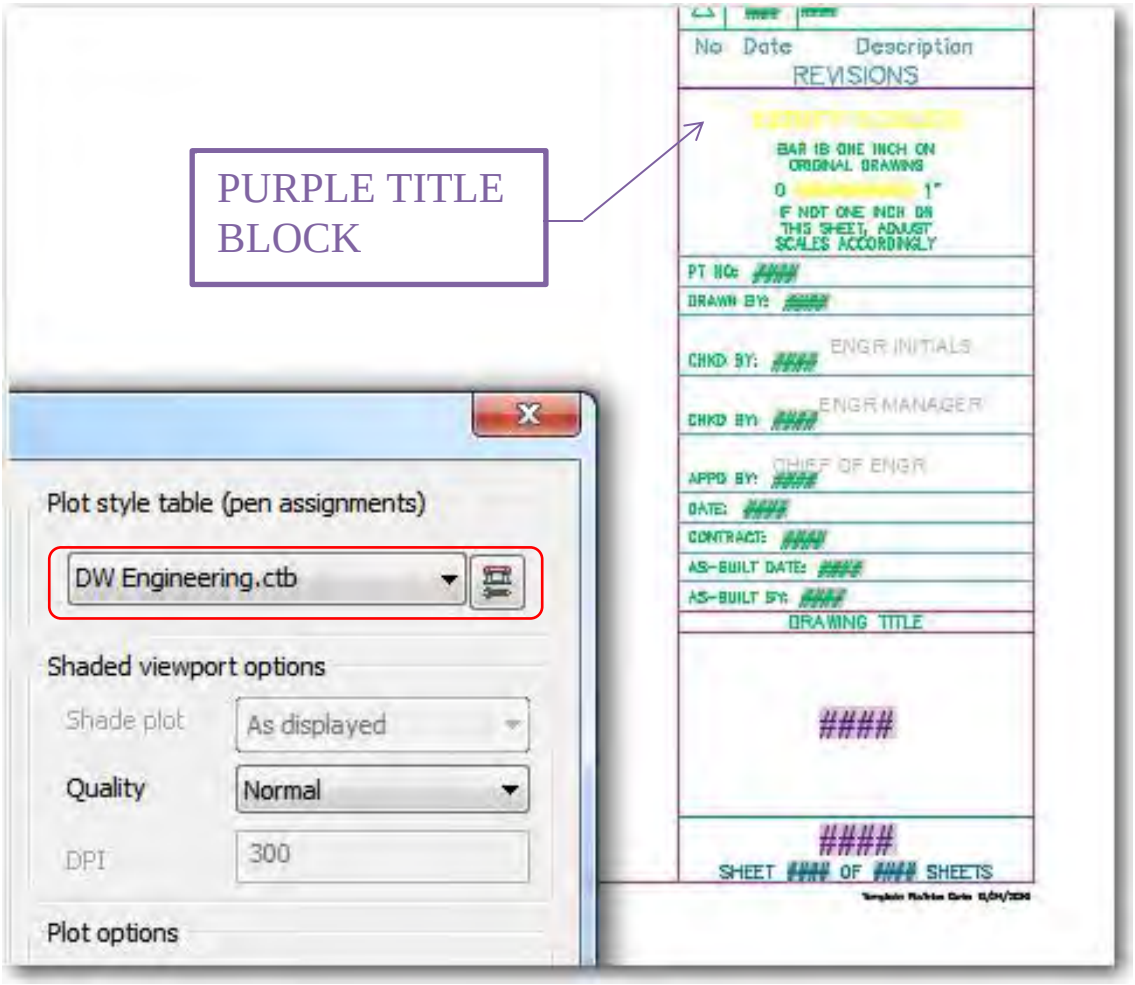
Magenta Title Blocks

Drawings with a magenta Title Block indicate the files were created using the 2011 DW CAD Standards. The DW_ENG_2011.ctb file should be used plotting for both full sized & half sized sets, with the appropriate Page Setups. [see *Section 16.2 – Named Page Setups*].



Purple Title Blocks

Drawings with a purple Title Block indicate the files were created post-August 2013 and use the current DW CAD Standards. The DW Engineering.ctb should be used for plotting both full sized and half sized sets, with the appropriate Page Setups. [see *Section 16.2 – Named Page Setups*].



Pen Line Weights

Use this table in correspondence with the Layer Color Chart, next page. The table represents how each pen assignment in the CTB file plots:

PLOTTED LINE WEIGHTS			
Pen Assignment	Line Width (in)	Plotted Line Width	50% Screened Line
Color 1	0.0050		
Color 2	0.0110		
Color 3	0.0177		
Color 4	0.0236		
Color 5	0.0290		
Color 6	0.0354		
Color 7	0.0417		
Color 8	0.0472		
Color 9	0.0530		

Layer Color Chart

All colors are assigned a Pen number based the ending number of the color. Colors ending in 0 plot in true color and are assigned a Pen 4 width. If the color is in a "screened" row, it will plot gray with the corresponding Pen width. The following chart mimics the provided **DW Engineering.ctb** (see Support Files - *Page 20.0-22*). The table represents how each color in the CTB file plots:

	Pen 1	Pen 2	Pen 3	Pen 4	Pen 5	Pen 6	Pen 7	Pen 8	Pen 9	COLOR PENS
LnWt. (in)	0.005	0.0110	0.0177	0.0236	0.0290	0.0354	0.0417	0.0472	0.0530	0.014
	1	2	3	4	5	6	7	8	9	10
	11	12	13	14	15	16	17	18	19	20
	21	22	23	24	25	26	27	28	29	30
	31	32	33	34	35	36	37	38	39	40
SCREENED	41	42	43	44	45	46	47	48	49	50
	51	52	53	54	55	56	57	58	59	60
	61	62	63	64	65	66	67	68	69	70
SCREENED	71	72	73	74	75	76	77	78	79	80
	81	82	83	84	85	86	87	88	89	90
	91	92	93	94	95	96	97	98	99	100
	101	102	103	104	105	106	107	108	109	110
	111	112	113	114	115	116	117	118	119	120
	121	122	123	124	125	126	127	128	129	130
	131	132	133	134	135	136	137	138	139	140
	141	142	143	144	145	146	147	148	149	150
SCREENED	151	152	153	154	155	156	157	158	159	160
	161	162	163	164	165	166	167	168	169	170
	171	172	173	174	175	176	177	178	179	180
SCREENED	181	182	183	184	185	186	187	188	189	190
	191	192	193	194	195	196	197	198	199	200
	201	202	203	204	205	206	207	208	209	210
	211	212	213	214	215	216	217	218	219	220
	221	222	223	224	225	226	227	228	229	230
SCREENED	231	232	233	234	235	236	237	238	239	240
	241	242	243	244	245	246	247	248	249	250
SCREENED	251	252	253	254	255					

Section 16.2

Named Page Setups

Overview - Section 16.2

DW uses Named Page Setups that include the paper size, plotter names and other plot settings. These page setups have been predefined and applied to the layouts in DW's templates, which are maintained to reflect plotting with current DW CAD Standards and plotters. Plot settings held within the Page Setups include plotters, (.ctb) files, paper sizes, scale, and sheet orientation.

Named Page Setups may need to be adjusted or reimported from templates when plot settings change or are no longer needed in project drawings. *Named Page Setups* are important for Publishing with Sheet Sets properly.

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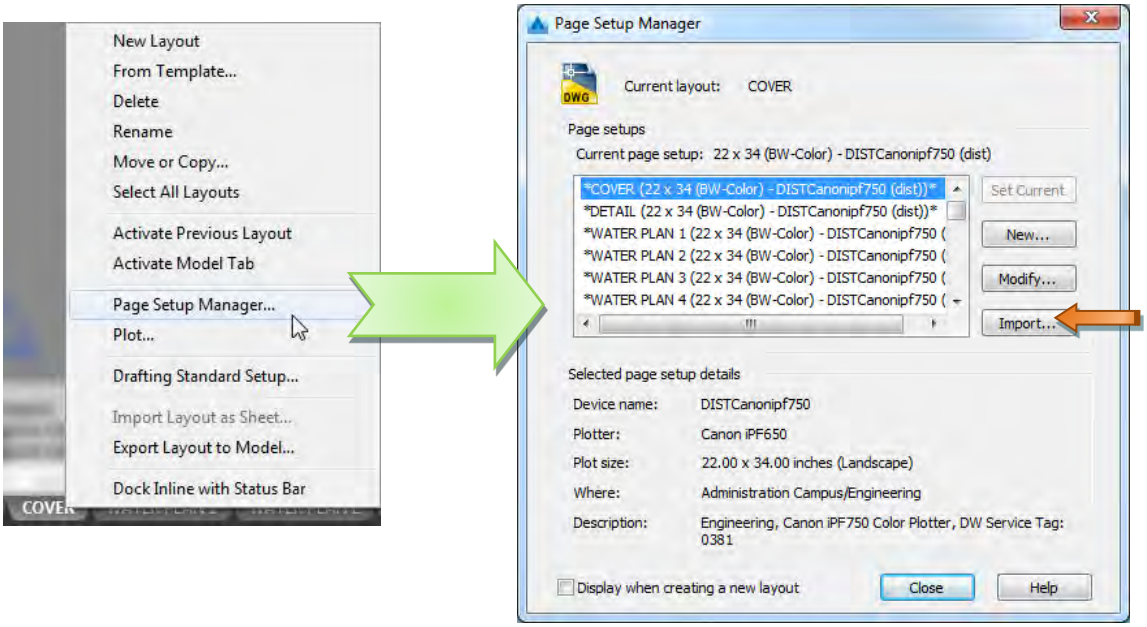
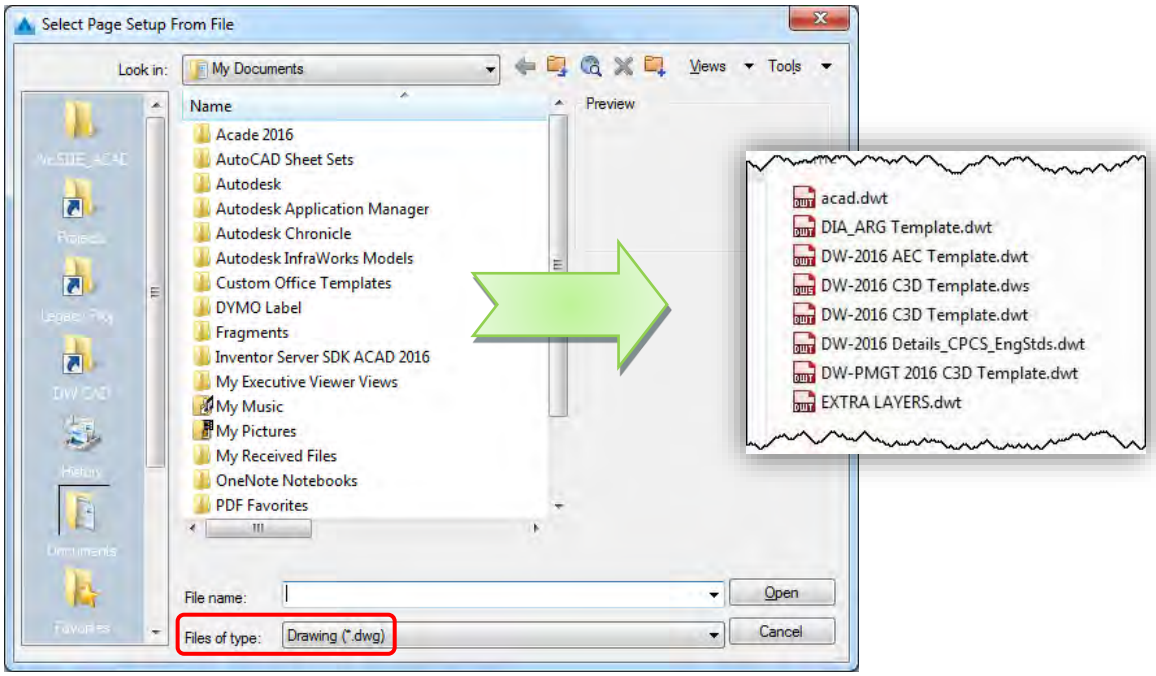
Importing from Templates

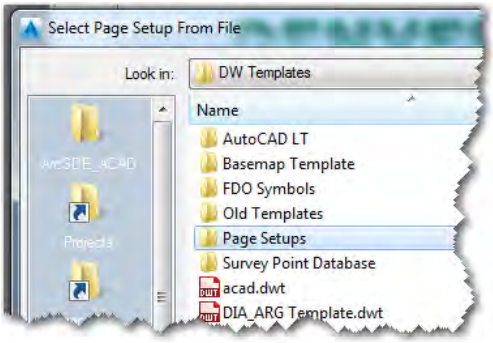
To update a *Named Page Setup*, right-click on the desired layout tab and select Page Setup Manager…. The Page Setup Manager pop-up window will appear listing all the current drawings page setups (these may vary from drawing to drawing) click <Import…>:



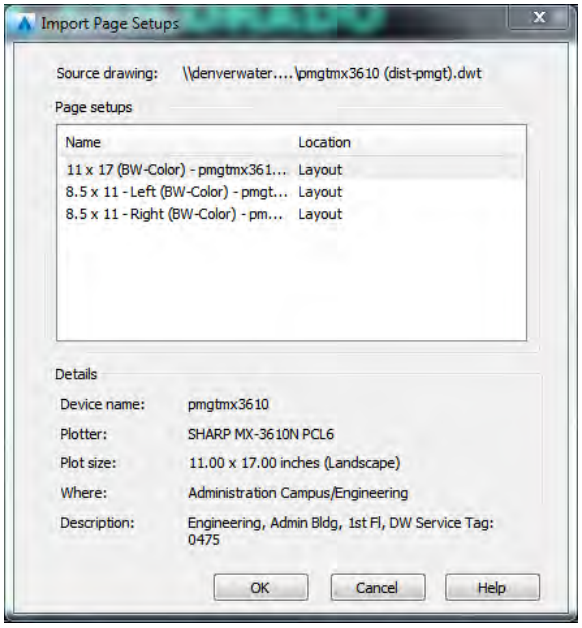
The *Select Page Setup From File* pop-up window will appear, set the **Files of type** to *Template (*.dwt) – DW's templates should now be listed*:



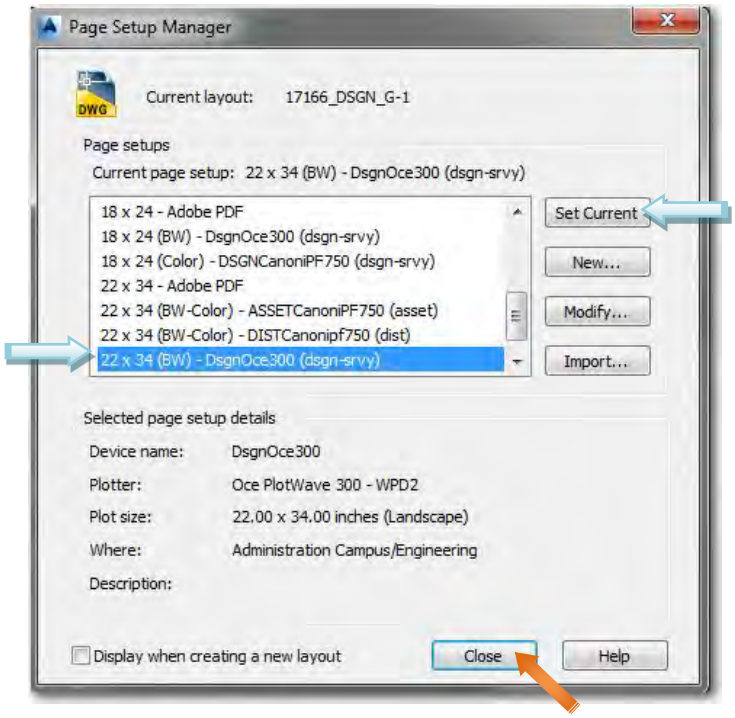
Choose the **Page Setups** folder in the *Select Page Setup Form File* pop-up window:



The *Import Page Setups* pop-up will appear listing the selected templates' *Named Page Setups*:



To apply the new setup to the current layout, select it in the *Named Page Setups* list and click <Set Current> and then <Close> once finished.



Tip: Standard Page Setup

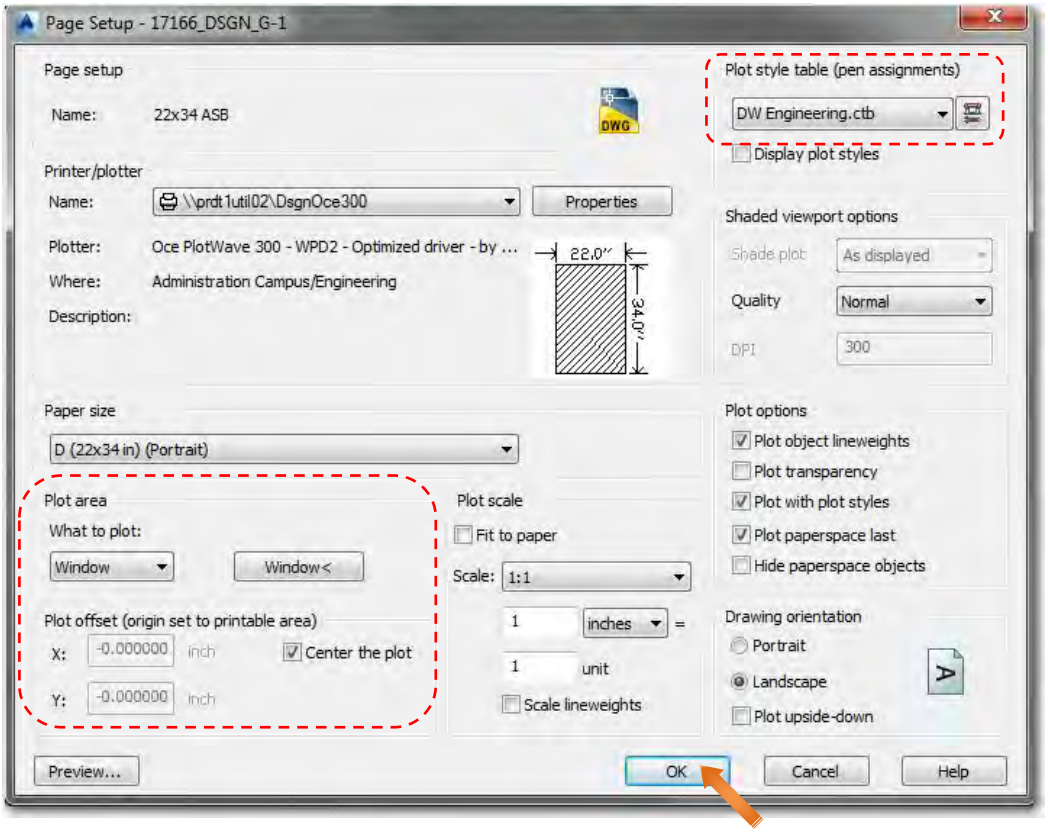
Page setups imported from current template may need to be revised when plotting older drawings.

Tip: Standard Page Setup

NOTE: Named Page Setups also may be imported from .dwg files. This can be useful for updating multiple project drawings when old "non-standard" plot settings need to be used.

MODIFYING PAGE SETUPS

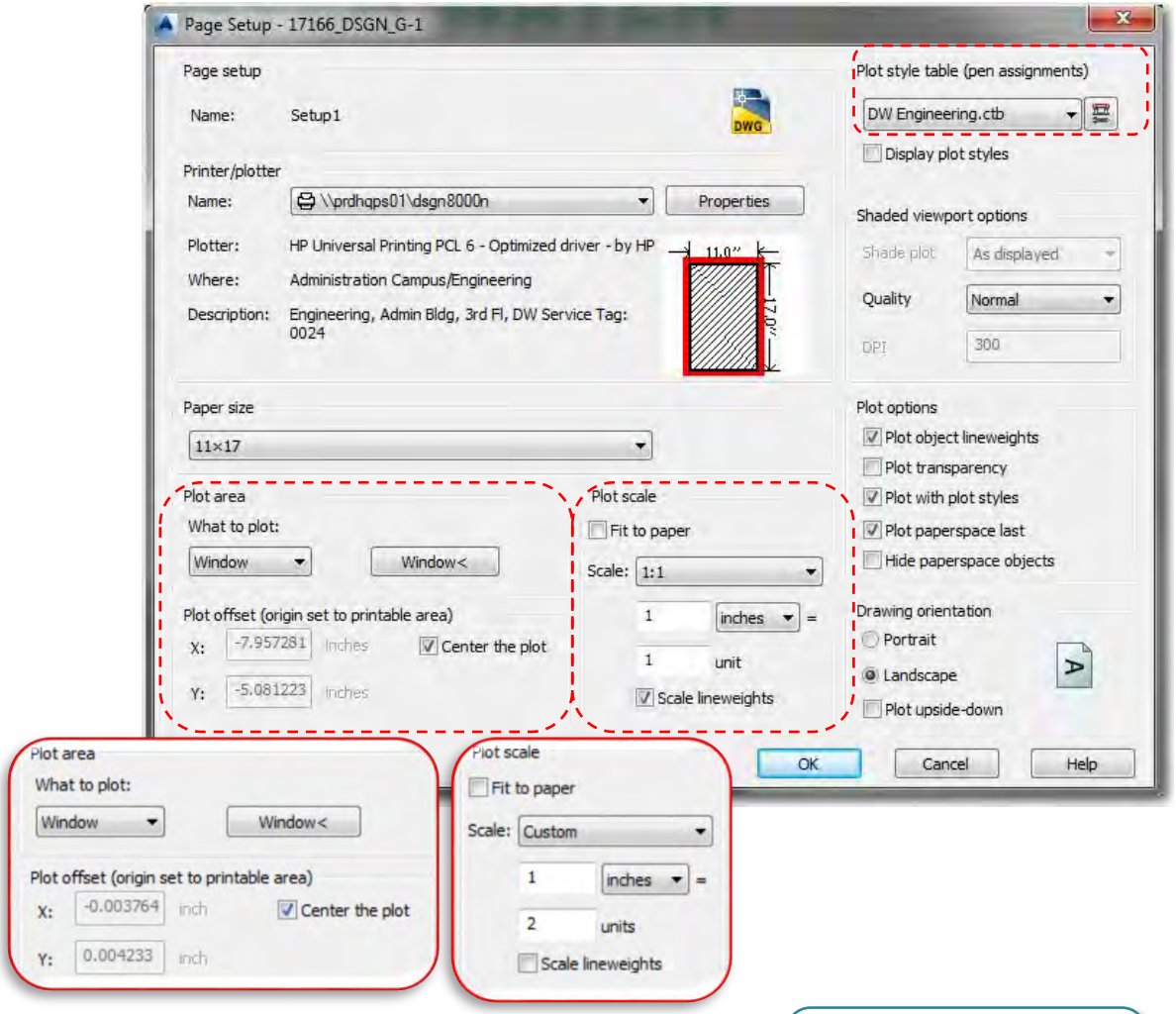
In some cases, Page Setups may need to be adjusted so that the plan output is reflective of the CAD Standards used with the creation of the project usually indicated by the color of the Title Block. Click <OK> when finished [see *Section 16.0 – Plotting & Publishing*].



The most common modifications to imported page setups are:

Ctb file- [see *Section 16.0 – Plotting & Publishing*].

1. *Plot Area*- typically this should be set properly, however title blocks could have been moved, resulting in necessary adjustments.
2. *Plot Scale*- Always 1”=1’ for full sized plots- Half sized should always be 1’=2’.

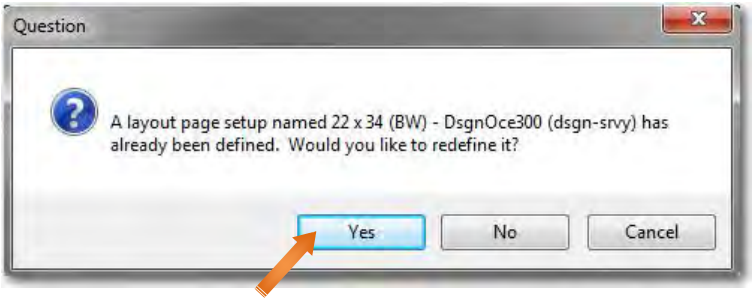


Tip: Preview

When modifying Page Setups, it is always good to preview the plot.

ERRORS AND TROUBLESHOOTING

This “Question” error will appear when importing a named Page Setup with the sample name already contained within the drawing- click yes to redefine and update:



Section 16.3

Publishing with Sheet Set Manager

Overview - Section 16.3

This Section describes how to use the PUBLISH command in conjunction with Sheets Set, use primarily for batch plotting.

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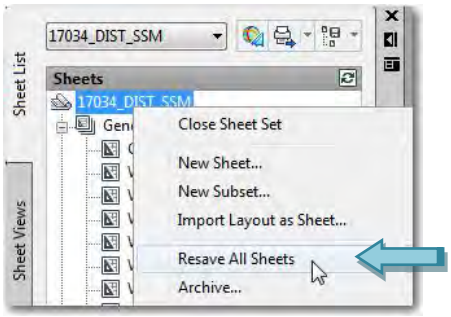
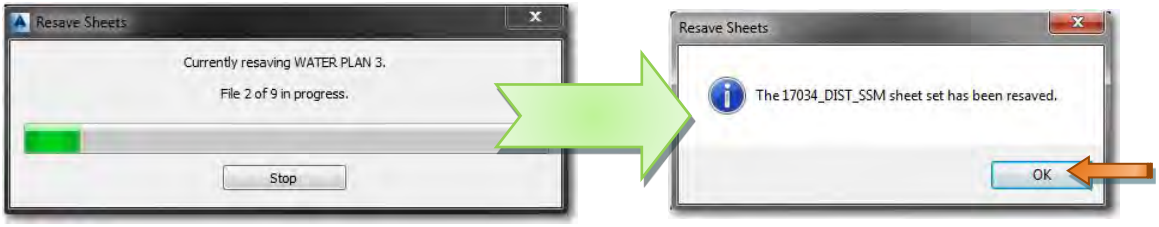
Publishing with Sheet Sets

Sheet Sets allows for the plotting of single or multiple sheets to plotters, PDF's, and DWF's. Please note that at least one drawing from the desired Sheet Set must be open for plotting and publishing [see *Section 7.0 – Sheet Set Manager*]:

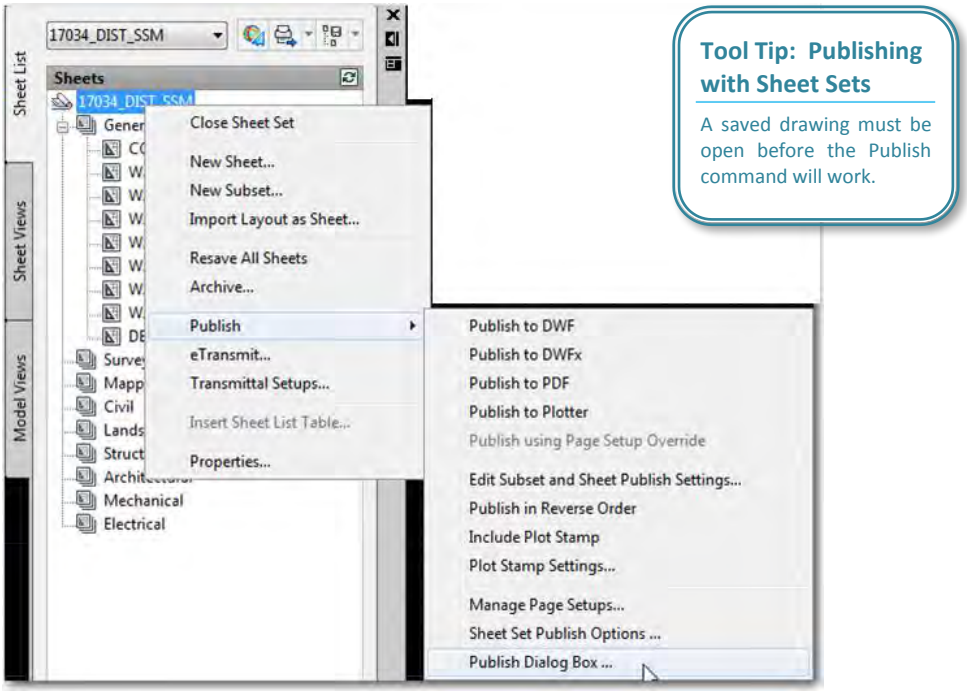
Sheets in the SSM must be synced first in order to be recognized. To do this, right-click on the Sheet Set name and select *Resave All Sheets*:



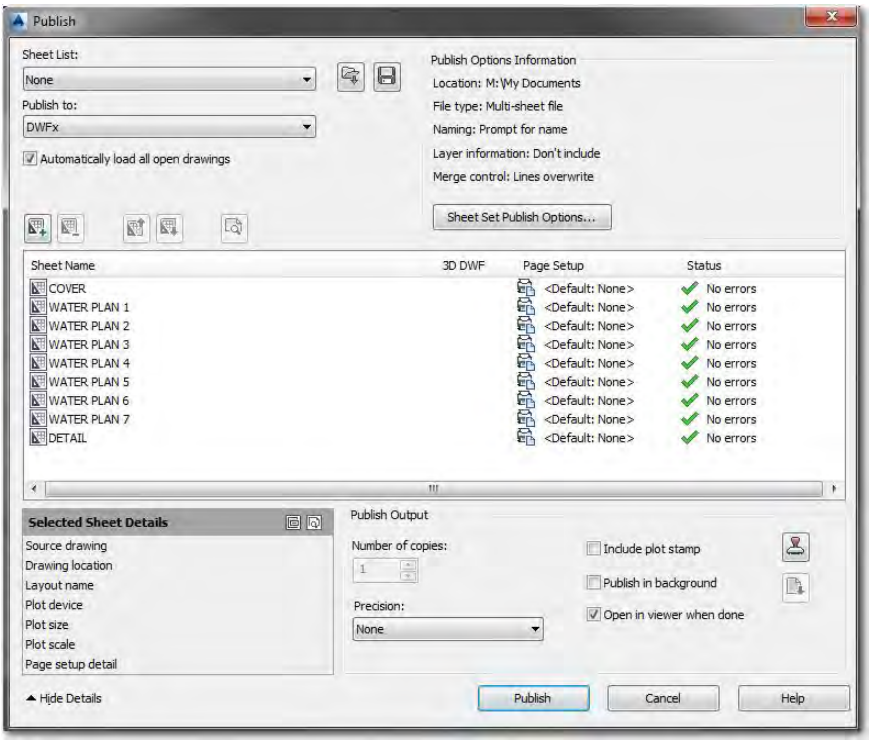
The *Resave Sheets* pop-up window will appear showing the progress of the sheets being synced; once it is finished, another pop-window will appear stating that the sheets have been resaved, click <OK>:



To accomplish this, right-click on the Sheet Set name in the Sheet Set Manager palette [see *Section 7.0 – Sheet Set Manager*], navigate to Publish, then select *Publish Dialog Box…*:



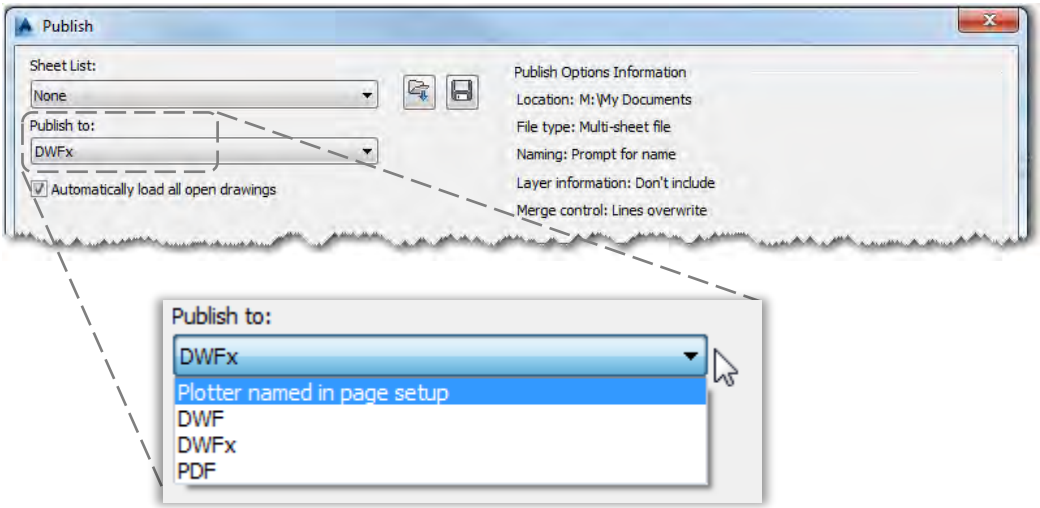
The *Publish* dialog box will then appear:



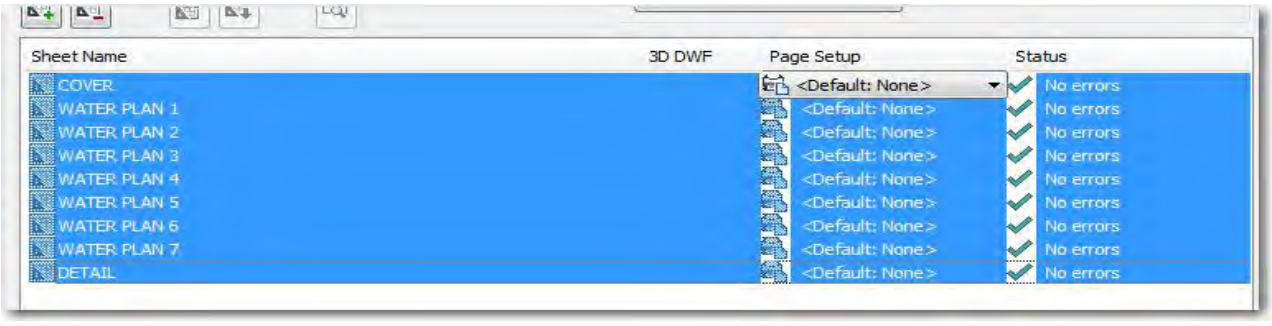
Tip: Named Page Setups

Named Page Setups must be correct in the drawings before this function works.

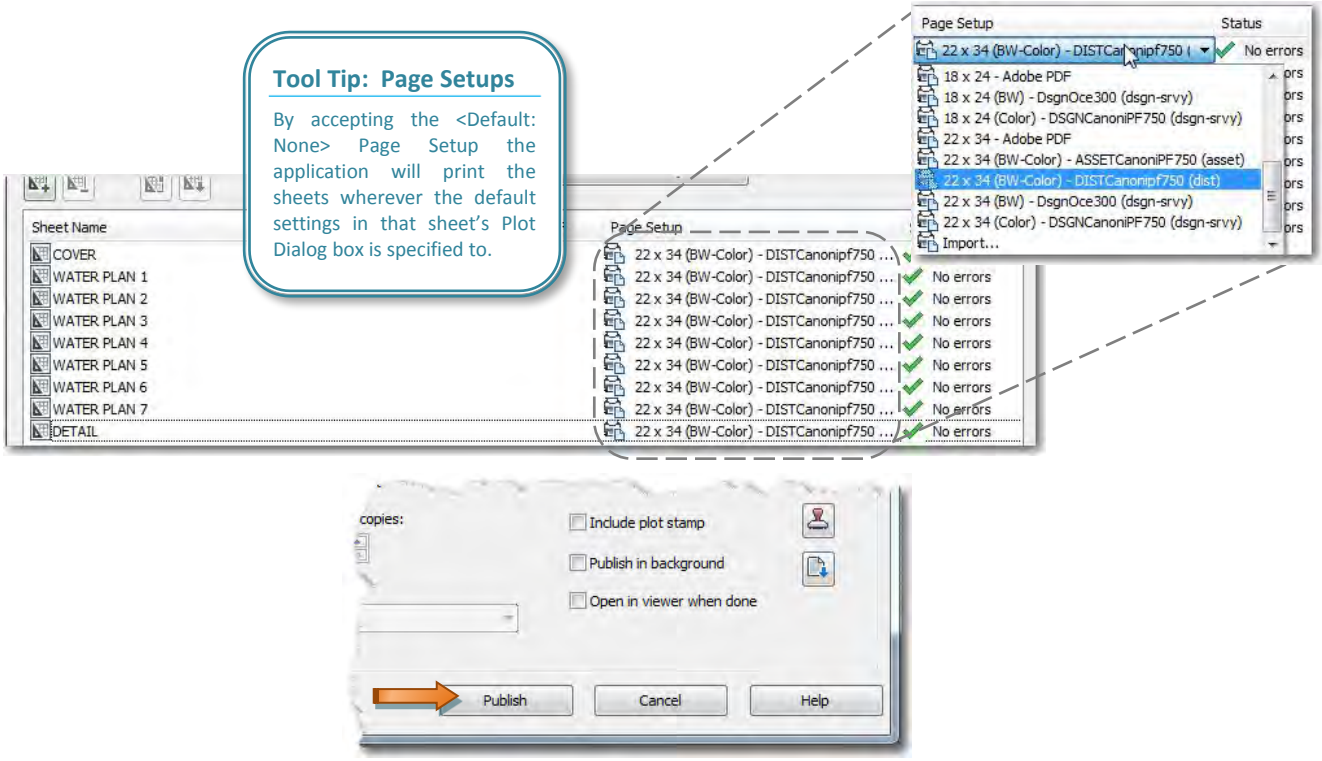
Use the Publish to pull-down to determine the final plan output type, select Plotter named in page setup:



Once the output type has been determined, select the sheets to be plotted – use the Shift and Ctrl keys to select multiple sheets:



The **Page Setup** pull-down has a list of the *Named Page Setups* contained within the selected drawings [see *Section: 16.2 – Named Page Setups*]. Choose the desired *Named Page Setup*, to be applied to all sheets:



NOTE: It is not recommended for DW's internal CAD Community to use the *Publish in background* option.

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Section 16.4

Electronic Plots (PDFs & DWFs)

Overview - Section 16.4

The information in this Section covers how to use the Sheet Set's to create electronic plan sets; electronic plan sets are the digital equivalent of paper plan sets.

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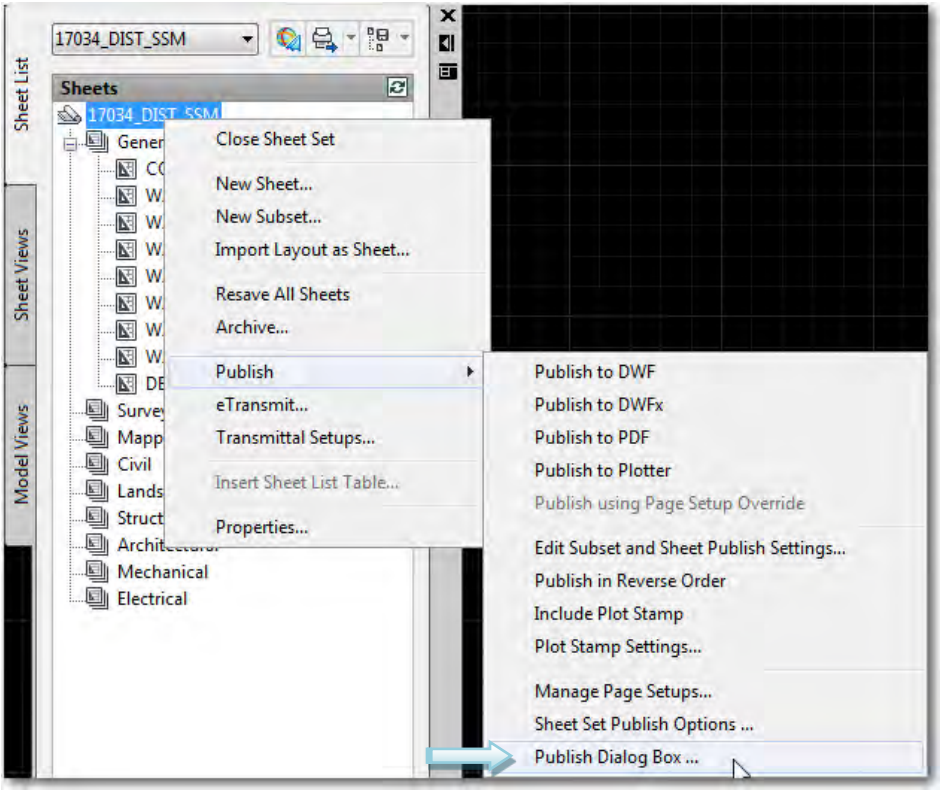
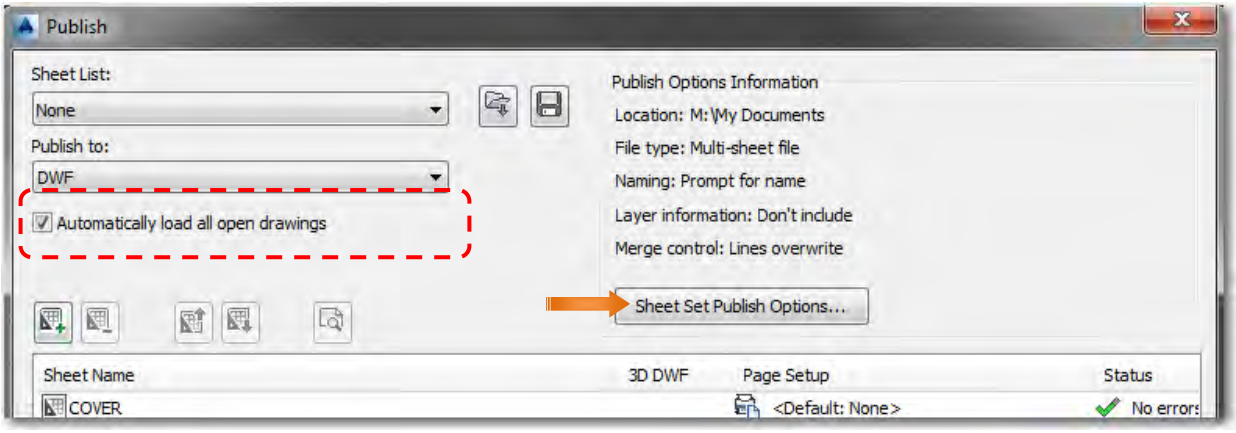
CREATING DWF'S OR PDF'S (WITH SHEET SETS)

In the SSM, right-click on the Sheet Set name, navigate to *Publish*, then select *Publish Dialog Box…*:

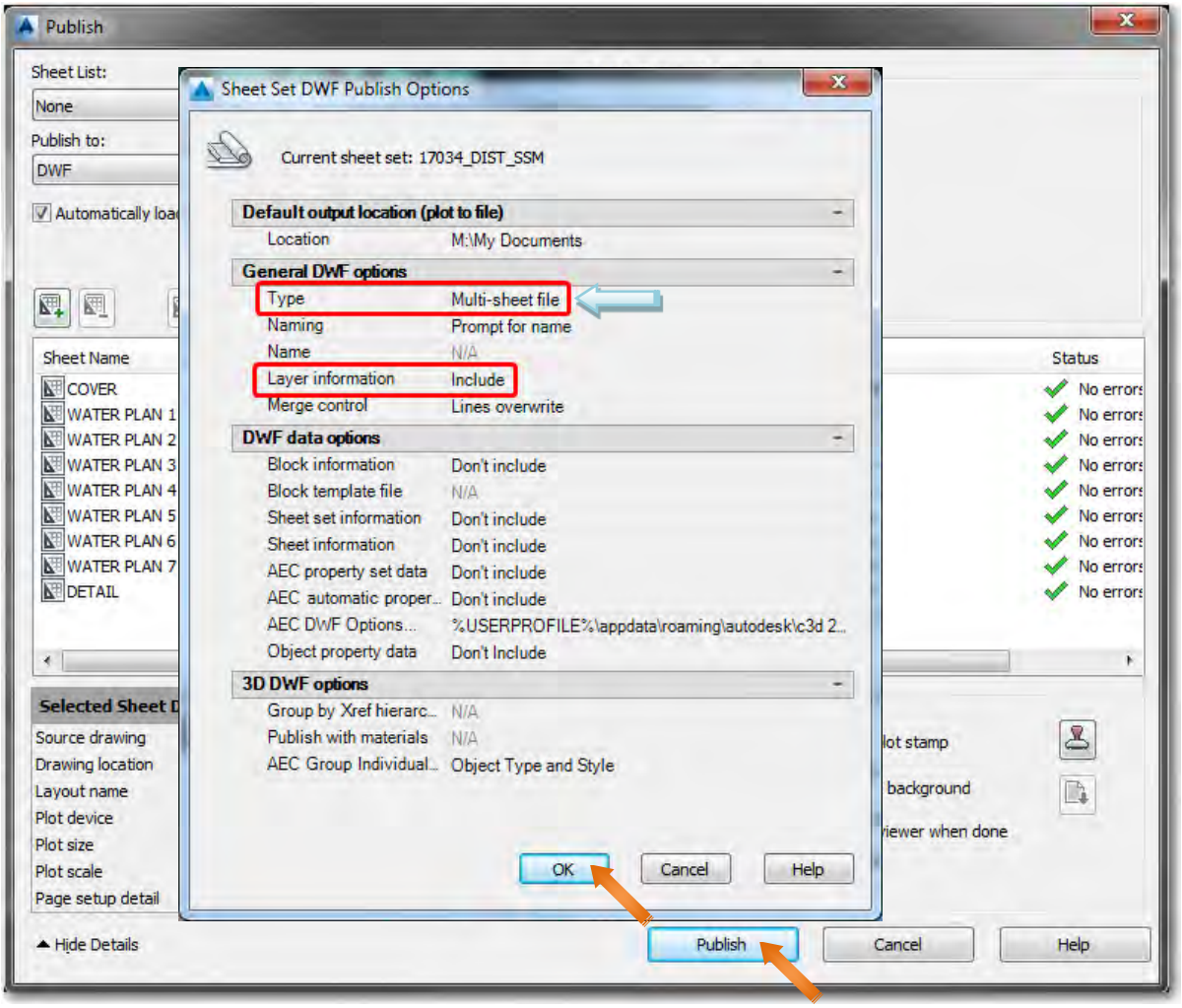


The Publish dialog box will then appear, in the Publish to: pull down choose DWF or PDF depending on the desired electronic plan output. In the Publish to area, click *Sheet Set Publish Options*… button:

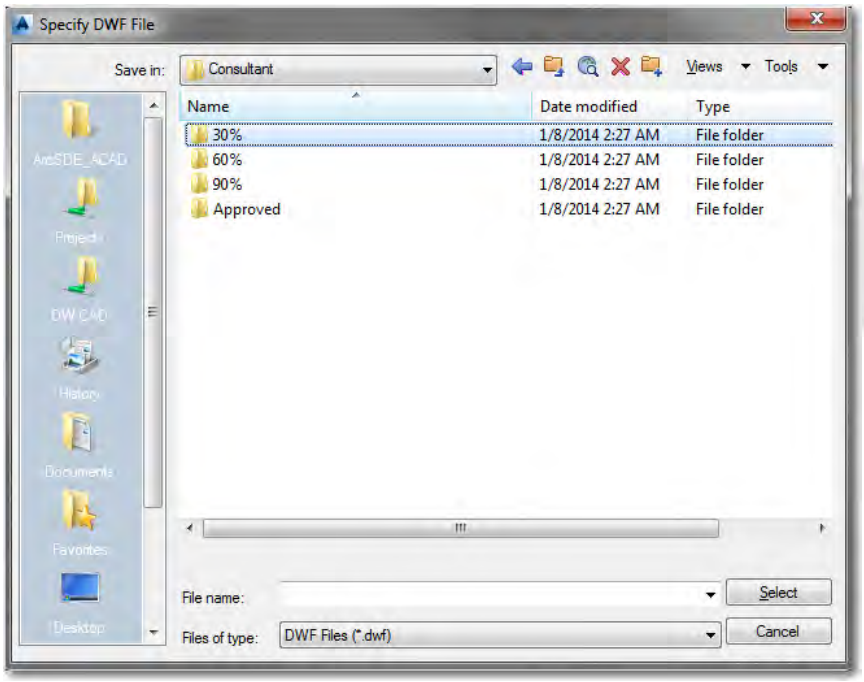


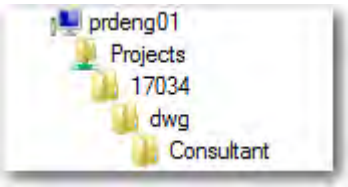
NOTE: By using the default page setup the plan set will plot to whatever settings are applied to the layout at the top of this list, alternately a name Page Setup may be picked.

The Sheet Set Publish Options pop-up will appear, be sure the Type is “Multi-sheet file” and the Layer information is set to “Include” (unless creating a PDF), and click <OK>. Then click <Publish> in the Publish dialog window:



The *Specify DWF* (or PDF) *File* pop-up will appear, navigate to the appropriate folder (30-60-90%) [see *Section 6.1 – File Management*] and name DWF/PDF appropriately:





Section 17.0

QA/QC Tools For CAD Compliance

Table of Contents: Section 17.0

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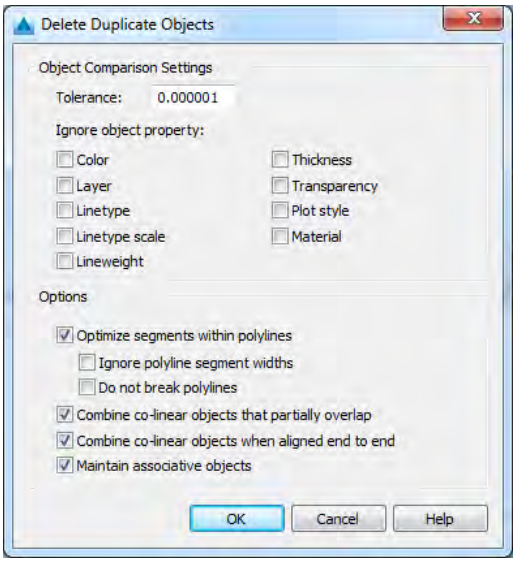
Overview - Section 17.0

Quality Assurance Quality Control is extremely important for the use of project drawings in all capacities. It prevents drawing errors and help keeps them consistent, which enables them to be referenced for future use.

Additional Tools

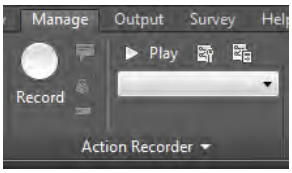
OVERKILL (command) – Removes duplicate geometry as well as overlapping lines, arcs, and polylines. Also, combines partially overlapping or contiguous ones.



ACTION RECORDER - You use the Action Recorder to record commands and input as an action macro (ACTM) file.

The Action Recorder is a panel on the ribbon that contains tools to record, modify, and play back an action macro. While recording, actions, commands, and input values are captured and displayed in the Action Tree as value nodes. A value node records the input provided at any prompt within a command, including acquired points, text strings, numbers, keywords, or other values that are entered when recording a command.

After recording is stopped, you can save captured commands and input to an action macro (ACTM) file which can be played back later. Once saved, you can specify base points, insert user messages, or change the behavior of recorded input values to pause for input during playback. You can also manage recorded action files with the Action Macro Manager from inside of the product or through the file system from outside the product.



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Section 17.1

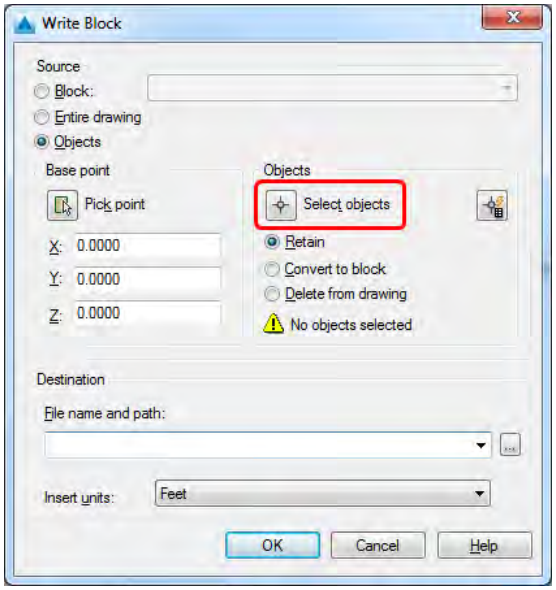
Using "Old" Drawing Information (scrubbing)

Overview - Section 17.1

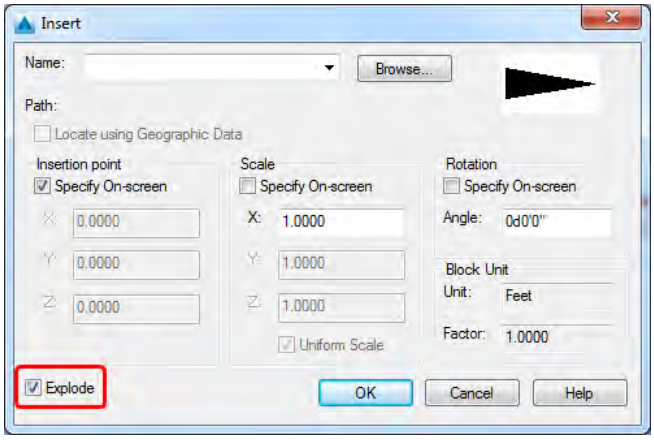
On occasion information from an old drawing needs to be utilized for a new one. It is extremely important to ensure that the drawing has been “scrubbed” so that it does not cause huge issues in the future.

Using the WBLOCK Command

Occasionally small amounts of information from old drawings needs to be utilized. Use the keyboard shortcuts for PURGEREGAPPS and AUDIT to cleanup errors and unnecessary applications, use the WBLOCK command to capture any data that you need, adjusting the settings as necessary, select  to manually *Select objects, save File name and Path:* to an appropriate location, select *OK*:



Once the WBLOCK is created ensure that all layers, texts, etc. in the drawing are correct before inserting the drawing as a block into the current project drawing. It is wise to PURGEREGAPPS and AUDIT again to be safe. Check *Explode* before insertion:



Section 17.2

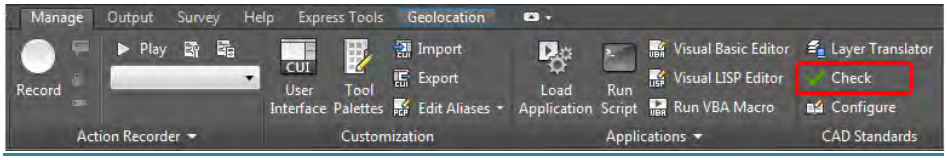
Standards Checker Tools

Overview - Section 17.2

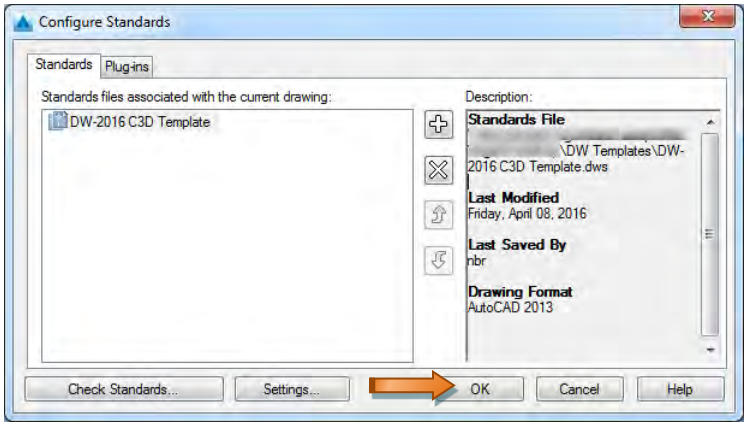
The Standards Checker Tool verifies that predefined properties for layers, dimension styles, linetypes, and text styles are used within a project drawing(s).

Using the CAD Standards Check Tool

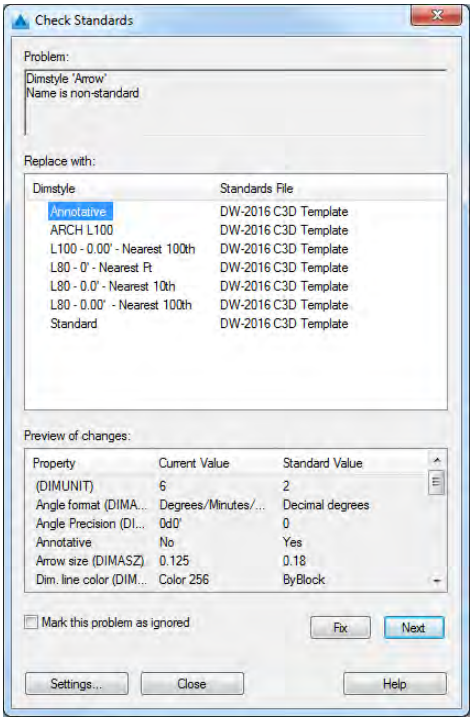
Access the CAD Standards Check by the keyboard shortcut CHECKSTANDARDS; or select *Check* on the *CAD Standards* tool, on the *Manage* Tab on the ribbon:



Associate the appropriate .dws file by selecting it in the \\denverwater.org\shares\DW CAD\DW CAD Standards/2016 folder, select *OK*:



Individually review each error by selecting it (highlighted in blue), you can choose to *Fix* or check *Mark the problem as ignored*, then select *Next,* when all errors have been reviewed, select *Close*:



Section 17.3

Drawing Cleanup Tool

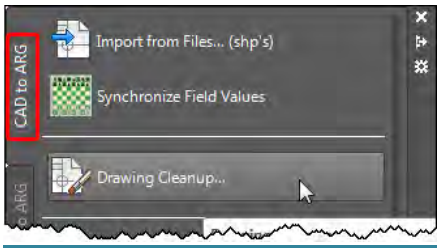
Overview - Section 17.3

There are many tools available for use in cleaning up a project drawing(s). Drawing Cleanup should be used when a drawing is finished for quality assurance quality checks (QAQC). Drawing cleanup helps you improve the accuracy of your maps, correct common map errors, and remove unnecessary detail from complex drawings or As-Builts. This is essential when you need accurate and complete maps suitable for design.

Drawing Cleanup is a sequence of pages that guide you through specifying the set of objects to include in a drawing cleanup operation, the objects to anchor, the cleanup actions to perform and the settings to use, how to treat the objects after cleanup, and the error marker settings (for interactive mode only).

Using Drawing Cleanup

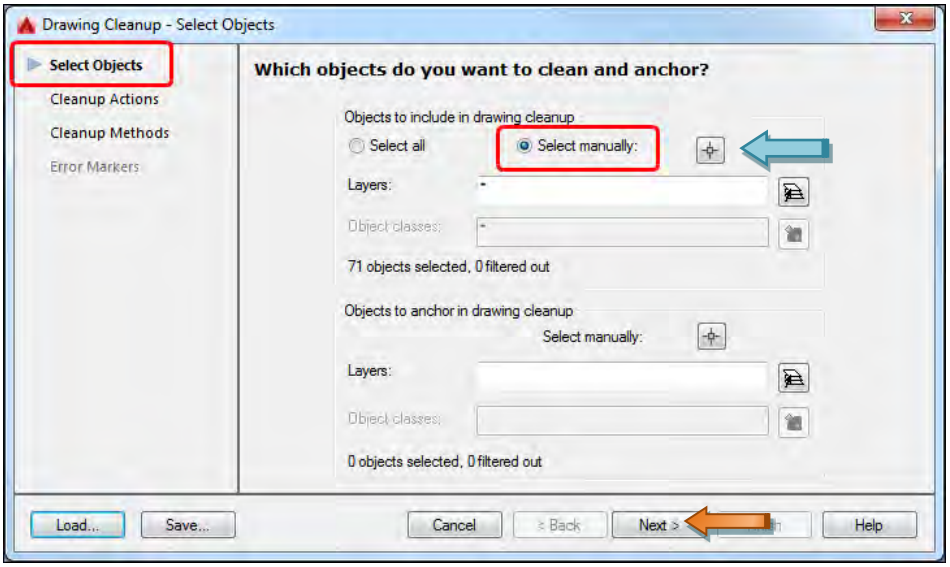
Drawing cleanup can be accessed via the keyboard shortcut MAPCLEAN; or *Drawing Cleanup…* located on the *CAD to ARG* Tab on the As-Builts Tool Palette:



Select Objects

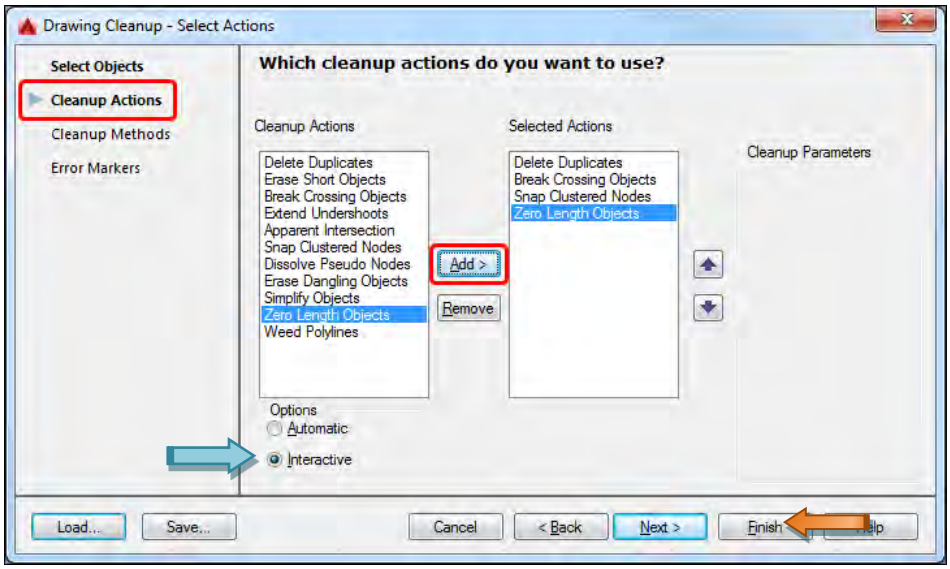
For ARG drawing cleanup see *Section 18.4 – Drawing Cleanup Tool for ARG Drawings*.

Select *Select manually:* and click the button  , type ALL or manually select the objects that you want to be checked for errors. Once the desired objects are selected, select *Next* >:



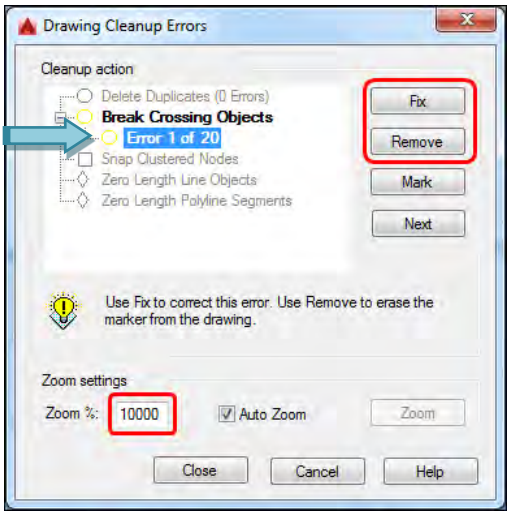
Cleanup Actions

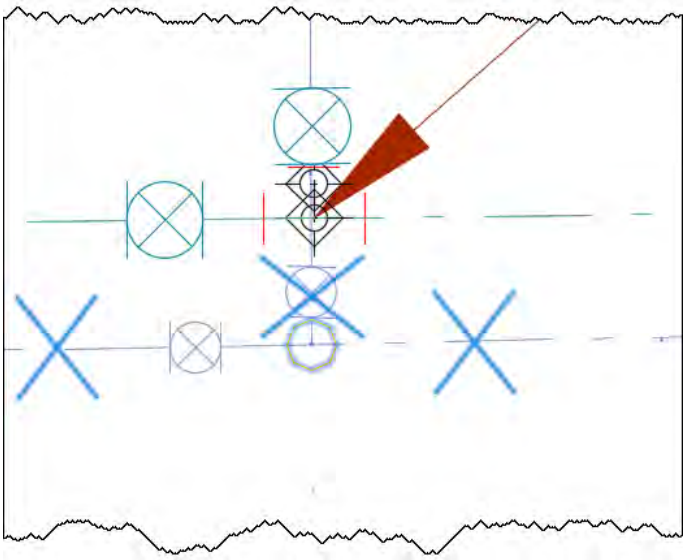
Select which desired Cleanup Actions you wish to add and Select *Add* >. Ensure that *Interactive* is selected under *Options,* select *Finish.* Typically, options are not modified under *Error Markers*:



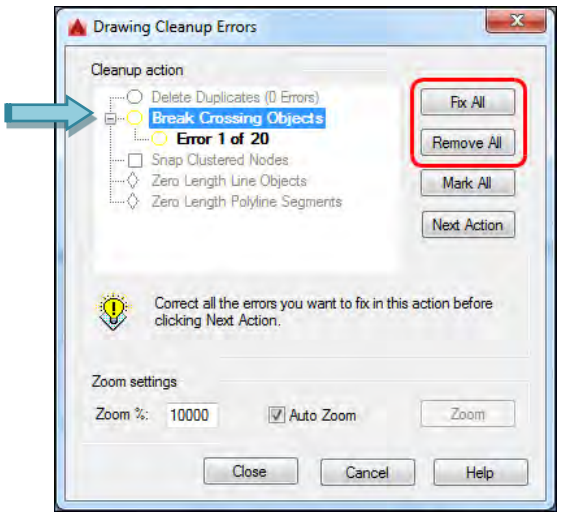
Drawing Cleanup Errors

To manually review errors individually select the plus sign next to the Cleanup Action, in this case *Break Crossing Objects*. Ensure that the *Zoom %:* under *Zoom settings* is a very high number, to view each error close enough. You can choose to correct the error by choosing *Fix* or ignore it by selecting *Remove*:

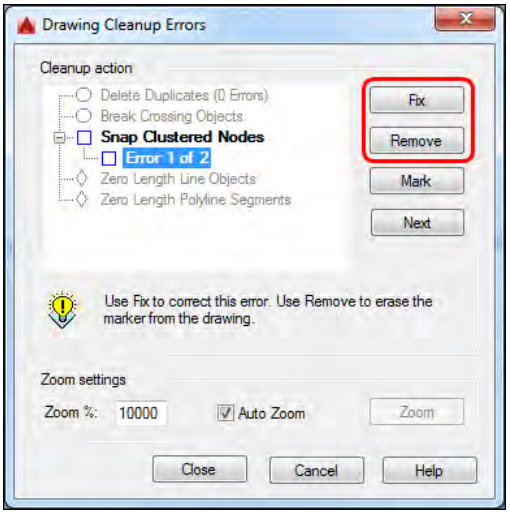


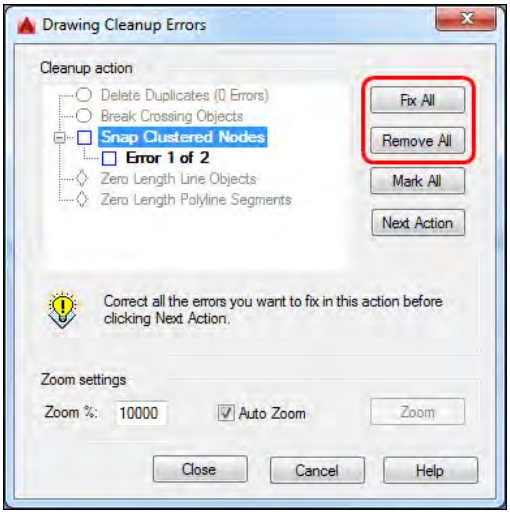


To review errors at one time select the Cleanup action, in this case *Break Crossing Objects*. To correct all errors select *Fix All* or to ignore all errors select *Remove All*:

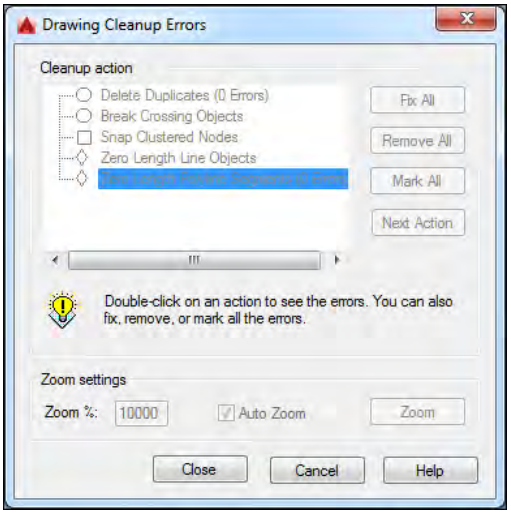


Similarly for each Cleanup Action:





Once all errors are reviewed, select *Close:*



Section 17.4

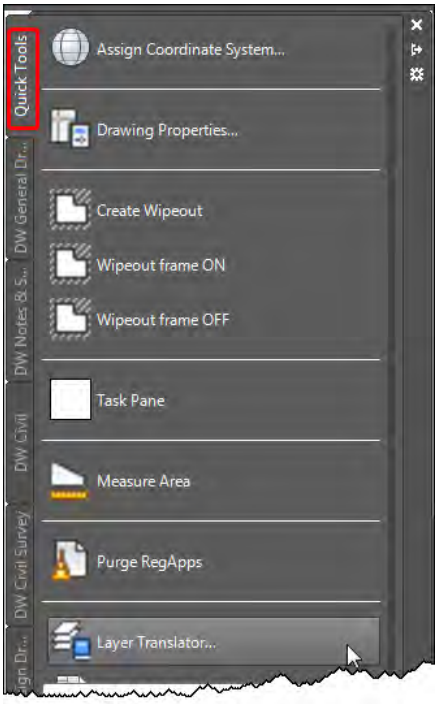
Layer Translator

Overview - Section 17.4

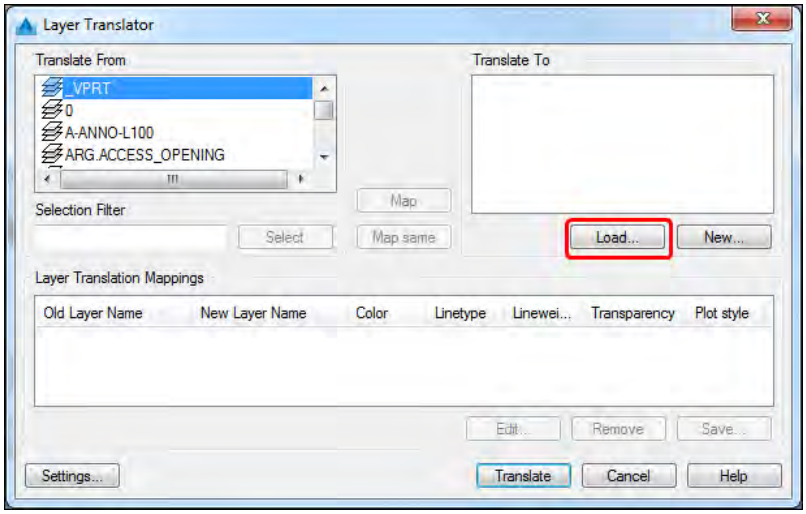
Layer Translator maps the layers in the current drawing to different layer names and layer properties in a specified drawing or standards file, and then converts them using those mappings. This tool is useful when using an SDE connection, when bringing in data from GIS to an existing drawing.

Using the Layer Translator Tool

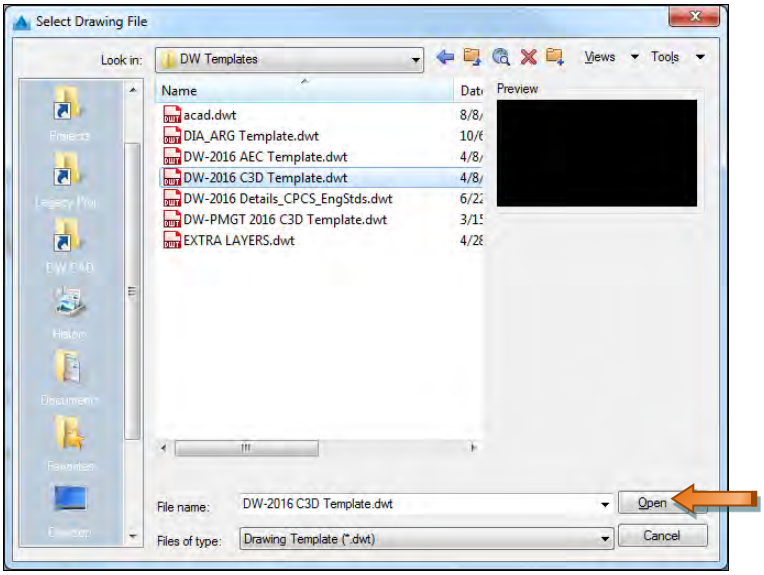
Layer translator can be accessed by the keyboard shortcut LAYTRANS; on the ribbon, the *Manage* Tab, under CAD Standards, Layer Translator; or the *Quick Tools* tab on the *DW General* Tool Palette.



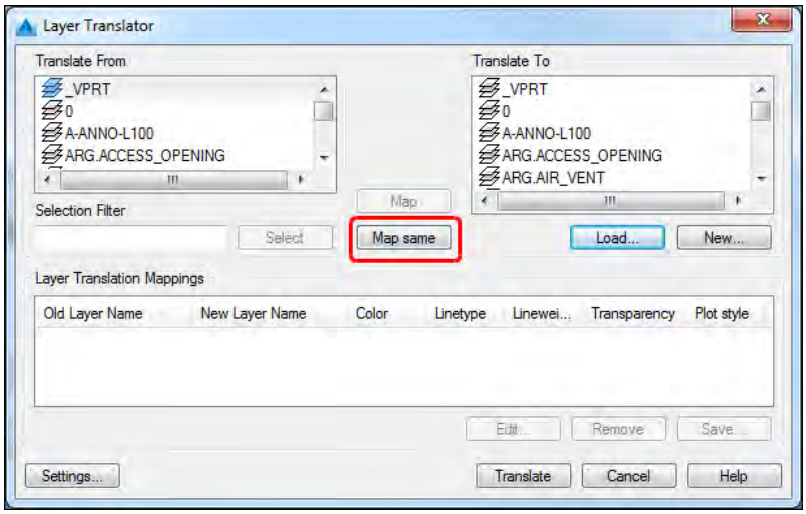
Select *Load…* on the Layer Translator Dialog Box:



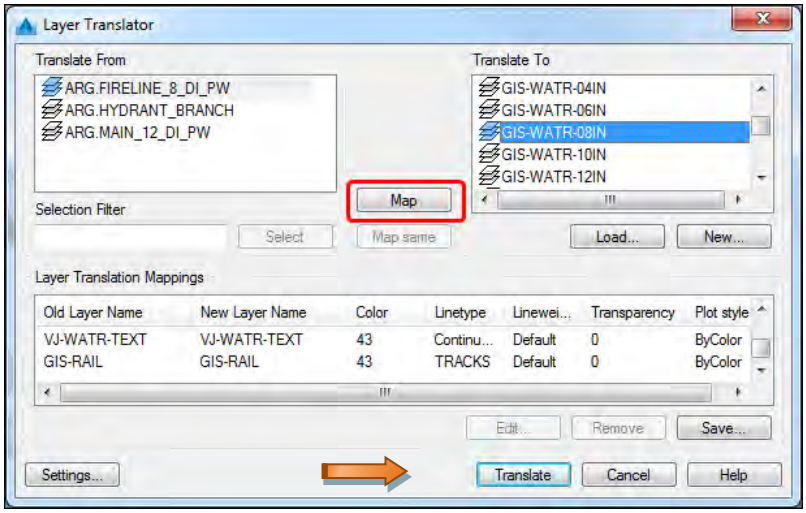
Select the template that is appropriate to the project, then Select *Open*:



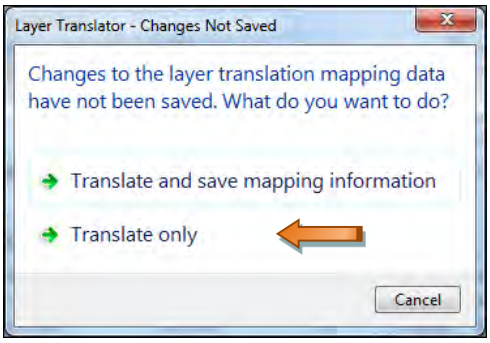
Select *Map same*, any layers that have an exact match will automatically be loaded:



Any layers that remain under *Translate From* need to be manually added. Individually select a layer under *Translate From*, locate the appropriate layer under *Translate To*, then Select *Map.* Once there are no remaining layer under *Translate From*, select *Translate*:



Then select *Translate only*. Refer to *Section 18.0 – CAD to GIS: Creating ARG As-Built Drawings* for more information:



Section 18.0

CAD to GIS: Creating ARG As-Built Drawings

Table of Contents: Section 18.0

Overview - Section 18.0

Internal Use: Full compliance where applicable

Contractor Use: Reference only

At DW there are two types of as-built drawings: one for historical record with the Records and Documents Administration (RDA), and one for posting to GIS with the Asset Recording Group (ARG). Typically Design Drafting and Distribution are the groups to create these drawings. Every project is submitted to RDA but not every project is posted to DW's GIS system, which should be determined by ARG at the onset of a project.

Use the steps in the following subsections to successfully create the **ARG As-built Drawings**. The content of these Sections will only contain information as it applies to CAD practices and tools. Other applications used in collaboration with these CAD functions may be captured in some documentation.

- See *Section 5.0 – Example Sheets*, and it's subsections for specific information related to plan creation
- See *Section 19.0 – Record As-Built Drawings*, and its subsections, for related As-built information

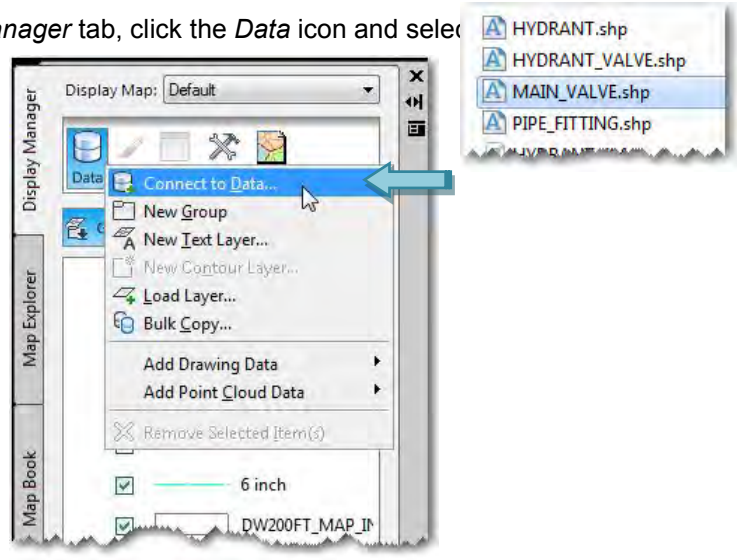
Use the steps in the following subsections to successfully create the applicable As-Builts.

- *Section 18.1 – CAD to ARG Tool Palettes & ARG Attributes*
- *Section 18.2 – ARG Drawings for Capital Projects*
- *Section 18.3 – ARG Drawings for Distribution Engineering*
- *Section 18.4 – Drawing Cleanup Tool for ARG Drawings*

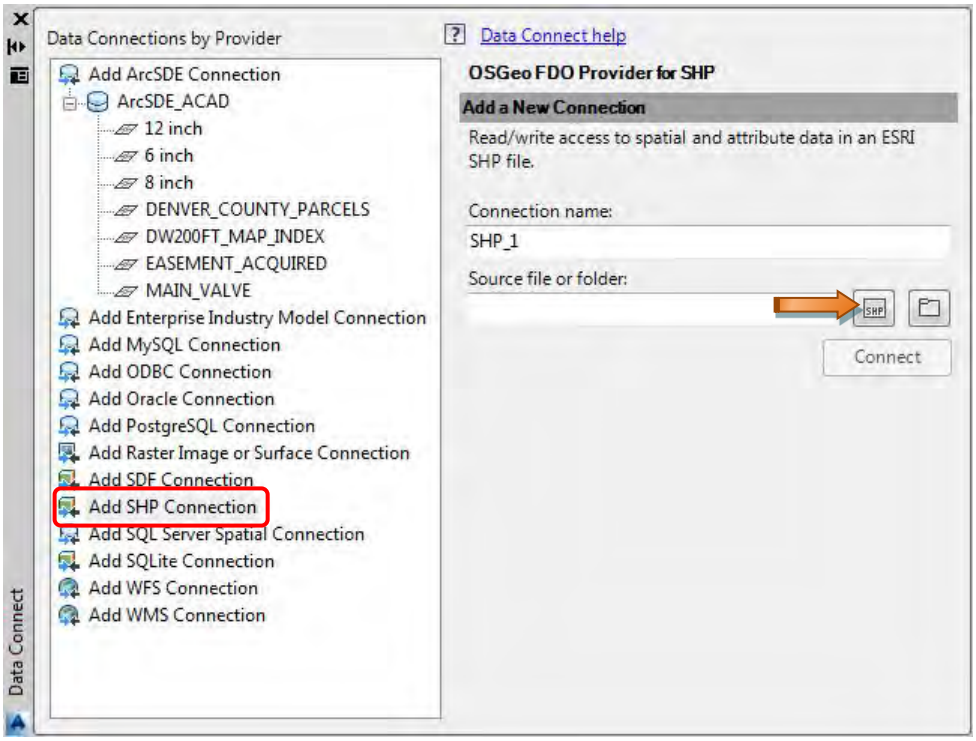
SHP References

GPS points can be imported into drawings as SHP files, these can help determine the project area within the drawing. This is optional to help verify the project location & must be done in AutoCAD Map 3D.

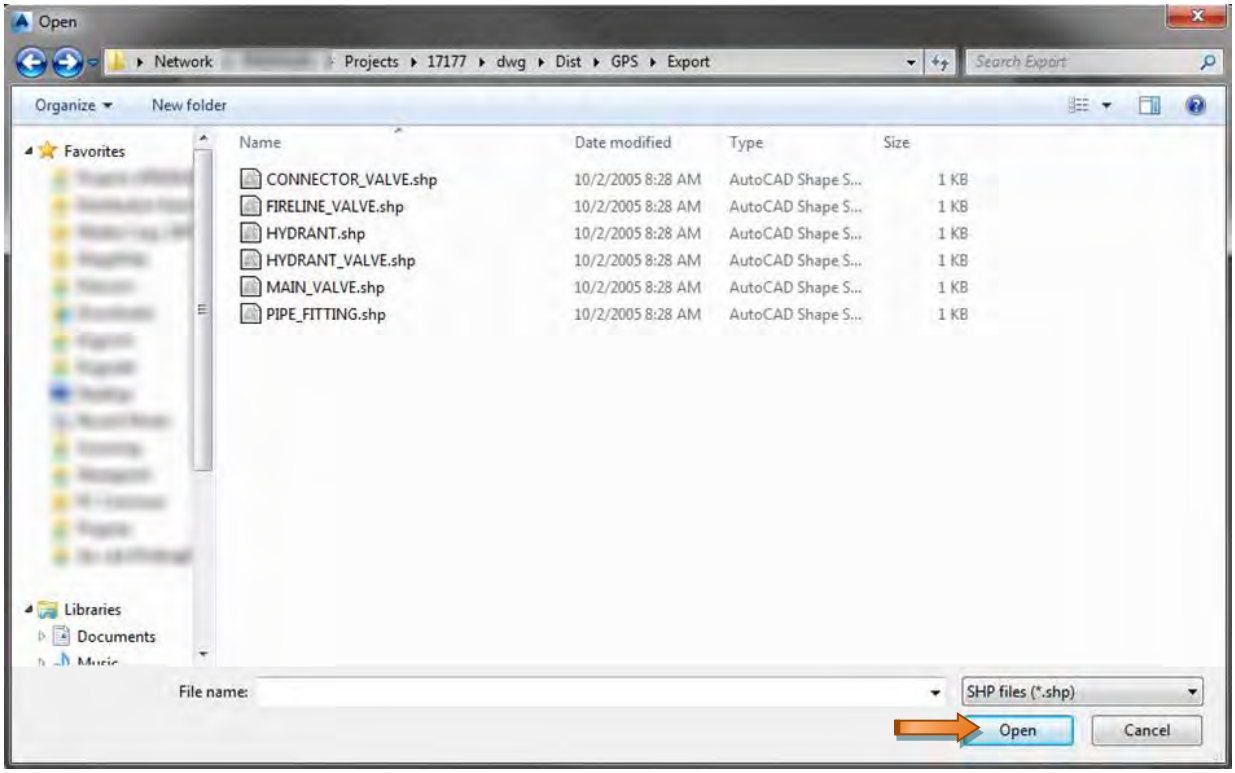
In the *Task Pane*, on the *Display Manager* tab, click the *Data* icon and selec



The *Data Connect* fly-out palette will appear. Choose *Add SHP Connection* from the list on the left and click the <SHP> button:

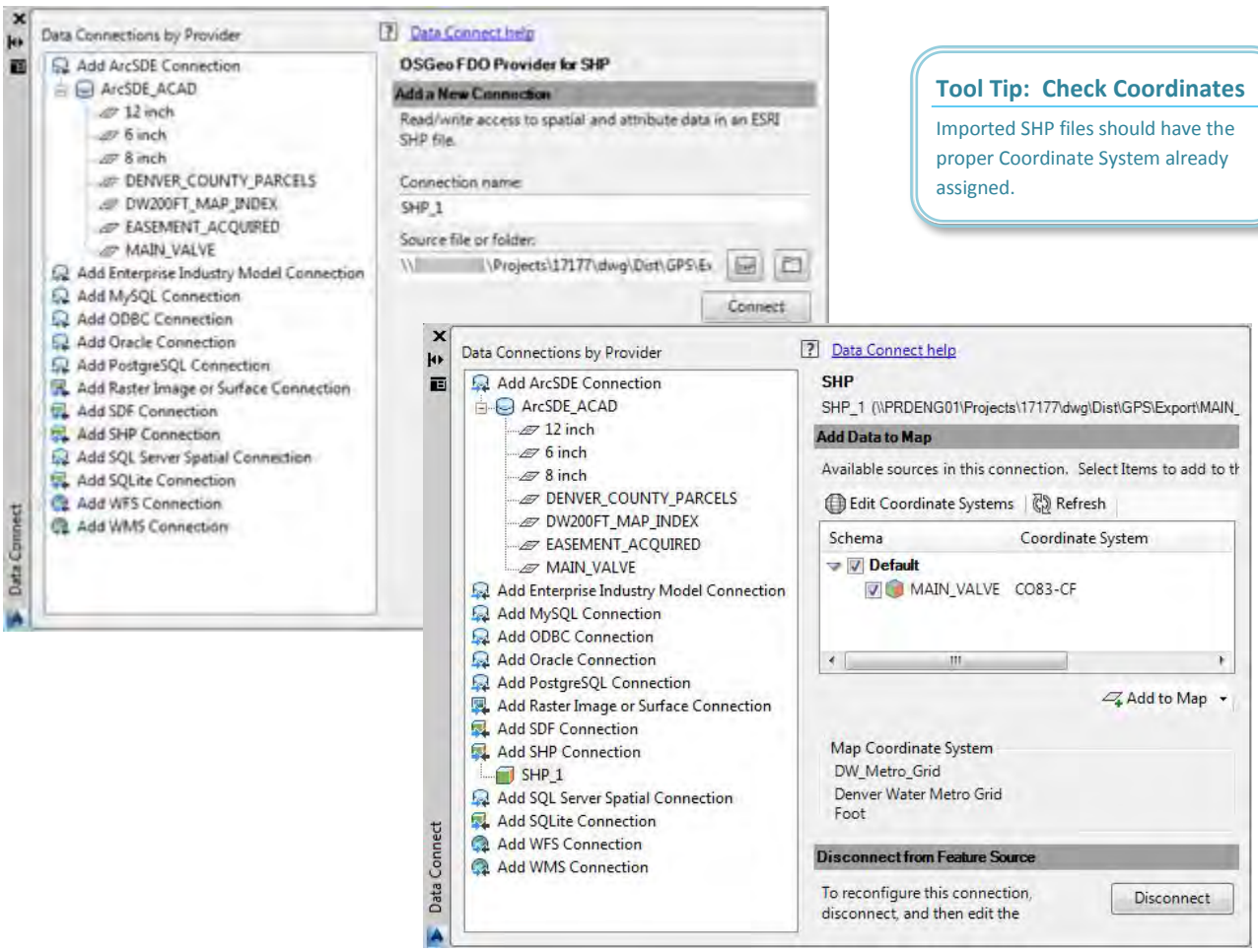


The *Open* pop-up window will appear. Navigate to the project folders' GPS location (***PTNO/dwg/DIST/GPS/Export***). Select **ONE** of the SHP files (preferably MAIN_VALVE) and click <Open>:



NOTE: The intent of this step is to locate the project area on the screen as a precursor to Querying Data.

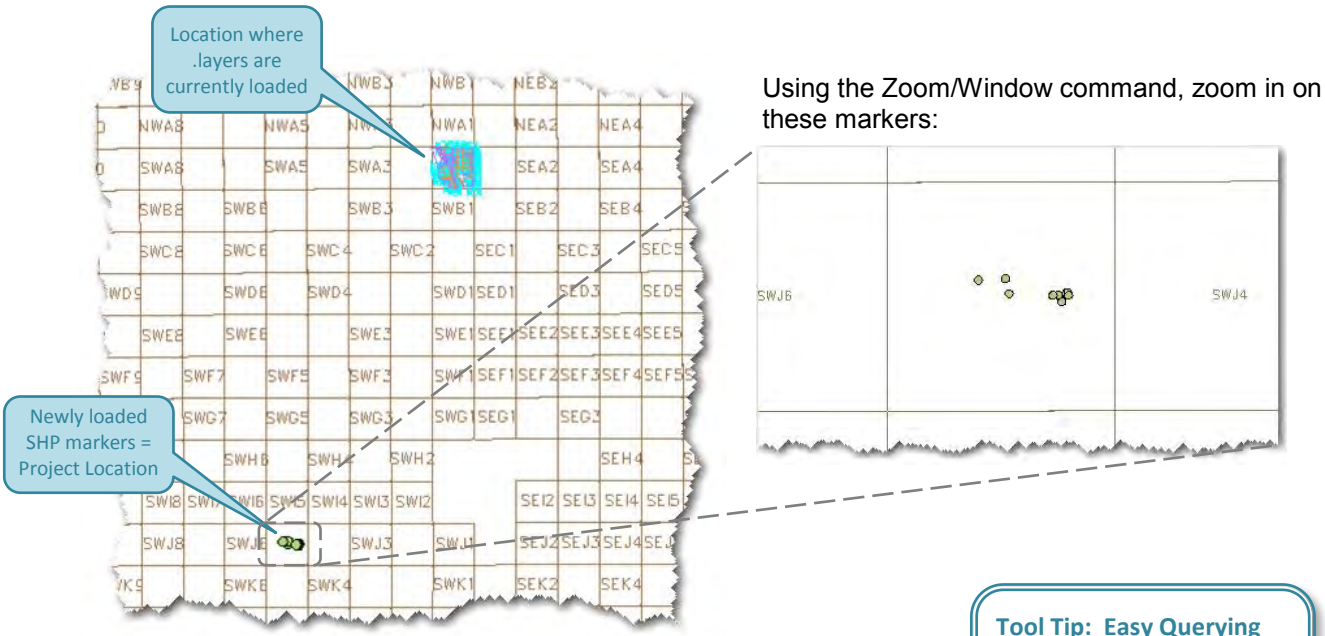
In the *Data Connect* fly-out palette, click <Connect>; then <Add to Map>:



Tool Tip: Check Coordinates

Imported SHP files should have the proper Coordinate System already assigned.

In Model Space, zoom extents. The newly loaded SHP files should appear as markers elsewhere in the drawing (from where layers are currently loaded):

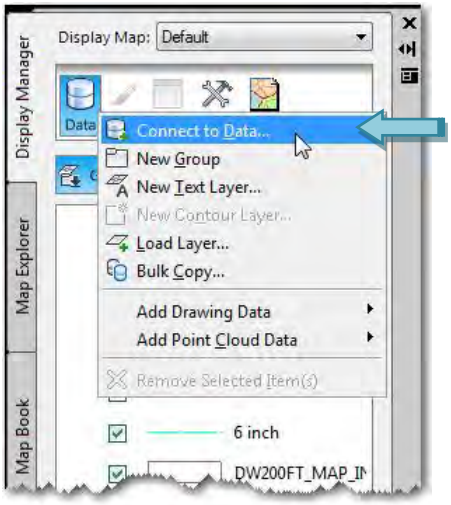


Tool Tip: Easy Querying

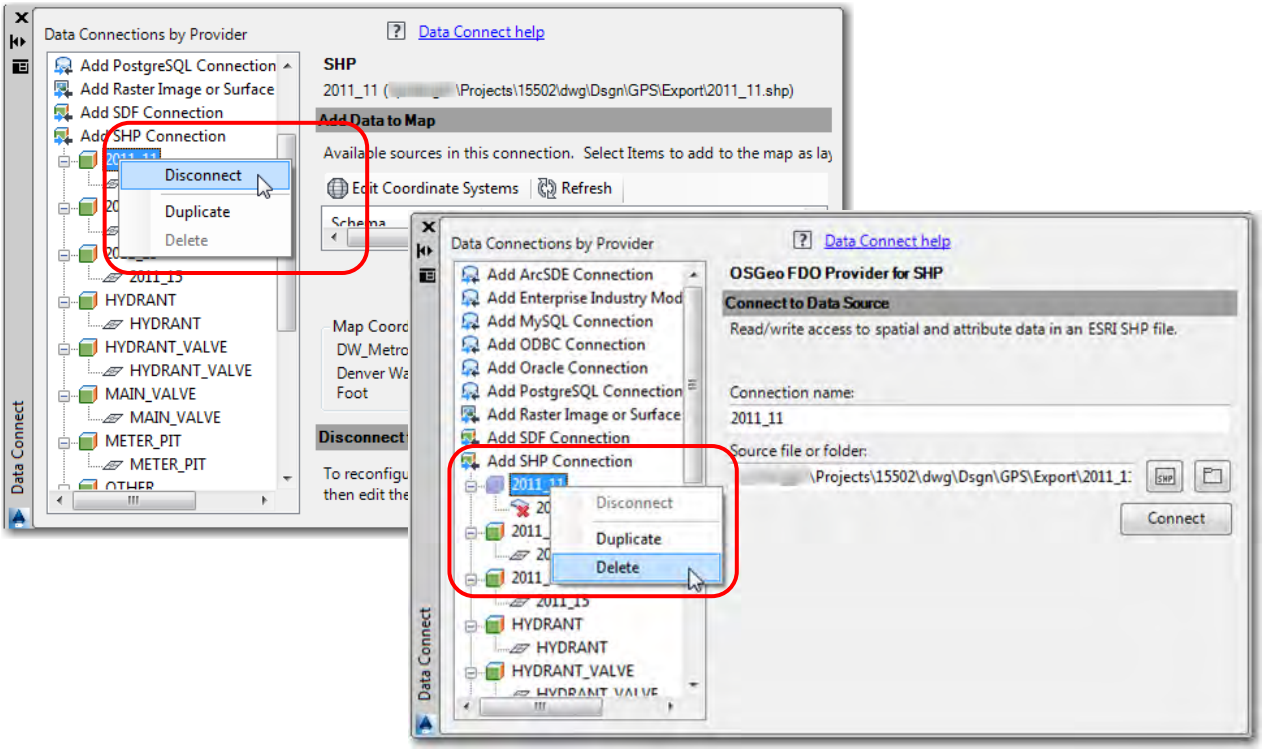
Draw a temporary rectangle around the SHP file to make Querying Data easier.

Remove .SHP References

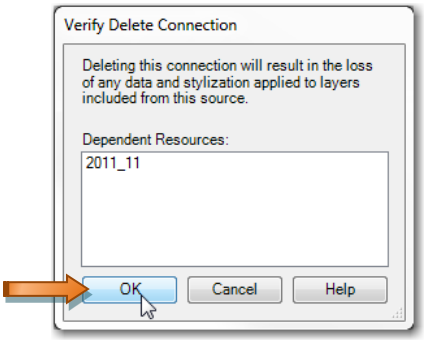
The SHP files must be disconnected and removed from the drawing. In the *Task Pane*, click the *Data* icon and select *Connect to Data…*:



In the Data Connect fly-out palette, right-click on the SHP connection (typically SHP_1) and select **Disconnect**. Repeat the right-click process and select **Delete**:

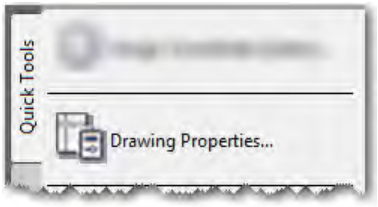


The *Verify Delete Connection* pop-up window will appear, click <OK>:

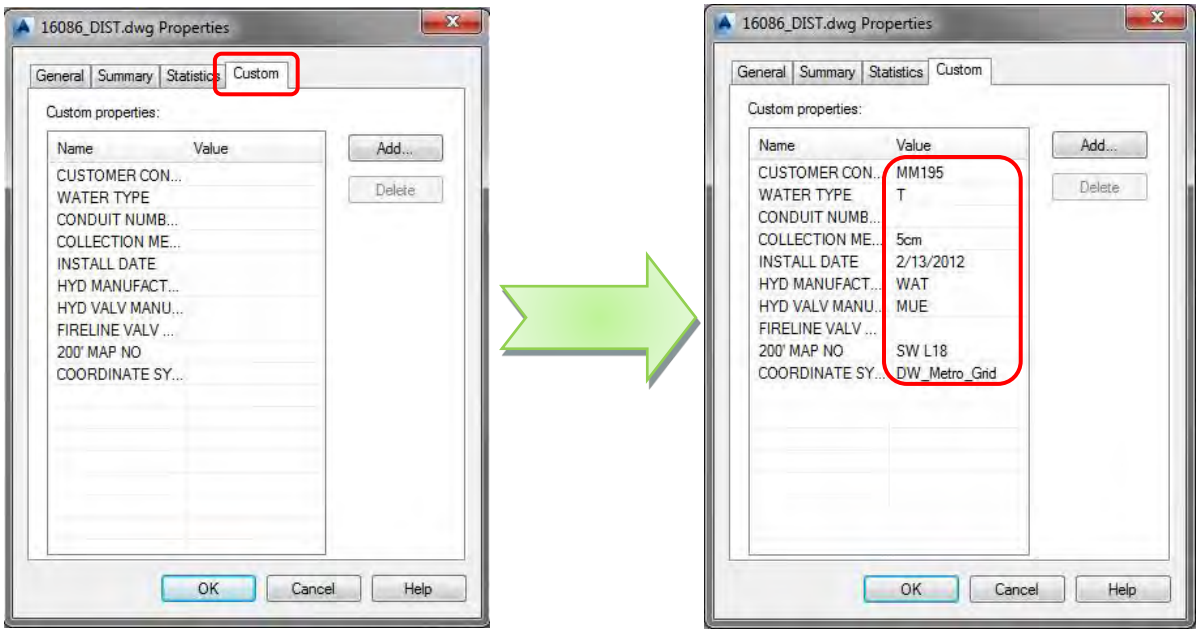


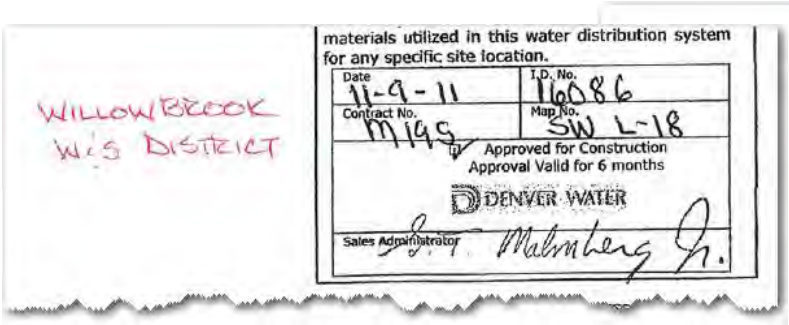
Drawing Properties

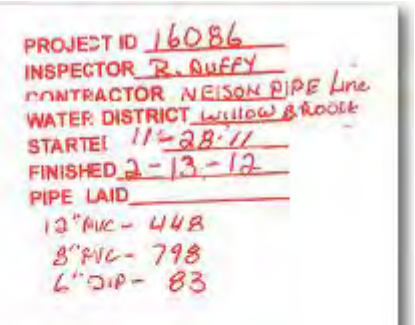
The Custom Drawing Properties can be filled in at any time throughout the ARG process. Some information may not be known up front and will need to be added later. To add information internally, click Drawing Properties… on the Quick Tools Tool Palette:

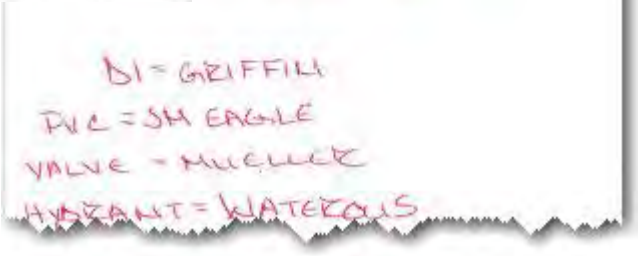


The *Drawing Properties* dialog window will appear; click the *Custom* tab and fill in as many values as possible. The information can be found in numerous locations, such as Project Tracker, E-Map, on Inspectors' notes, or various other places. Once the information has been added, click <OK>:



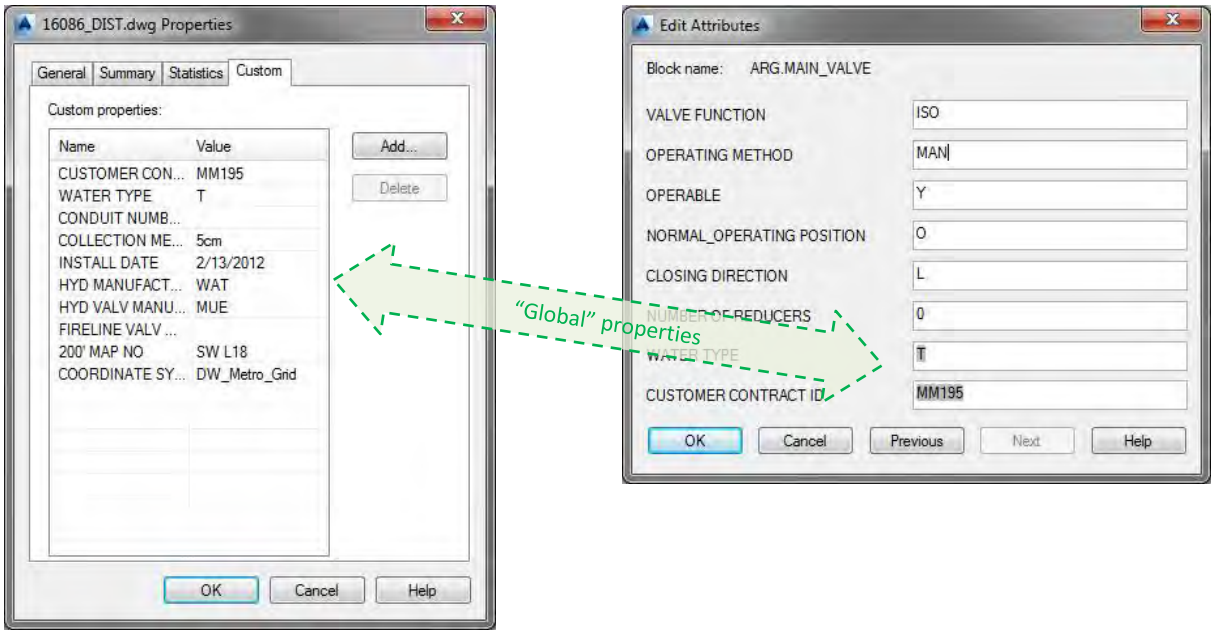






Examples of information used to populate *Drawing Properties*

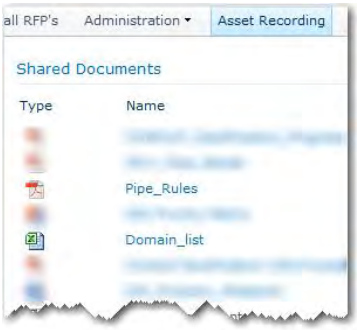
The Values translate into the ARG Attributes as “global” (highlighted gray) properties:



NOTE: The proper abbreviations MUST be used, see Asset Recording’s *Domain_list* on SharePoint.

See Asset Recording’s SharePoint site for the most up-to-date documents:

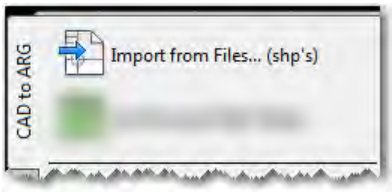
- **Pipe Rules**: Describes pipe and fitting connectivity
- **Domain List**: The proper abbreviations MUST be used

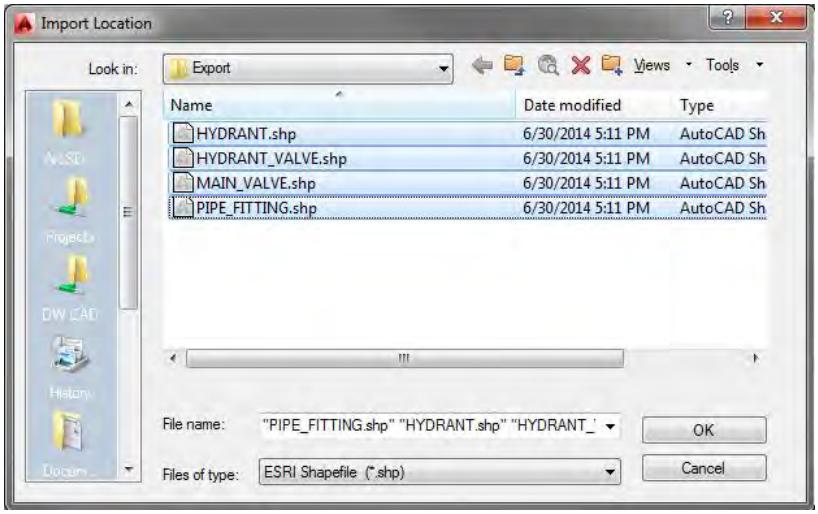


Import GPS Data For ARG use

Inspectors GPS points (SHP files) must be brought into the Project Drawing as ARG Attributes when possible.

On the *CAD to ARG* Tool Palette, click *Import from Files… (shp’s)*; the *Import Location* window will appear. Navigate to the project folders’ GPS location (***PTNO/dwg/DIST/GPS/Export***) and select ALL of the SHP files, then click <OK>:

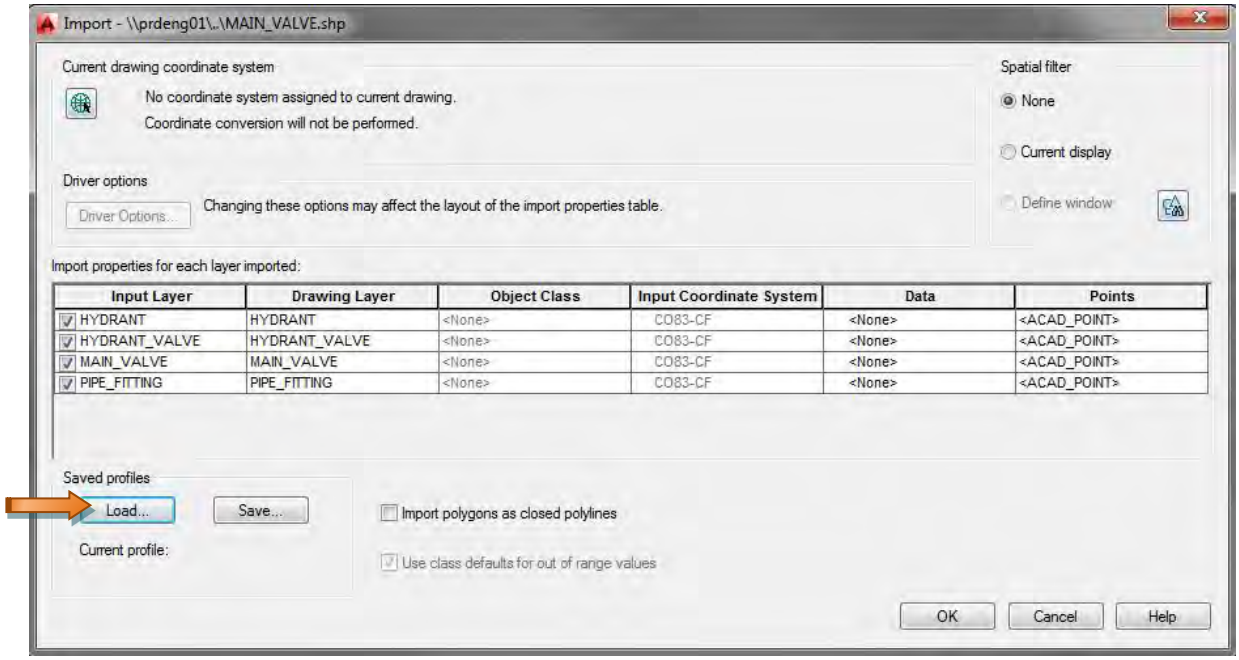




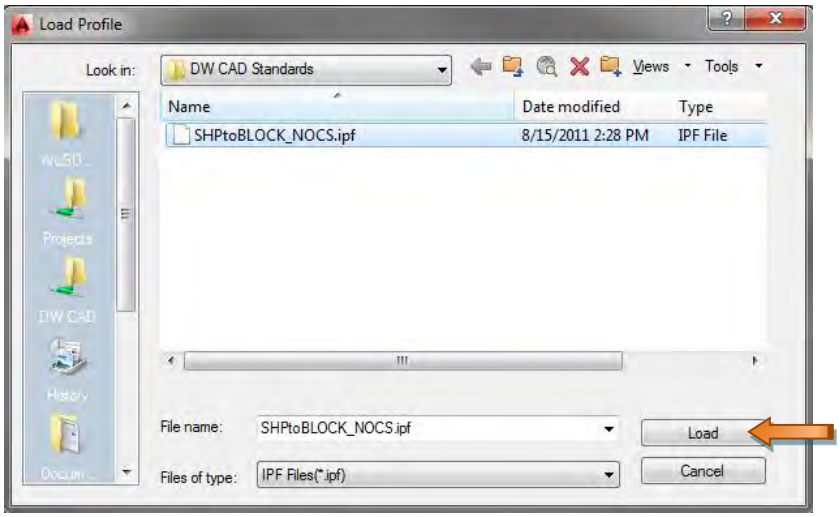
Tool Tip: Files of type

Make sure ESRI Shapefile (*shp) is selected under Files of type.

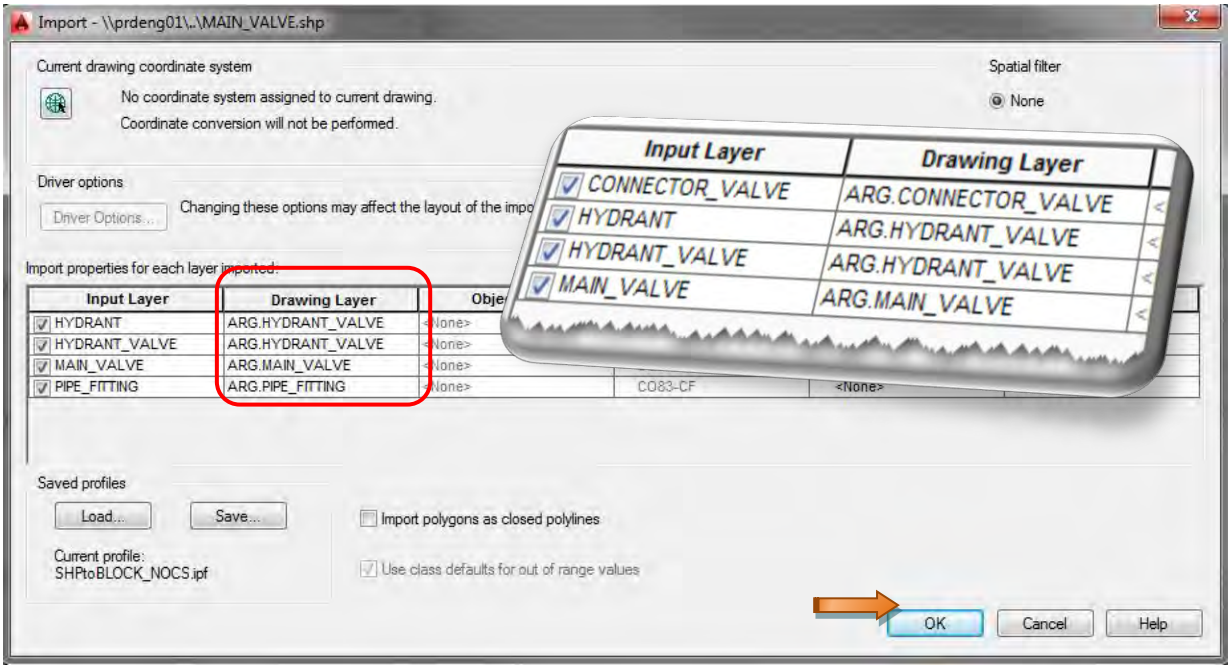
The *Import* window will appear; in the **Saved profiles** section click <Load…>:



In the *Load Profile* pop-up window navigate to *\DW CAD\DW CAD Standards*; select the ***SHPtoBLOCK_NOCS.ipf*** file and click <Load>:

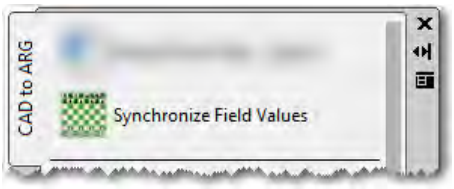


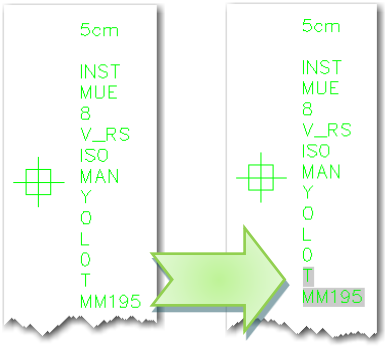
The *Import* pop-up will reappear. Change the **Drawing Layers** to the appropriate "ARG" layers, click <OK>:



NOTE: Changing layers may be done manually as well.

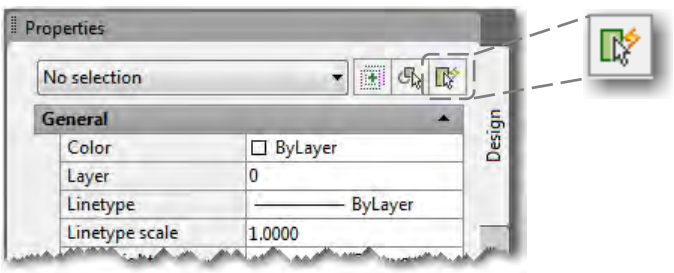
On the *CAD to ARG* Tool Palette, click **Synchronize Field Values**; this will add the fields, (links to the *Drawing Properties*) to the ARG Attributes (see *18.0-16*, this section):



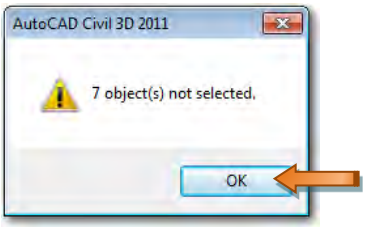


Manually Changing ARG Attribute Layers

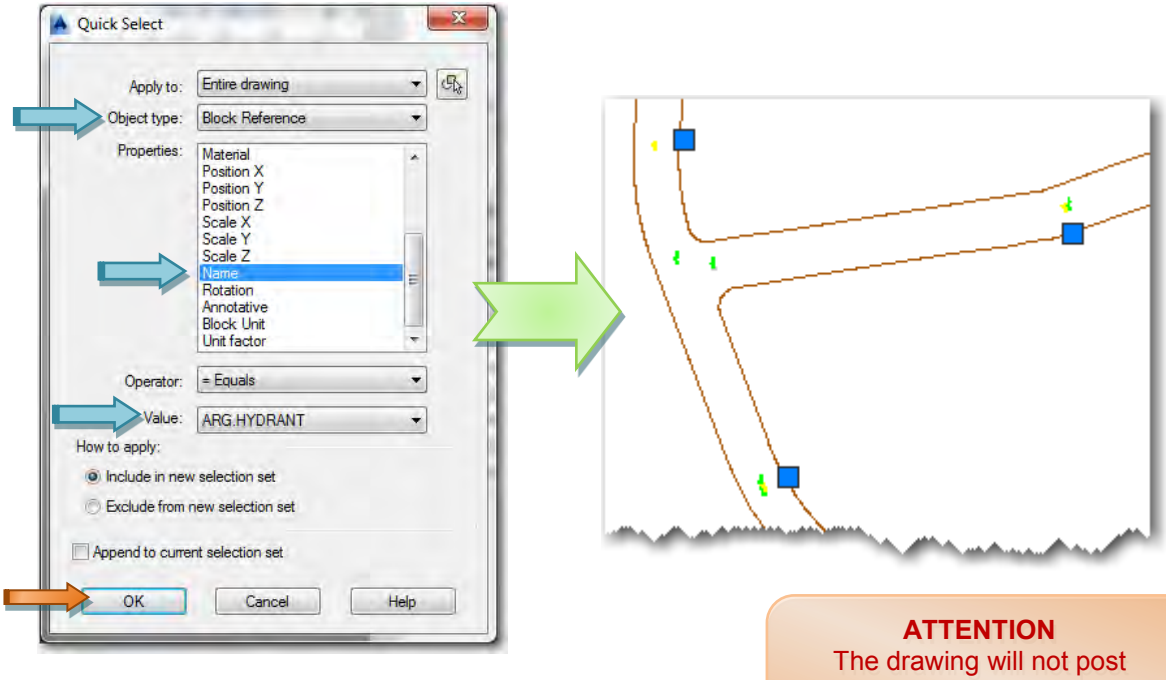
If drawing layers were not changed in the previous step, they must be changed manually after they are inserted. Using the *Properties* palette, click the **Quick Select** button:



An error window similar to the example below may appear, click <OK>:

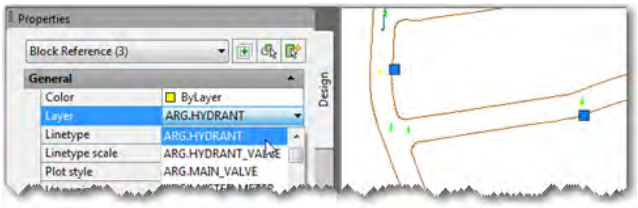


In the *Quick Select* pop-up window change the *Object type* to **Block Reference**, and *Properties* to **Name**. Using the *Value* pull-down, select one of the ARG blocks and click <OK>. In Model Space the chosen ARG Attributes will be selected (grips will be visible):



ATTENTION
The drawing will not post properly if the ARG Attributes are on the wrong layer.

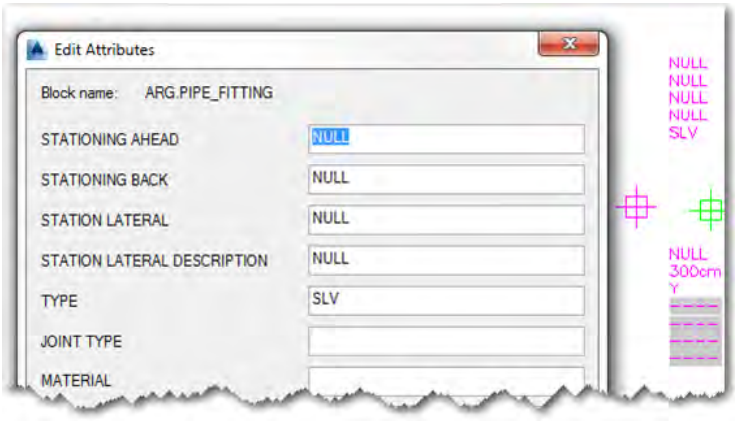
On the *Properties* palette, choose the appropriate layer:



Repeat this step until all ARG Attributes are on the appropriate layers.

Adding ARG Data

The ARG information will be added to the drawing at this time. Once the entire project has been "sketched" into Model Space, use the ARG tools found on the *CAD to ARG* Tool Palette [see *Section 18.1 – CAD to ARG Tool Palettes & ARG Attributes*] to add additional ARG Attributes as needed (i.e., fittings, hydrants or valves not GPS'd):

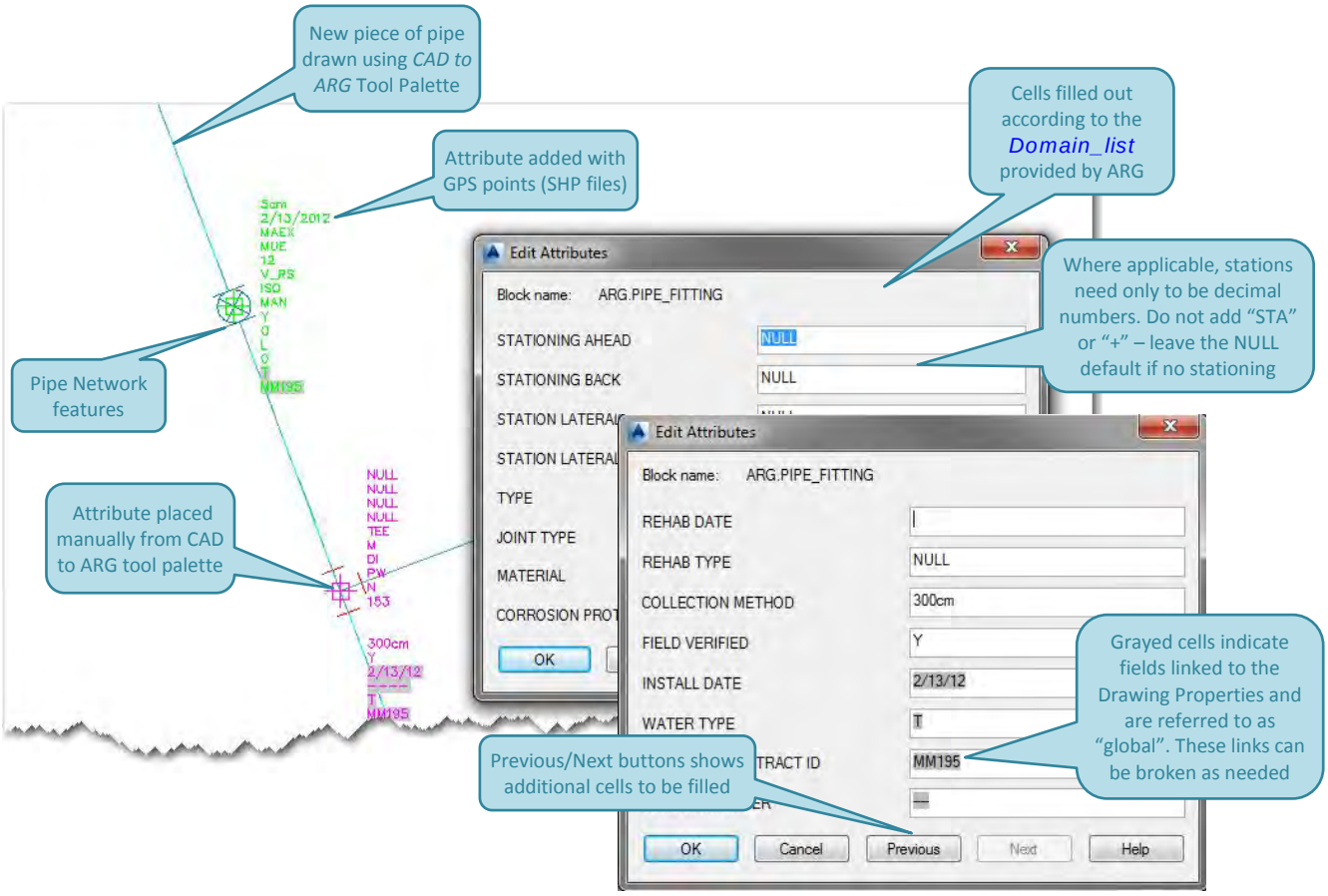


Keep these items in mind while adding ARG information:

- Water features must be designed in compliance with DW's Engineering and/or CPPM
- ARG's *Pipe Rules* and *Domain List* must be used when placing and populating ARG Attributes, this document can be found on the Asset Recording SharePoint Site
- ARG Attributes that were imported from SHP files with GPS points should not be moved if possible; adjust the Collection Method to 300cm in instances where locations have been adjusted (5cm should be maintained otherwise)
- For drafting purposes each ARG Attribute shall "break" the line/polyline that represents the water line, exceptions to this include the Access Opening and Fireline Taps – reference the *Pipe Rules* for compliance
- Pay close attention to referenced details, as these will give exact dimensions, locations, etc.
- Do not leave attribute fields blank – for example, if the manufacturer is not clear on valves, use "U" as the value instead
- The beginning and ending of projects should always have some kind of fitting/valve (i.e., buttstrap, etc.), and must be indicated with the appropriate ARG Attribute
- Blowoff Valve ARG Attributes have TNG (tangential) fittings, others will have SG_FLG_O (single flanged)
- Once the *CAD to ARG* tools have been used to create a line/polyline and/or polygonal the MATCHPROP command can be utilized on similar objects to maintain consistency
    - DO NOT use MATCHPROP on ARG Attributes
- ARG Attributes that have been placed by mistake (such as Connector Valve instead of Main Valve) must be removed and replaced with the correct ARG Attribute; changing the layer and/or values is not considered sufficient
- Always utilize OSNAP's; choose NODE when snapping to the center of ARG Attributes
- Make all "ARG" layers no-plot once finished

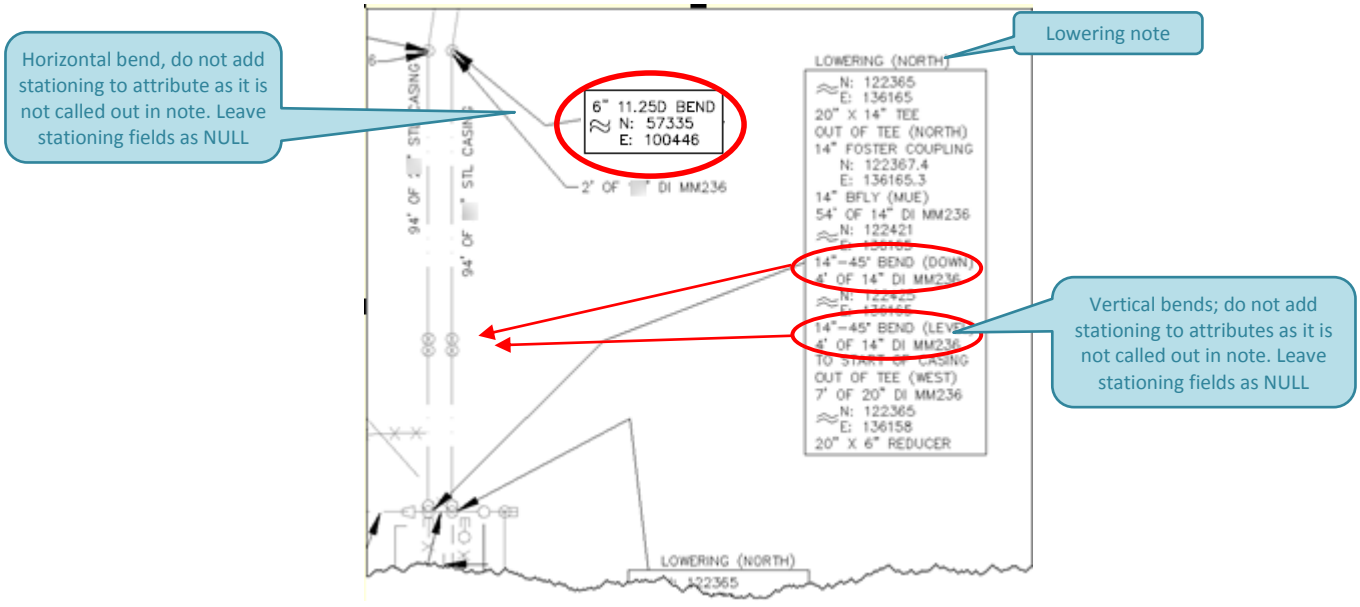
Placement of Line and Point Symbols

Using the XREF'd drawings, FDO base info, .shp files, and other available information, utilize the tools on the *CAD to ARG* Tool Palette to recreate the water line alignment, [see *Section 15.0 – Tool Palettes*]:



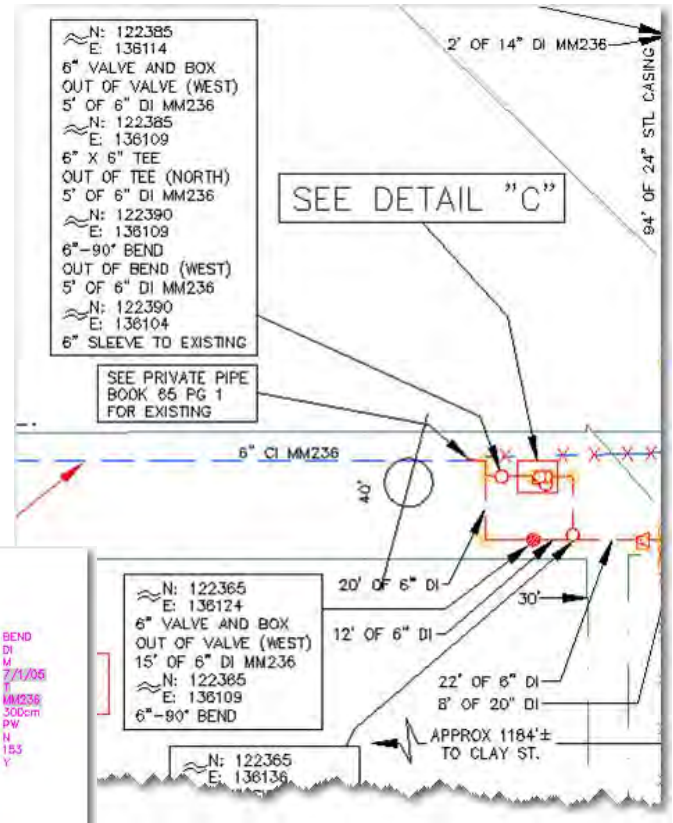
NOTE: Pipe Network features are drawn after ARG data on Private Pipe and Contractor installed jobs.

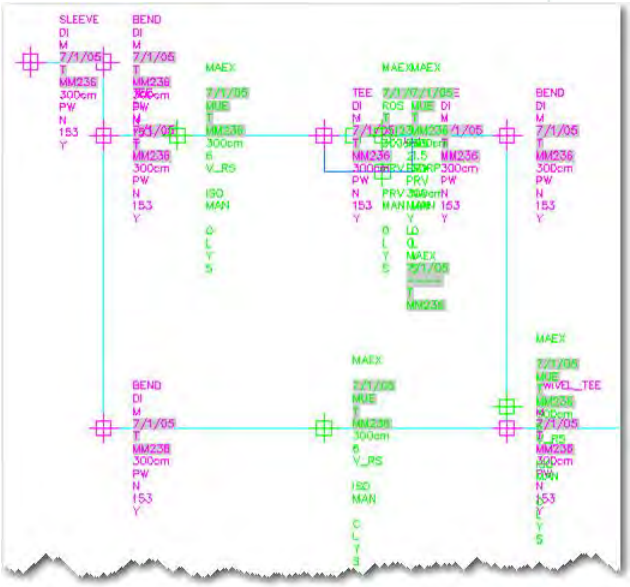
Continue along entire length of project utilizing the *CAD to ARG* Tool Palette. Pay close attention to the notes in the original/approved drawings and inspectors notes to add any vertical information:



Using the original/approved drawings and inspectors notes, begin recreating the "new" water line alignment, including all appurtenances. Be sure to use the appropriate tools\buttons from the *CAD to ARG* Tool Palette:

This example shows the original/approved drawing with the items to be attributed:





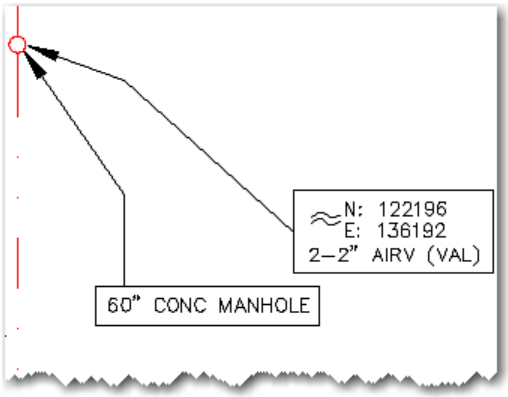
The example to the left shows what the ARG attributes will look like within Model Space once they have been populated.

Placement of Polygon Symbols

On the *CAD to ARG* Tool Palette, the **Polygon Symbols** tools will be used to represent vaults, manholes or other DW structures.

The most commonly used tool will be the **Enclosure** button and is used primarily for manholes and vaults. For a full explanation of the tools and buttons see *Section 18.1 – CAD to ARG Tool Palettes & ARG Attributes*.

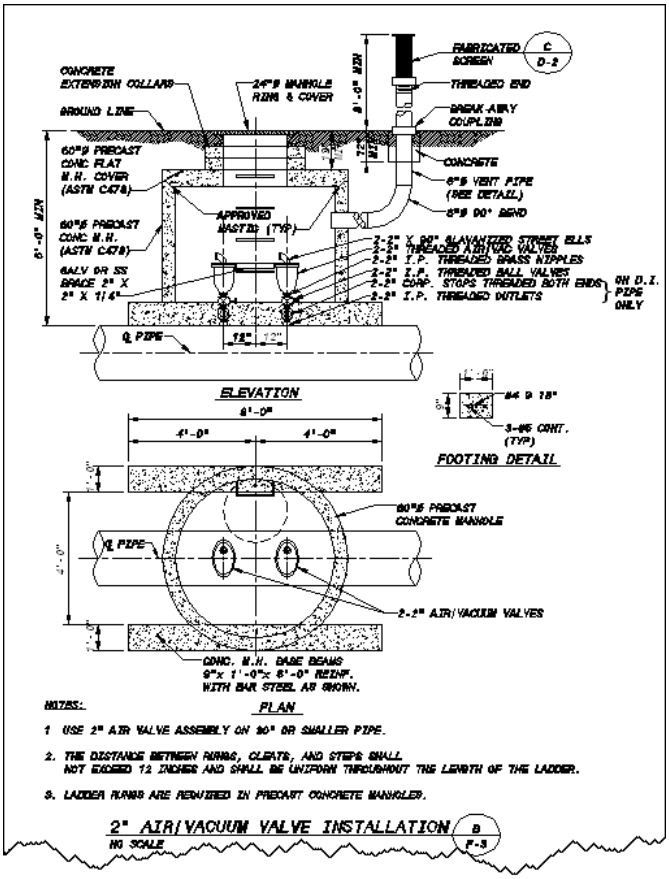
When drawings & details indicate the use of a manhole, the exact location in relation to the waterline and valves is very important. Review the detail referenced in the drawing, and place the polygon within the drawing according to the dimensions given. Keep in mind symbols in plan view may not be accurate and may be used solely for graphic representation.



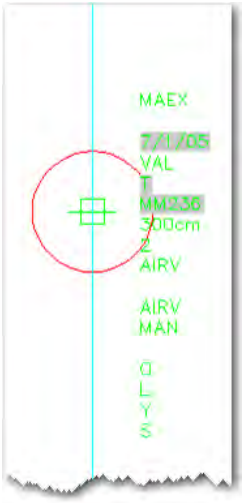
This example on the left shows 2 – 2" AIRV (VAL) and 60" CONC MANHOLE called out with notes

The example on right shows the corresponding detail of the 2" AIRV, place the polygon in drawing according to the detail.

Use the Enclosure button from the *CAD to ARG* Tool Palette. When prompted for *DW Structure Type* at the Command Line prompt, type **MH_60** (the number changes per size of manhole).



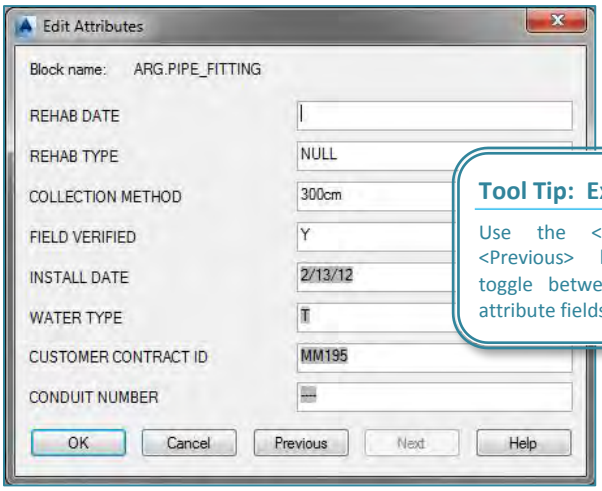
This example illustrates the polygon placement, with attributes, in Model Space:



Editing ARG Attributes

There are several ways to edit ARG Attributes, for an explanation of each value (stationing ahead, stationing back, etc…) [see *Section 18.1 – CAD to ARG Tool Palettes & ARG Attributes*].

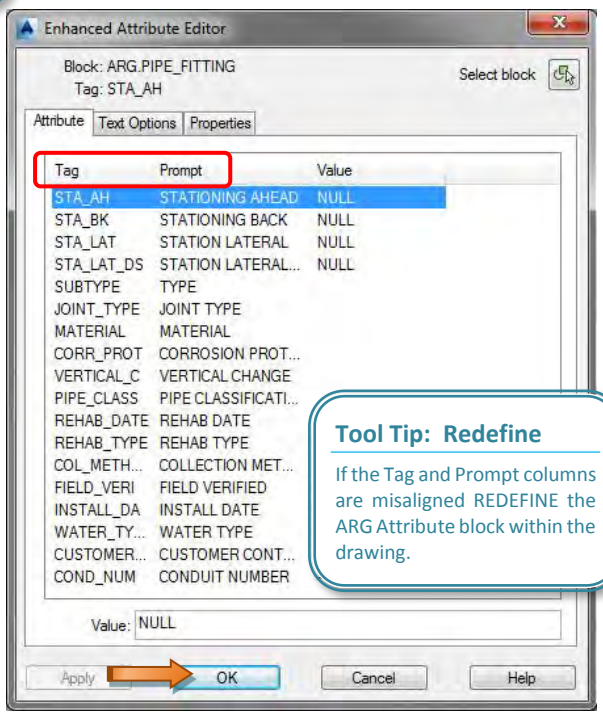
When an ARG Attribute is inserted into the drawing an *Edit Attributes* window pops up, it is best to fill out as much information as possible at this point:



Tool Tip: Extra Info

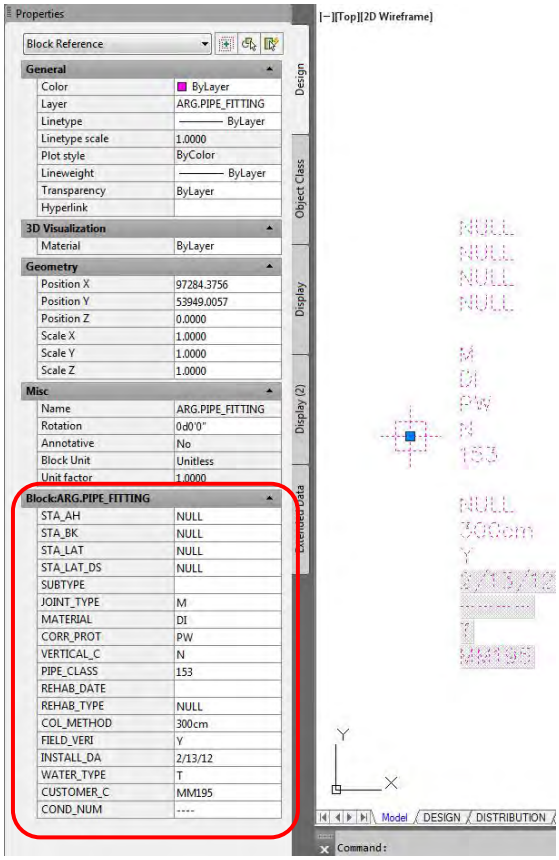
Use the <Next> and <Previous> buttons to toggle between multiple attribute fields.

Once the ARG Attribute has been placed, one option for editing is the AutoCAD EDIT command. This will bring up a window called Enhanced Attribute Editor. Simply click on the **Tag** to be updated and type the new information at the **Value** line:



Tool Tip: Redefine

If the Tag and Prompt columns are misaligned REDEFINE the ARG Attribute block within the drawing.

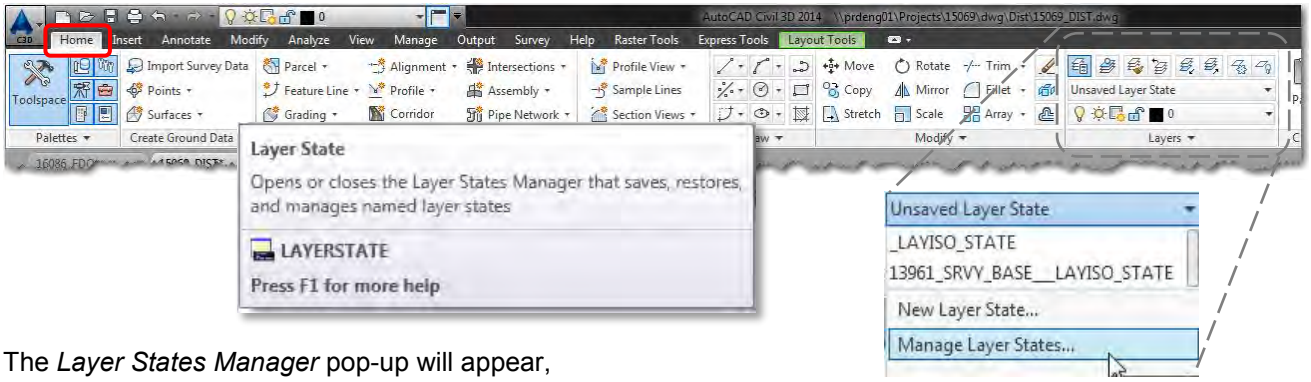


Another option for editing an ARG Attribute is to click the attribute once (showing only a grip edit) and to edit the information by using the AutoCAD *Properties* palette.

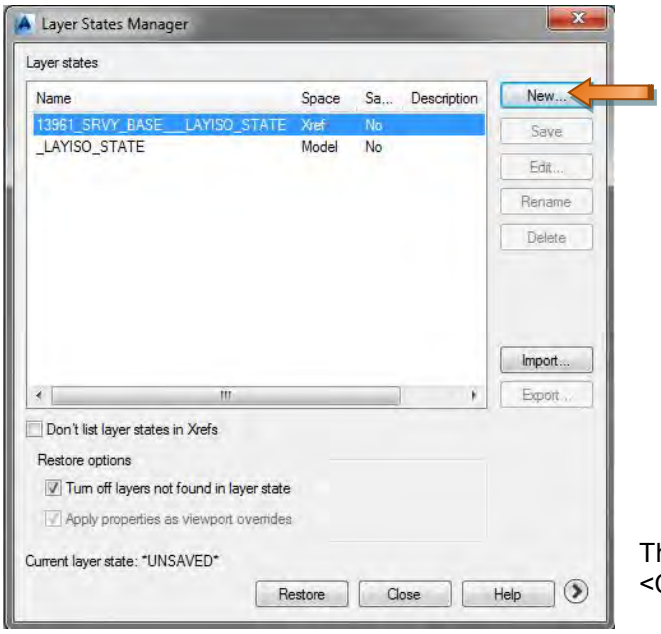
ARG Layer States

Layer States can be used to manage the ARG layers; Layer States are useful when using the Drawing Cleanup tool as described later in this document.

On the *Home* tab of the ribbon, on the *Layers* panel, select the *Layer State* pull-down and choose *Manage Layer States…*:



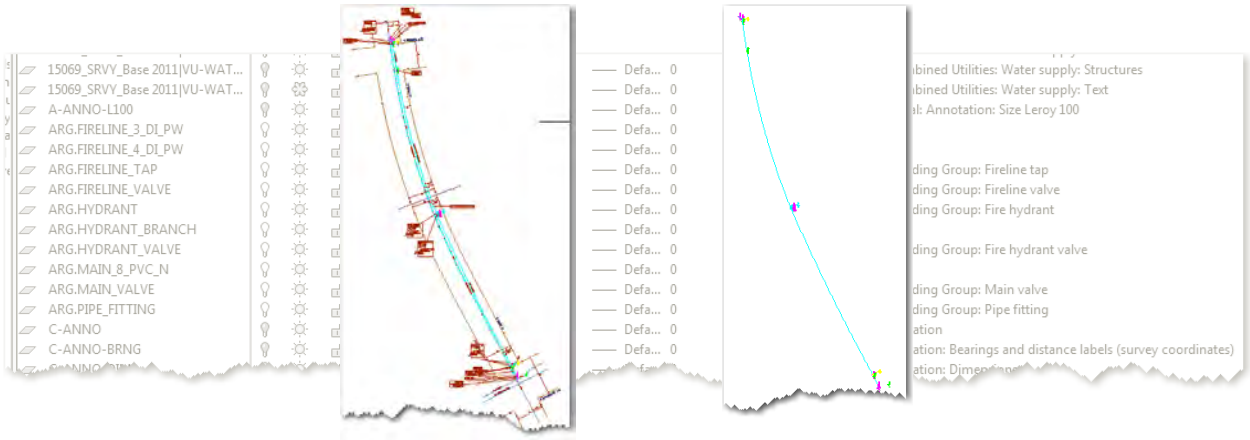
The *Layer States Manager* pop-up will appear, click <New…>:



The *New Layer State to Save* pop-up will appear, type the name in the *New layer state name field*, then click <OK>:

The *Layer States Manager* window will reappear, click <Close> when finished.

Within Model Space of the ARG drawing turn all layers off except those prefixed with "**ARG.**":



ARG Drawing Cleanup

In order for ARG to post to GIS properly it is critical for them to receive drawings that meet specific "connectivity" requirements. The Drawing Cleanup Tools [see *Section 17.3 – Drawing Cleanup Tools*] have been customized to work efficiently with ARG drawings.

Section 18.1

CAD to ARG Tool Palettes & ARG Attributes

Overview - Section 18.1

Internal Use: Full compliance

Contractor Use: Reference only

This Section describes the CAD to ARG Tool Palette(s), and the tools used to create ARG Drawings for posting DW information to GIS. This document contains information on how to properly add the lines, points and polygon features currently being collected for DW's SDE database. The use of these tool will automatically create the layers needed for ARG Drawings.

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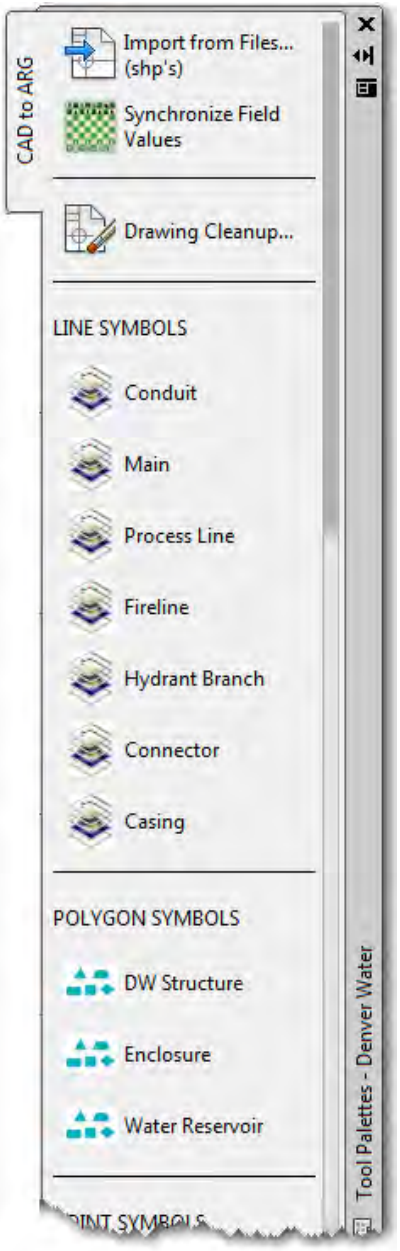
Palette Tools

The ARG tools, on the *CAD to ARG* Tool Palette, have been partitioned into four parts: the Supplemental AutoCAD tools, Line Symbols, Polygon Symbols, and Point Symbols.

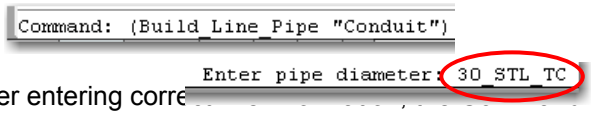
LINE SYMBOLS: Each button is intended for the construction of linework. And creates and sets the current line features as the current layer. Layers will be prefixed with ***ARG.*** and followed by CONDUIT, MAIN, FIRELINE, etc.

POLYGON SYMBOLS: Each button is intended to reflect the placement of a structure that is not otherwise shown using the LINE SYMBOLS or POINT SYMBOLS features.

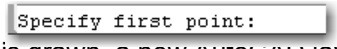


Supplemental AutoCAD tools:
Import from Files… (shp's), *Synchronize Field Values* and *Drawing Cleanup…* are described within this document.

LINE SYMBOLS: When prompted at the Command Line to *Enter pipe diameter*, type the size, material, & corrosion protection using the proper coding and separated with an underscore; <u>casing is to be drawn on top of Conduit, Main or other waterline</u>:



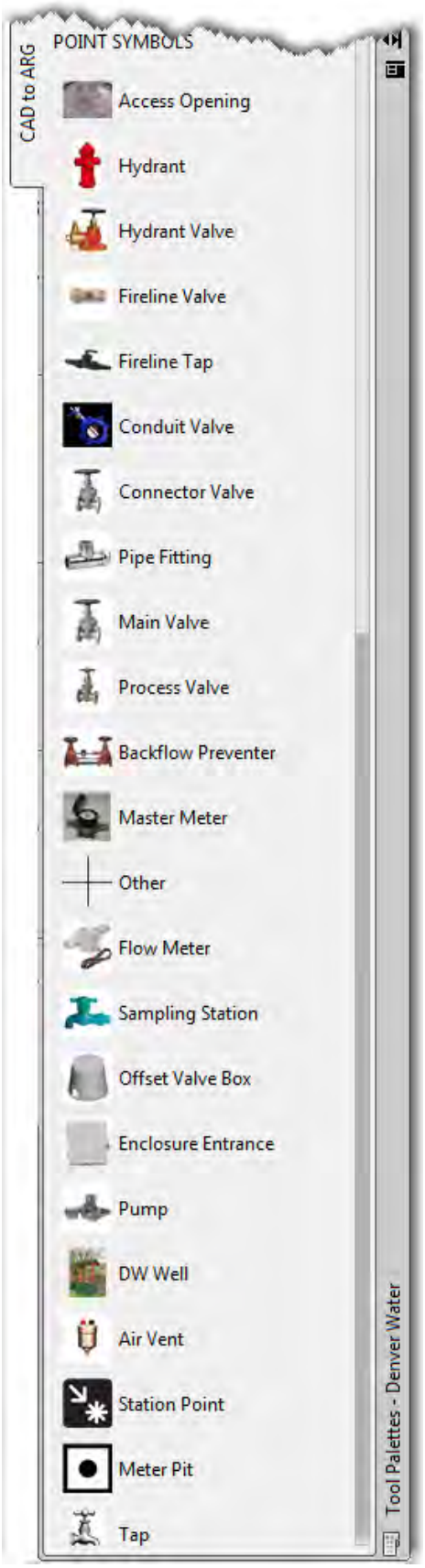
After entering corre
Line will prompt to *Specify first point*:



Once the line is drawn, a new AutoCAD layer will be created and become the current layer.

Hydrant Branch button does not prompt for pipe diameter, only *Specify first point*.

POINT SYMBOLS: Each button is intended for use when an appurtenance is delineated on the plan set and needs to be manually inserted. Each button inserts the block/attribute in the proper layer and opens an Edit Attributes window prompting the user to update relevant data.



POLYGON SYMBOLS: the Command Line will prompt to either *Enter DW Structure Type*, *Enter Enclosure Type* or *Enter Water Reservoir Type*. At this point use the correct coding or description to delineate what type of polygon feature is being represented:

```
Command: (Build_Facility "Enclosure")
Enter Enclosure Type: MH_60
```

After entering co
command line wi

```
Specify start point:
```

This will invoke the PLINE command. Be sure to draw a closed polyline with the proper dimensions, use the PEDIT command if

```
Command: _Pline
Specify start point:
Specify start point:
Current line-width is 0.0000
Specify next point or [Arc/Halfwidth/Length/Undo/Width]:
```

If the desired polygon shape is a circle (such as a manhole) then Esc out of the command, once prompted to *Specify start point*:

```
Command: _Pline
Specify start point:
Specify start point: *Cancel*
Command:
```

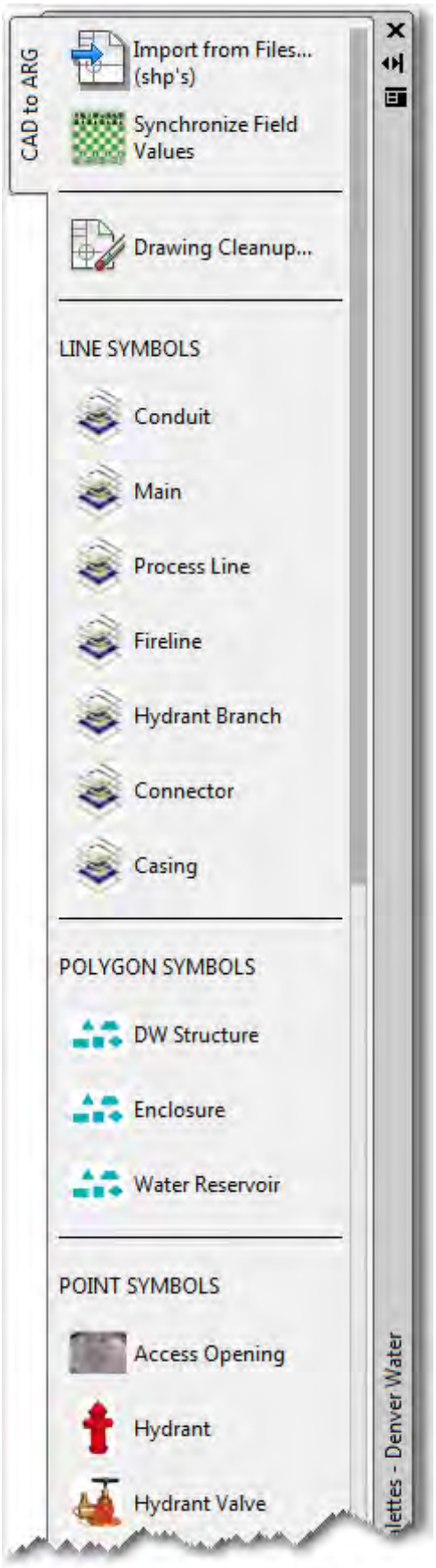
At this time the user can initiate the CIRCLE command and manually draw and place the polygon according to plans and details.

Tool Tip: Match Properties

To limit the number of keystrokes utilize the MATCHPROP command for layers that have been previously created in the drawing.

Button descriptions and Definitions

Each button on the CAD to ARG Tool Palette has a very specific function, accompanied with specific rules and guidelines that shall be followed at all times.



Import from files… (shp's): Imports an external file format into AutoCAD – allows user to import GPS points

Synchronize Field Values: Synchronizes values from the fields in the Drawing Properties to the ARG Attribute Tags, after importing points from the shape files. USE EXTREME CAUTION WITH THIS TOOL, as it may change what is currently in the drawing

Drawing Cleanup…: Performs drawing cleanup operations [see Section *18.4 – Drawing Cleanup Tool for ARG Drawings*]

Conduit: Only for conduit pipe (typically 24 inch or larger pipe), must have a Conduit Number

Main: Distribution pipe beyond the connection point of a connector valve, or outlet valve off conduit pipe (typically smaller than 24 inch diameter)

Process Line: Used for Drain, Wash, Solids, Sampling and Chemical Lines

Fireline: Typically 4 inch and larger line. Placed as laterals to mains or occasionally to connectors and conduits (goes into buildings for fire protection)

Hydrant Brach: Pipe line from fitting on mains, connector or conduits, leading from fire hydrant valve to hydrant (typically 6" dia.)

Connector: Pipe from fitting on conduit (outlet, tap, etc…) to connector valve. Also used with all blow offs

Casing: Line feature to be drawn on top of pipe, indicating use of casing or tunnel

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DW Structure: Used for Building, Pump Station, Recreation Structures (has address)

Enclosure: Used for Vaults, Manholes, Cabinets, and Tanks (Examples: PRV's, BFLY's, Fiber Optic, Backflow Preventers, Electric, and Storage)

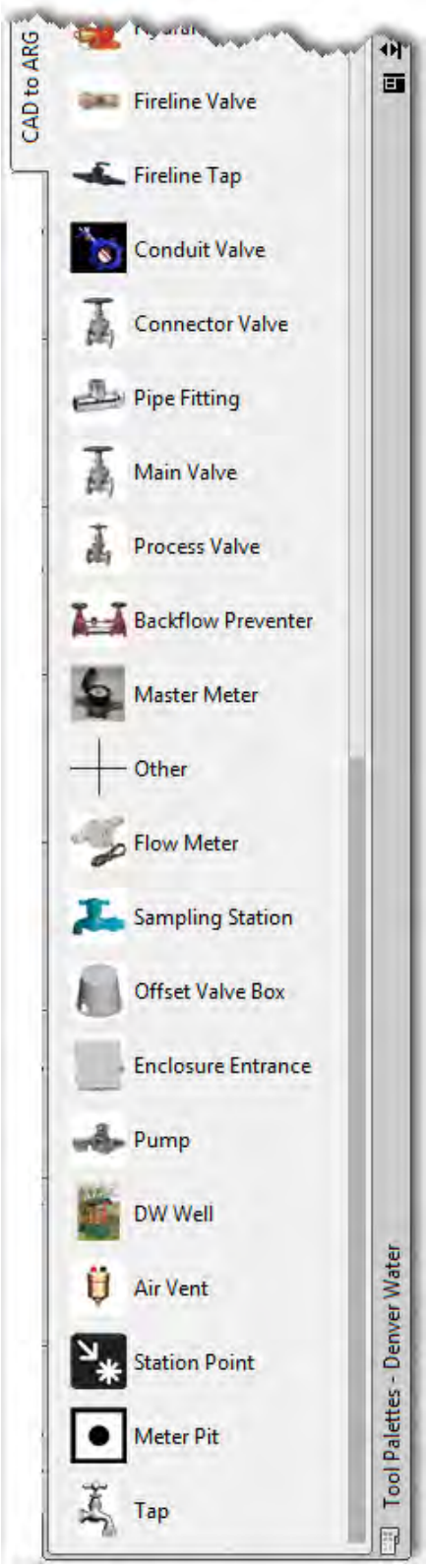
Water Reservoir: Used for Treated, Raw and Recycle Reservoirs

---

Access Opening: Access opening or standpipe, does not break conduit, connector or main lines (snaps to continuous polyline)

Hydrant: Fire hydrants, place feature at end of Hydrant Branch line

Hydrant Valve: Tap valve or gate valve, breaks Hydrant Branch line



Fireline Valve: Tap valve or gate valve, breaks Fireline pipe

Fireline Tap: Tapping feature for Fireline or large domestic pipe. Placed on mains, connectors or conduits like a fitting, however it does not break the main

Conduit Valve: Any valve on a conduit line. Examples: BFLY, AIRV, PITO, V, V_RS, etc…; does not break the conduit

Connector Valve: All Blow off valves and any valve that is offset from conduit, such as an outlet valve or the first valve off conduit at the end of connector pipe. Also used in Pump station and Water Treatment Plant areas; breaks the main

Pipe Fitting: Used to connect two or more pieces of pipe that is not otherwise connected with a valve or other feature (ex. BEND, R, SG_FLG_O, WYE, CRS, etc…), breaks the main

Main Valve: Any valve on a Main line, except a BO or MBO and except where the line is Main and Connector; breaks the main

Process Valve: Used with Drain, Wash, Solids, Sampling and Chemical Lines; breaks the main

Backflow Preventer: Allows water to flow only one direction, often to keep recycle water from flowing back into treated water. Breaks the Main, Connector or Conduit lines

Master Meter: Meters the water going into a district, allows water to flow only one direction. Breaks the Main, Connector or Conduit lines

Other: Distribution Engineering place holder

Flow Meter: Measures the water flow, usually near treatment plant or pump station. Breaks the Conduit or Connector line

Sampling Station: GPS'd, not from drawing, represents the a general location of Water Quality sampling location

Offset Valve Box: GPS'd, not from drawings. Surface feature is the Valve Box but not directly over valve, directly over operator of the valve, usually BFLY

Enclosure Entrance: GPS'd, not from drawings. Surface feature usually ring and cover or hatch door for Manhole or Vault

Pump: Usually placed on Connector line in Pump Station area, pumps do break the line, separates Suction and Discharge lines

DW Well: Point feature indicating a DW well, this would have piping coming from this feature that is Non-potable

Air Vent: GPS'd not from drawings. Surface feature is the vent for a vault, (usually for Air Valves) Industrial or Residential see Engineering Standards

Station Point: Place holder for stationing, delineates the beginning and end stations of casing. Another example would be Ahead and Back station if you are not at a bend or other feature (EQN STA); does not break the line

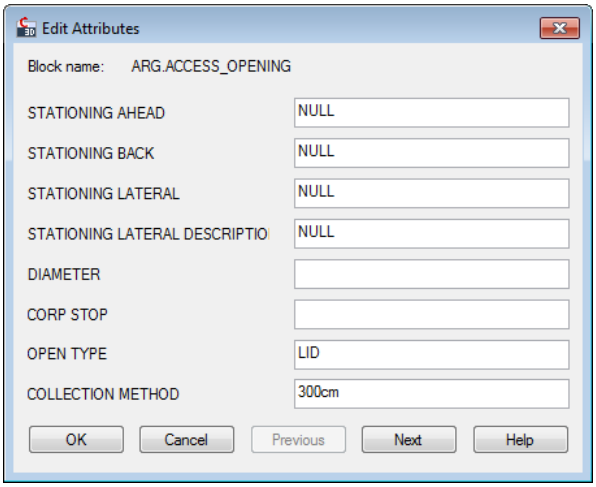
Meter Pit: GPS'd, not from drawings. There are minimal attributes with this feature because its main purpose in GIS is to provide a location and identifier number to link to exterior databases maintained by other departments

Tap: GPS'd, not from drawings. There are minimal attributes with this feature because its main purpose in GIS is to provide a location and identifier number to link to exterior databases maintained by other departments

ARG Attributes

The following describes each ARG Attribute along with the expected results for each field.

Access Opening (Standpipe or Casing Vent)



STATIONING AHEAD: default of NULL - ahead stationing on conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

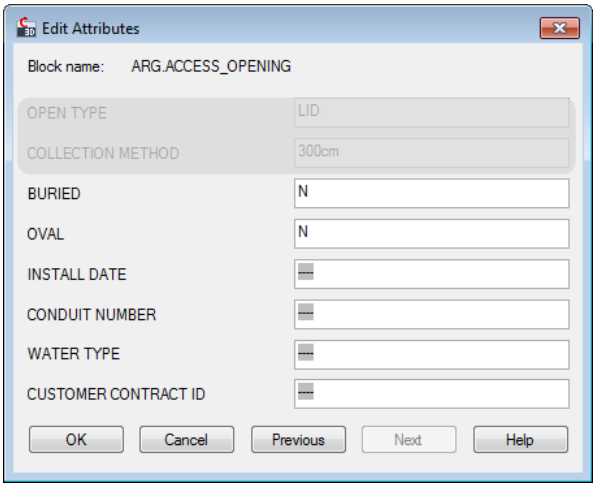
STATIONING BACK: default of NULL - back stationing on conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATIONING LATERAL: default of NULL - station on crossing conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATIONING LATERAL DESCRIPTIO: default of NULL - crossing conduit number or DIA PFW or NPW (all caps, no punctuation - Ex. COND NO 94 or PFW-22681)

DIAMETER: (number field) 18, 20, etc…

CORP STOP: Y or N



OPEN TYPE: default of LID

COLLECTION METHOD: default of 300cm

BURIED: default of N; if no manhole change to Y

OVAL: default of N; change to Y if it is an oval shape

INSTALL DATE: global entry from Drawing Properties

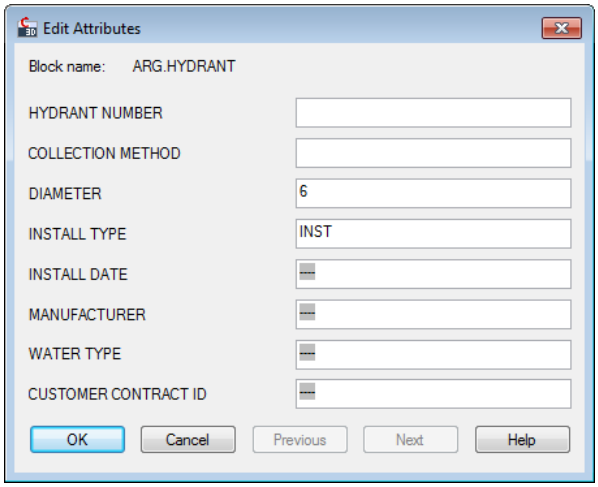
CONDUIT NUMBER: global entry from Drawing Properties; no text - number field only

WATER TYPE: global entry from Drawing Properties; T=Treated, R=Raw Water, RC=Recycle

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

NOTE: If the Access Opening is in the same manhole with an Air Vale there will not be any stationing.

Hydrant (Districts do not have hydrant numbers)



HYDRANT NUMBER: assigned number

COLLECTION METHOD: 5cm or 300cm

DIAMETER: default of 6

INSTALL TYPE: default of INST

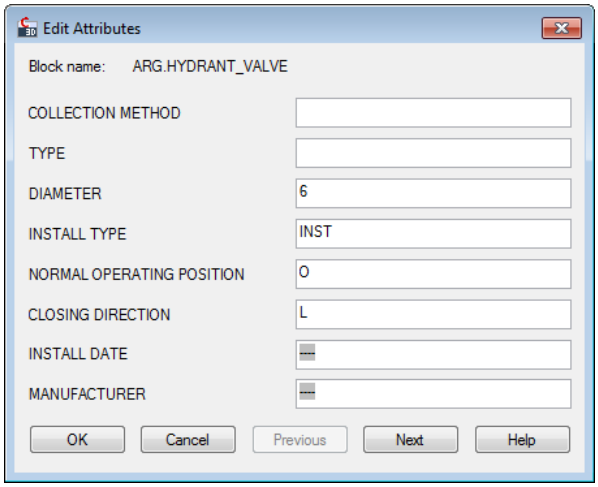
INSTALL DATE: global entry from Drawing Properties

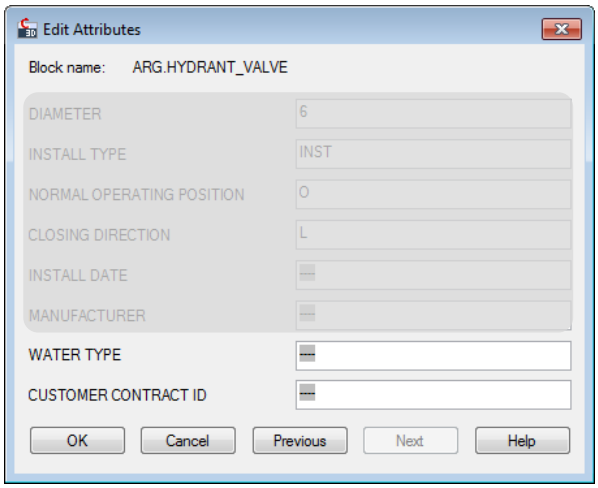
MANUFACTURER: global entry from Drawing Properties, found on plans or in specs

WATER TYPE: global entry from Drawing Properties; T=Treated, R=Raw Water, RC=Recycle

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

Hydrant Valve





COLLECTION METHOD: 5cm or 300cm

TYPE: V=Valve, V_RS=Valve Resilient Seat, TV=Tapping Valve, TV_RS=Tapping Valve Resilient Seat, etc…

DIAMETER: default of 6

INSTALL TYPE: default of INST

NORMAL OPERATING POSITION: default of O

CLOSING DIRECTION: default of L; always L unless recycled water & MM31 (all corps are L, even on Recycle)

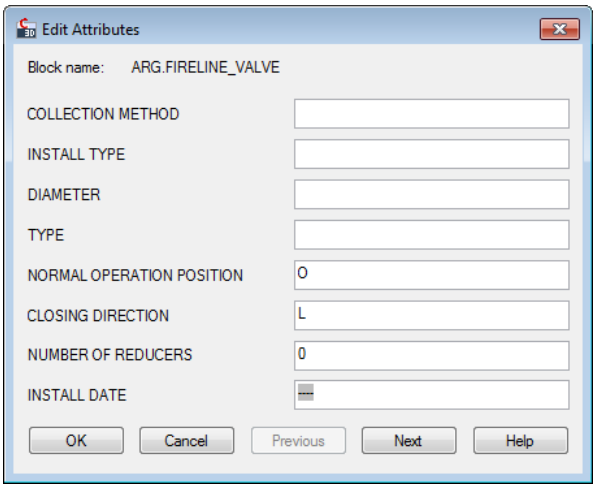
INSTALL DATE: global entry from Drawing Properties

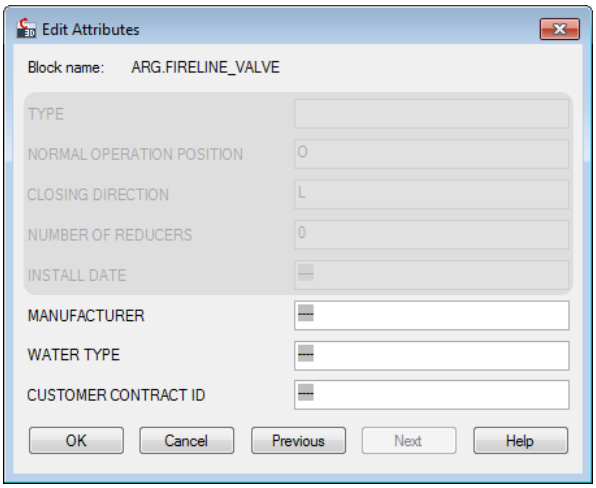
MANUFACTURER: global entry from Drawing Properties, found on plans or in specs

WATER TYPE: global entry from Drawing Properties; T=Treated, R=Raw Water, RC=Recycle

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

Fireline Valve (Usually on distribution lines, not conduits)





COLLECTION METHOD: 5cm or 300cm

INSTALL TYPE: SPKR, DOMC for Domestic or SCSC for first valve off main that has both Sprinkler and Domestic

DIAMETER: size of valve (use decimal number instead of fraction)

TYPE: V=Valve, V_RS=Valve Resilient Seat, TV=Tapping Valve, TV_RS=Tapping Valve Resilient Seat, etc…

NORMAL OPERATION POSITION: default of O

NUMBER OF REDUCERS: default of 0; change to numerical value based upon how many reducers the valve has

INSTALL DATE: global entry from Drawing Properties

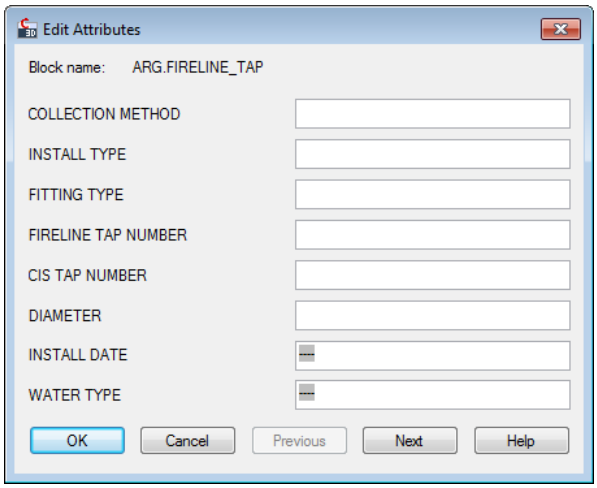
MANUFACTURER: global entry from Drawing Properties, found on plans or in specs

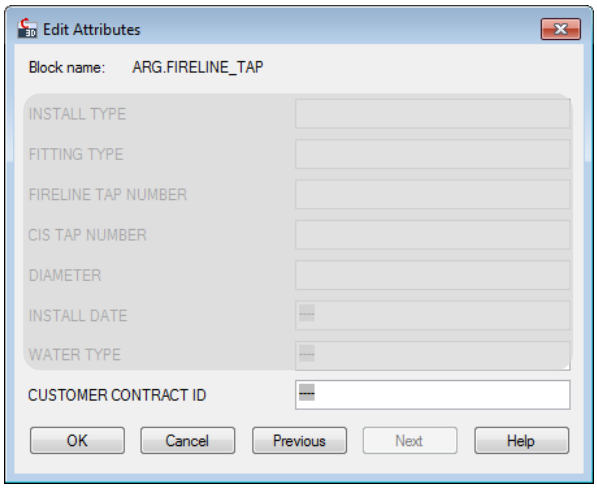
WATER TYPE: global entry from Drawing Properties; T=Treated, R=Raw Water, RC=Recycle

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

CLOSING DIRECTION: default of L; always L unless recycled water & MM31; use NA for AIRV, PITO & PRV's (all corps are L, even on Recycle)

Fireline Tap (Usually on distribution lines, not conduits)





COLLECTION METHOD: 5cm or 300cm

INSTALL TYPE: SPKR, DOMC for Domestic or SCSC for first valve off main that has both Sprinkler and Domestic

FITTING TYPE: TEE, TAPSLV, SWIVEL_TEE, TAPSAD, WELD, CORP, SING_FLAN_OUT, etc…

FIRELINE TAP NUMBER: assigned by Sales Administration - Plan Review Coordinator or Tap Sales Rep. (SPKR)

CIS TAP NUMBER: assigned by Sales Administration - Plan Review Coordinator or Tap Sales Rep. (DOMC)

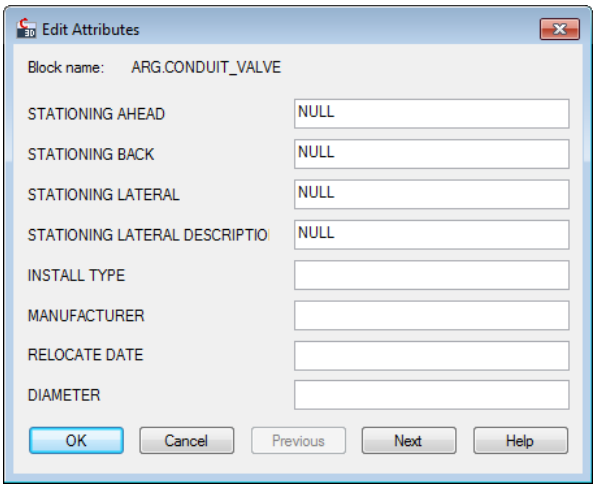
DIAMETER: size of tap (use decimal number instead of fraction)

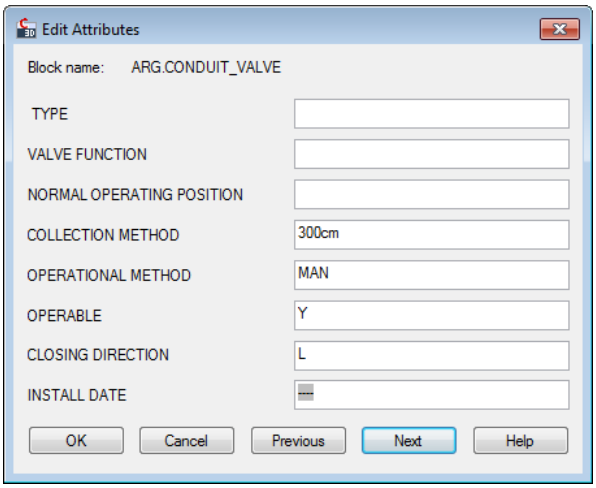
INSTALL DATE: global entry from Drawing Properties

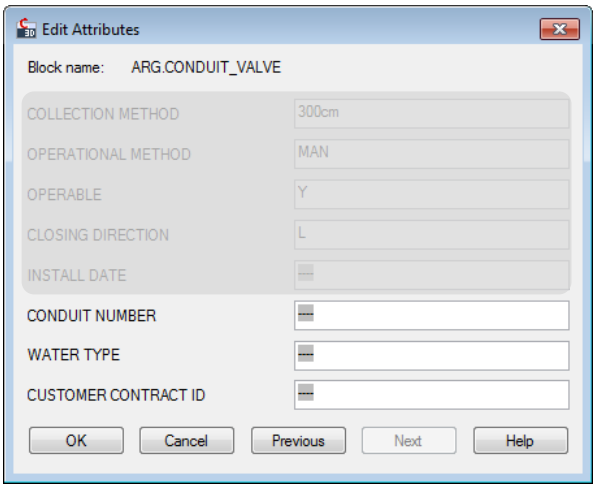
WATER TYPE: global entry from Drawing Properties; T=Treated, R=Raw Water, RC=Recycle

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

Conduit Valve







STATIONING AHEAD: default of NULL - ahead stationing on conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATIONING BACK: default of NULL - back stationing on conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATIONING LATERAL: default of NULL - station on crossing conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATIONING LATERAL DESCRIPTIO: default of NULL - crossing conduit number or DIA PFW or NPW (all caps, no punctuation. - Ex. COND NO 94 or PFW-22681)

INSTALL TYPE: who did the contract: CONT or DWD

MANUFACTURER: found on plans or in specs

RELOCATE DATE: date the existing valve was moved to a new location

DIAMETER: size of valve (use decimal number instead of fraction)

TYPE: AIRV, BFLY, PITO, V, V_RS, etc…

VALVE FUNCTION: ISO, STUB, etc…

NORMAL OPERATING POSITION: O for Open, C for Closed (use NA for AIRV, PITO & PRV's)

COLLECTION METHOD: default of 300cm, GPS collection will over ride default

OPERATIONAL METHOD: default of MAN (AUTO for AIRV & PRV; NA for Pitot; REMOTE for SCADA)

OPERABLE: default of Y; change to N if Buried or inoperable (Use NA for AIRV, PITO & PRV's)

CLOSING DIRECTION: default of L; always L unless recycled water & MM31; use NA for AIRV, PITO & PRV's (all corps are L, even on Recycle)

INSTALL DATE: global entry from Drawing Properties

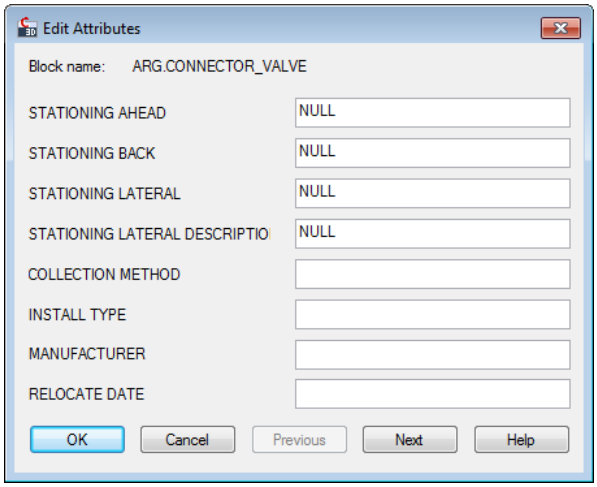
CONDUIT NUMBER: global entry from Drawing Properties, no text - number field only

WATER TYPE: global entry from Drawing Properties;

T=Treated, R=Raw Water, RC=Recycle

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

Connector Valve



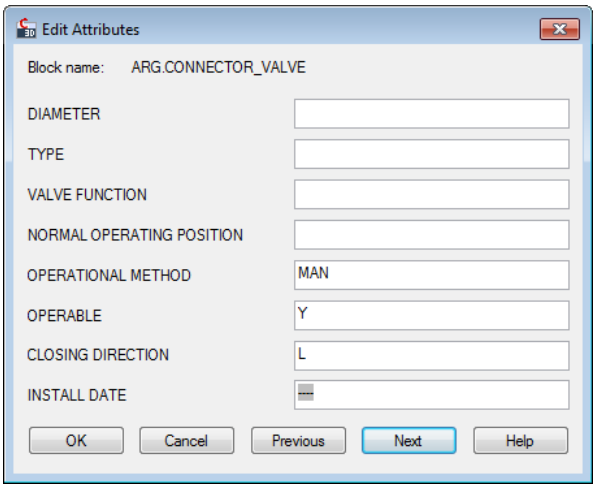
STATIONING AHEAD: default of NULL - ahead stationing on conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATIONING BACK: default of NULL - back stationing on conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATIONING LATERAL: default of NULL - station on crossing conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATIONING LATERAL DESCRIPTIO: default of NULL - crossing conduit number or DIA PFW or NPW (all caps, no punctuation. - Ex. COND NO 94 or PFW-22681)

COLLECTION METHOD: 5cm or 300cm



INSTALL TYPE: MAEX, IMPR, RELO, SYST, VALV, etc…

MANUFACTURER: found on plans or in specs

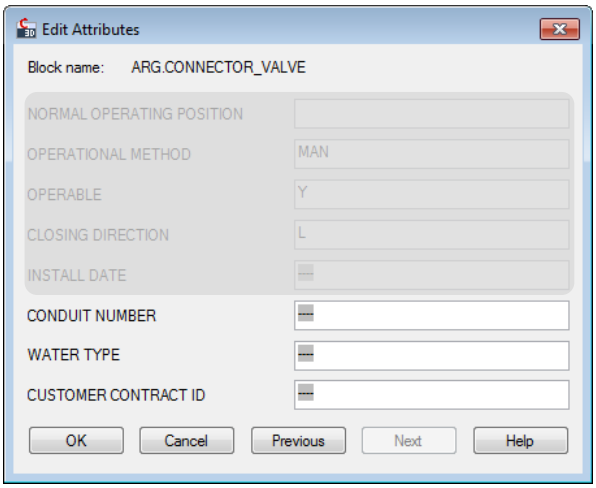
RELOCATE DATE: date the existing valve was moved to a new location.

DIAMETER: size of valve (use decimal number instead of fraction)

TYPE: BO, V, V_RS, TV, etc…

VALVE FUNCTION: BO, ISO, PRV, STUB, etc…

NORMAL OPERATING POSITION: O for Open, C for Closed (use NA for AIRV, PITO & PRV's)



OPERATIONAL METHOD: default of MAN (AUTO for AIRV & PRV; NA for Pitot; REMOTE for SCADA)

OPERABLE: default of Y; change to N if Buried or inoperable (Use NA for AIRV, PITO & PRV's)

CLOSING DIRECTION: default of L; always L unless recycled water & MM31; use NA for AIRV, PITO & PRV's (all corps are L, even on Recycle)

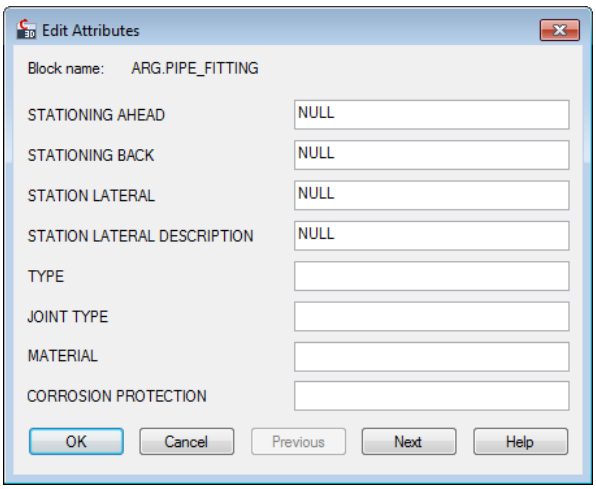
INSTALL DATE: global entry from Drawing Properties

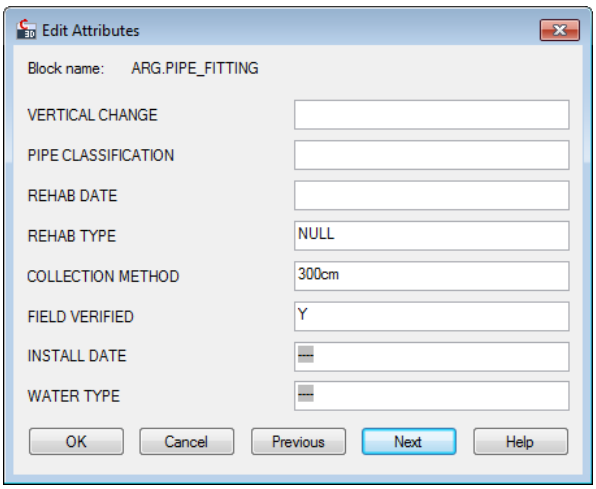
CONDUIT NUMBER: global entry from Drawing Properties, no text - number field only

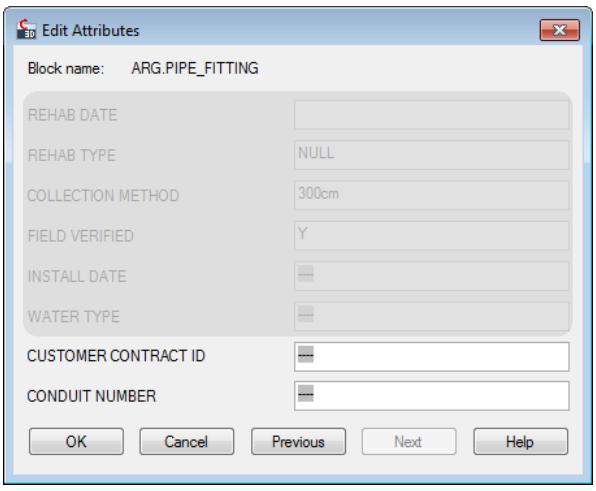
WATER TYPE: global entry from Drawing Properties; T=Treated, R=Raw Water, RC=Recycle

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

Pipe Fitting







STATIONING AHEAD: default of NULL - ahead stationing on conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATIONING BACK: default of NULL - back stationing on conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATION LATERAL: default of NULL - station on crossing conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATION LATERAL DESCRIPTION: default of NULL - crossing conduit number or DIA PFW or NPW (all caps, no punctuation. - Ex. COND NO 94 or PFW-22681)

TYPE: BEND, P, SG_FLG_O, R, TEE, etc…

JOINT TYPE: L, M, R, etc… - NA on Conduit pipe

MATERIAL: CI, CONC, DI, etc…

CORROSION PROTECTION: N, P, U, PW, etc…

VERTICAL CHANGE: Y or N

PIPE CLASSIFICATION: 50, 51, 150, etc…

REHAB DATE: mm/dd/yyyy

REHAB TYPE: default of Null - CML, CLN, EP, etc…

COLLECTION METHOD: default of 300cm, GPS collection will over ride default

FIELD VERIFIED: default of Y, always

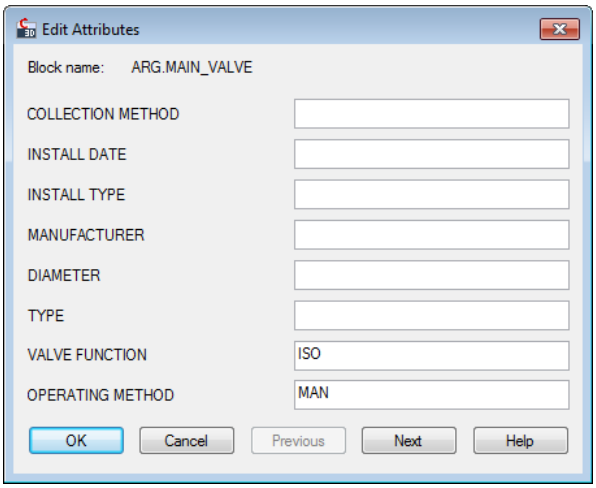
INSTALL DATE: global entry from Drawing Properties

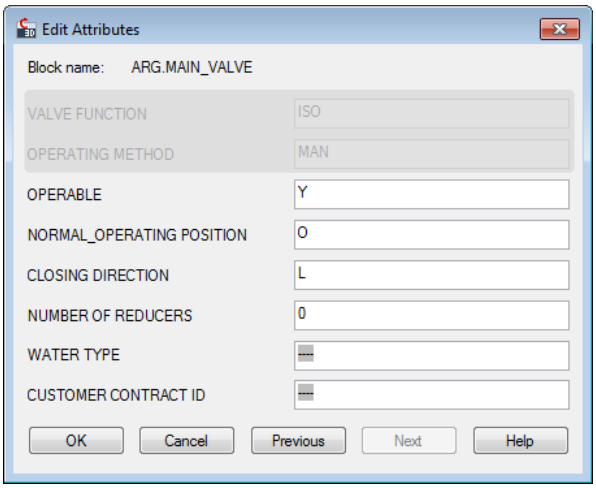
WATER TYPE: global entry from Drawing Properties; T=Treated, R=Raw Water, RC=Recycle

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

CONDUIT NUMBER: global entry from Drawing Properties, no text - number field only; fill this in only if the fitting has a Station Ahead or Station Back

Main Valve





COLLECTION METHOD: 5cm or 300cm

INSTALL DATE: found on plans - mm/dd/yyyy

INSTALL TYPE: MAEX, IMPR, RELO, SYST, VALV, etc…

MANUFACTURER: found on plans or in specs

DIAMETER: size of valve (use decimal number instead of fraction)

TYPE: V, V_RS, BFLY, TV, TV_RS, etc…

VALVE FUNCTION: default of ISO; STUB, PRV, CHK, NA)

OPERATING METHOD: default of MAN (AUTO for AIRV & PRV; NA for Pitot; REMOTE for SCADA)

OPERABLE: default of Y; change to N if Buried or inoperable (Use NA for AIRV, PITO & PRV's)

NORMAL_OPERATING POSITION: default of O for Open, if Closed change to C (use NA for AIRV, PITO & PRV's)

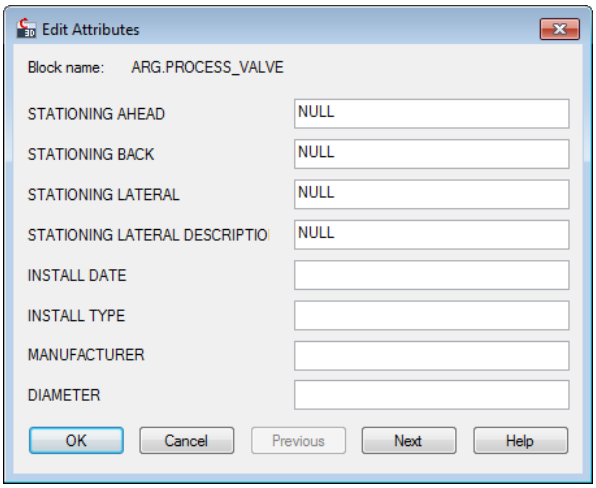
CLOSING DIRECTION: default of L; always L unless recycled water & MM31; use NA for AIRV, PITO & PRV's (all corps are L, even on Recycle)

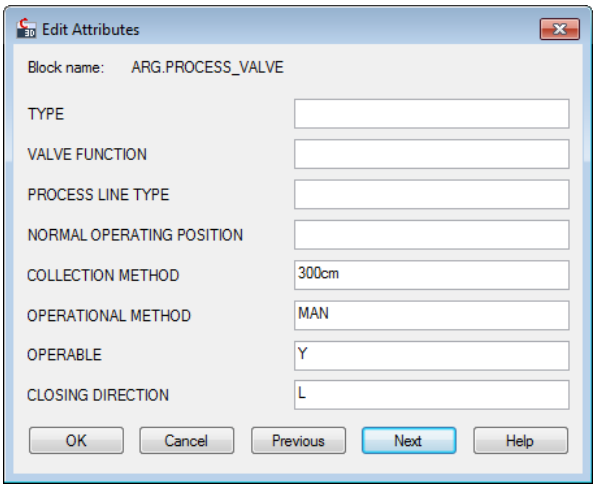
NUMBER OF REDUCERS: default of 0; change to numerical value based upon how many reducers the valve has

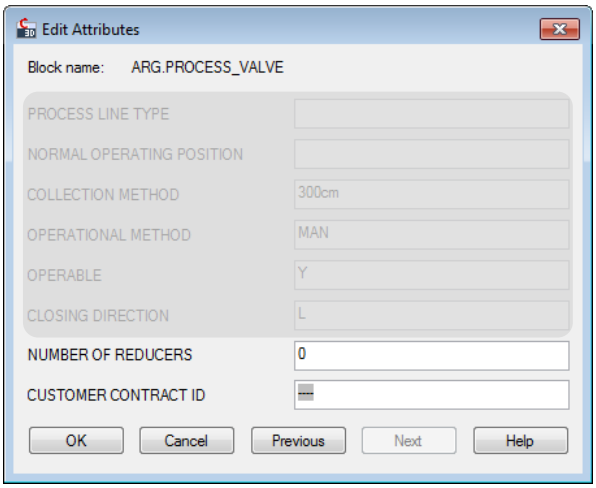
WATER TYPE: global entry from Drawing Properties; T=Treated, R=Raw Water, RC=Recycle

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

Process Valve







STATIONING AHEAD: default of NULL - ahead stationing on conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATIONING BACK: default of NULL - back stationing on conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATIONING LATERAL: default of NULL - station on crossing conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATIONING LATERAL DESCRIPTIO: default of NULL - crossing conduit number or DIA PFW or NPW (all caps, no punctuation. - Ex. COND NO 94 or PFW-22681)

INSTALL DATE: found on plans – mm/dd/yyyy

INSTALL TYPE: MAEX, IMPR, RELO, SYST, VALV, etc…

MANUFACTURER: found on plans or in specs

DIAMETER: size of valve (use decimal number instead of fraction)

TYPE: V, V_RS, BFLY, TV, TV_RS, etc…

VALVE FUNCTION: NA, BO, ISO, PRV, STUB, etc…

PROCESS LINE TYPE: Drain Line, Solids Line, Chemical, etc…

NORMAL OPERATING POSITION: O for Open, C for Closed (use NA for AIRV, PITO & PRV's)

COLLECTION METHOD: default of 300cm, GPS collection will over ride default

OPERATIONAL METHOD: default of MAN (AUTO for AIRV & PRV; NA for Pitot; REMOTE for SCADA)

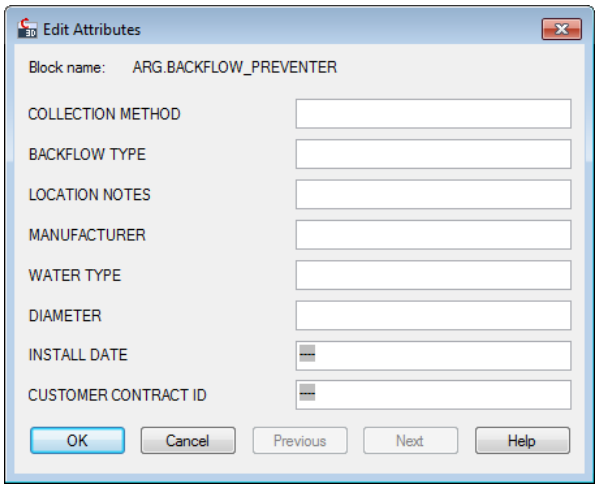
OPERABLE: default of Y; change to N if Buried or inoperable (Use NA for AIRV, PITO & PRV's)

CLOSING DIRECTION: default of L; always L unless recycled water & MM31; use NA for AIRV, PITO & PRV's (all corps are L, even on Recycle)

NUMBER OF REDUCERS: default of 0; change to numerical value based upon how many reducers the valve has

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

Backflow Preventer



COLLECTION METHOD: 5cm or 300cm

BACKFLOW TYPE: AIRGAP, DBLCHK, RPZ, AVB, SVB, PVB

LOCATION NOTES: Description

MANUFACTURER: from Source

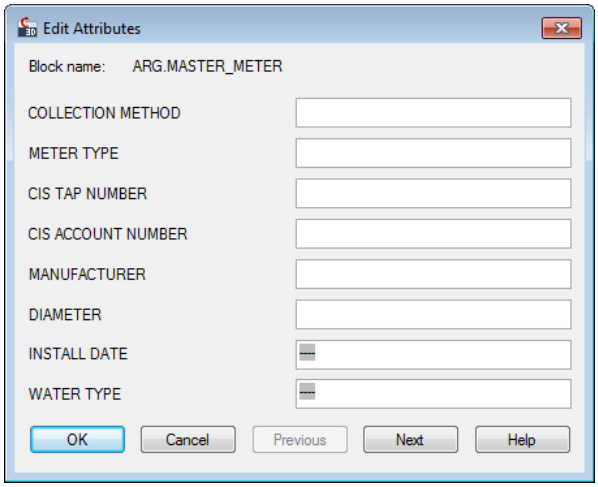
WATER TYPE: T=Treated, R=Raw Water, RC=Recycle

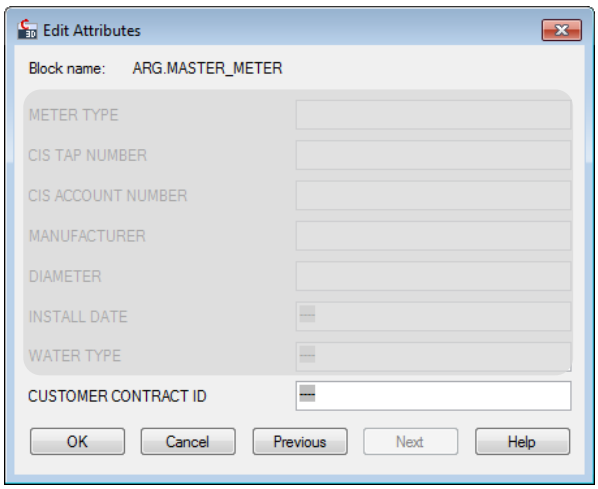
DIAMETER: size of backflow (use decimal number instead of fraction)

INSTALL DATE: global entry from Drawing Properties

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

Master Meter





COLLECTION METHOD: 5cm or 300cm

METER TYPE: U, FMCT, COMP, TURB, FM, CUS

CIS TAP NUMBER: premise number, if available

CIS ACCOUNT NUMBER: see Asset Recording for information

MANUFACTURER: from Source

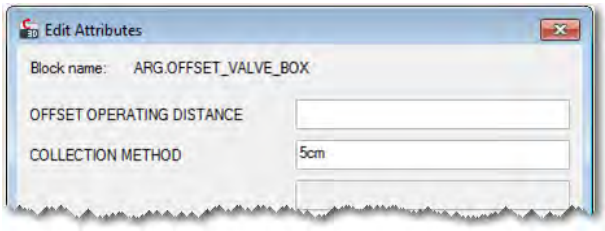
DIAMETER: size of meter (use decimal number instead of fraction)

INSTALL DATE: global entry from Drawing Properties

WATER TYPE: global entry from Drawing Properties; T=Treated, R=Raw Water, RC=Recycle

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

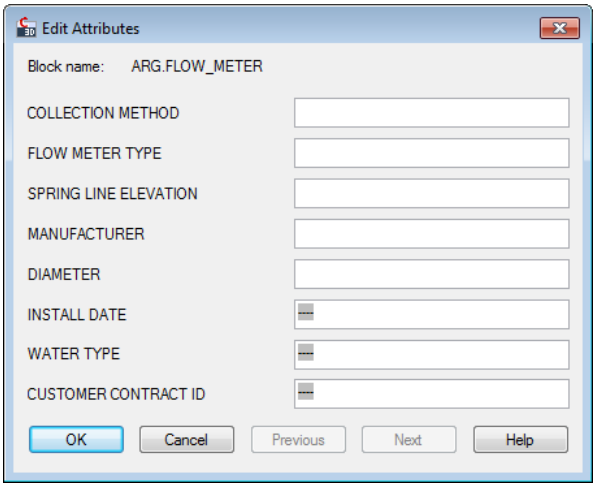
Other (Placeholder for Distribution Engineering)



SUBTYPE: see Asset Recording for information

NORMAL OPERATING POSITION: O for Open, C for Closed (use NA for AIRV, PITO & PRV's)

Flow Meter



COLLECTION METHOD: 5cm or 300cm

FLOW METER TYPE: Sonic, Venturi, Mag, U

SPRING LINE ELEVATION: per as-built or survey only

MANUFACTURER: from Source

DIAMETER: size of meter (use decimal number instead of fraction)

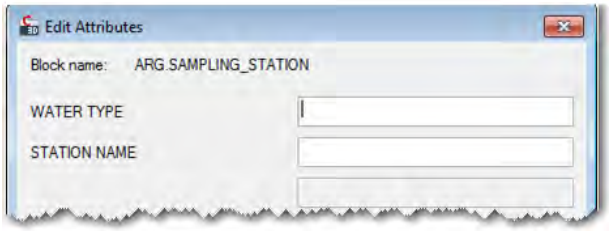
INSTALL DATE: global entry from Drawing Properties

WATER TYPE: global entry from Drawing Properties; T=Treated, R=Raw Water, RC=Recycle

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

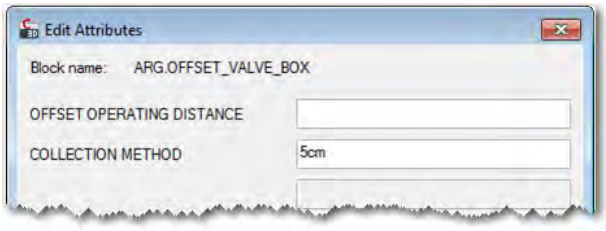
Sampling Station

WATER TYPE: T=Treated, R=Raw Water, RC=Recycle



STATION NAME: Name comes from LIMS database in Water Quality

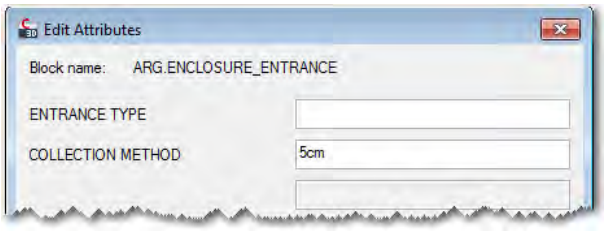
Offset Valve Box



OFFSET OPERATING DISTANCE: see detail drawing

COLLECTION METHOD: Default of 5cm

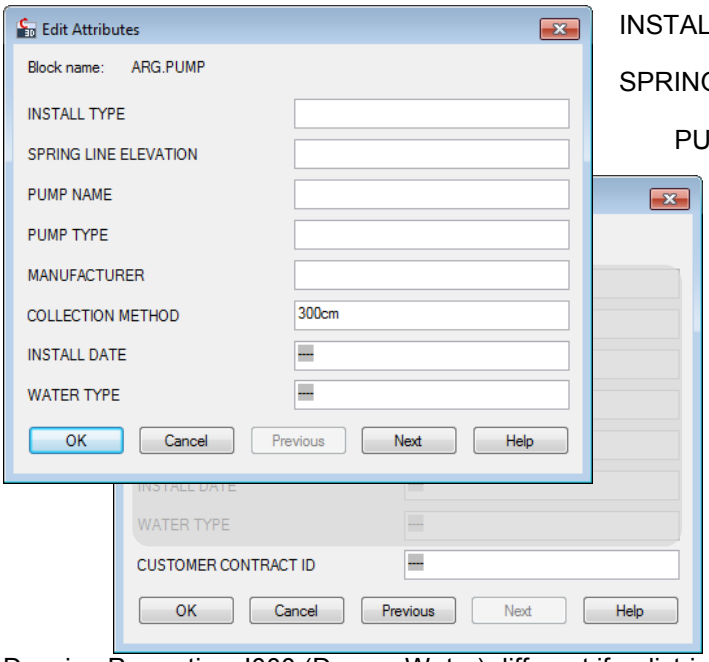
Enclosure Entrance (GPS'd – not from drawings)



ENTRANCE TYPE: RC, H

COLLECTION METHOD: Default of 5cm

Pump



INSTALL TYPE: who did the contract: CONT or DWD

SPRING LINE ELEVATION: per as-built or survey only

PUMP NAME: per as-built or O&M

PUMP TYPE: AHP, BP, CWP, MP, RWP, SP, WP, TURB, U

MANUFACTURER: from Source

COLLECTION METHOD: default of 300cm, GPS collection will over ride default

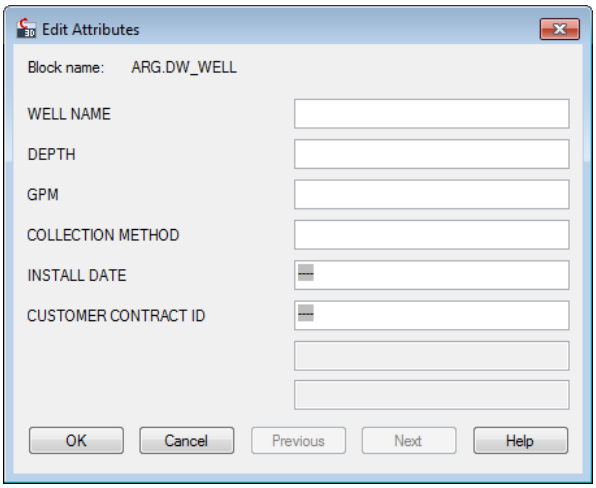
INSTALL DATE: global entry from Drawing Properties

WATER TYPE: global entry from Drawing Properties; T=Treated, R=Raw Water, RC=Recycle

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

DW Well

WELL NAME: see as-built or Annual Report



DEPTH: see as-built or Annual Report

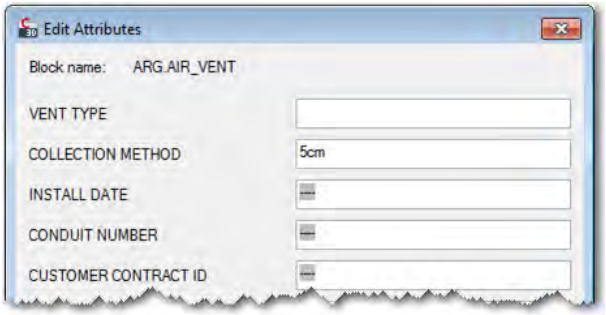
GPM: see as-built or Annual Report

COLLECTION METHOD: 5cm or 300cm

INSTALL DATE: global entry from Drawing Properties

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

Air Vent



VENT TYPE: IND or RSD

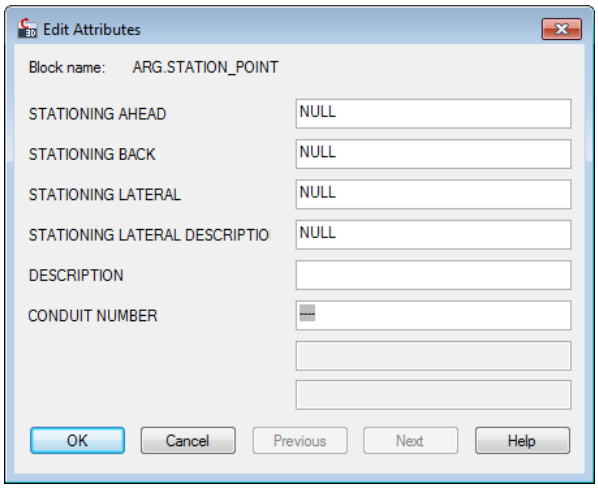
COLLECTION METHOD: default of 5cm

INSTALL DATE: global entry from Drawing Properties

CONDUIT NUMBER: global entry from Drawing Properties, no text - number field only

CUSTOMER CONTRACT ID: global entry from Drawing Properties; I000 (Denver Water) different if a district, total service area, etc…

Station Point



STATIONING AHEAD: default of NULL - ahead stationing on conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATIONING BACK: default of NULL - back stationing on conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

STATIONING LATERAL: default of NULL - station on crossing conduit or DIA pipe (decimal number only; ex: 500.00 for sta 5+00.00)

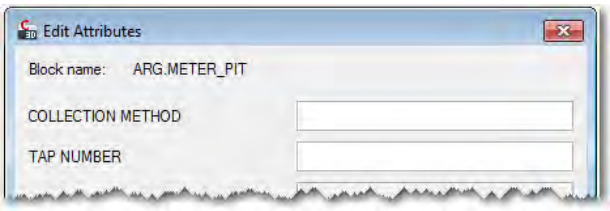
STATIONING LATERAL DESCRIPTIO: default of NULL - crossing conduit number or DIA PFW or NPW (all caps, no punctuation. - Ex. COND NO 94 or PFW-22681)

DESCRITION: limit description (ex: End Casing)

CONDUIT NUMBER: global entry from Drawing Properties, no text - number field only

Meter Pit

COLLECTION METHOD: 5cm or 300cm



TAP NUMBER: assigned by Sales Administration - Plan Review Coordinator or Tap Sales Rep

Tap

COLLECTION METHOD: 5cm or 300cm

TAP NUMBER: assigned by Sales Administration - Plan Review Coordinator or Tap Sales Rep.

ADDRESS: Physical address

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Section 18.2

ARG Drawings for Capital Projects

Overview - Section 18.2

Internal Use: Full compliance

Contractor Use: Reference only

ARG drawings must be created for projects that are going to be posted to Denver Water's GIS (E-map) system. To ensure the most current, accurate information gets passed along, the following steps must be utilized.

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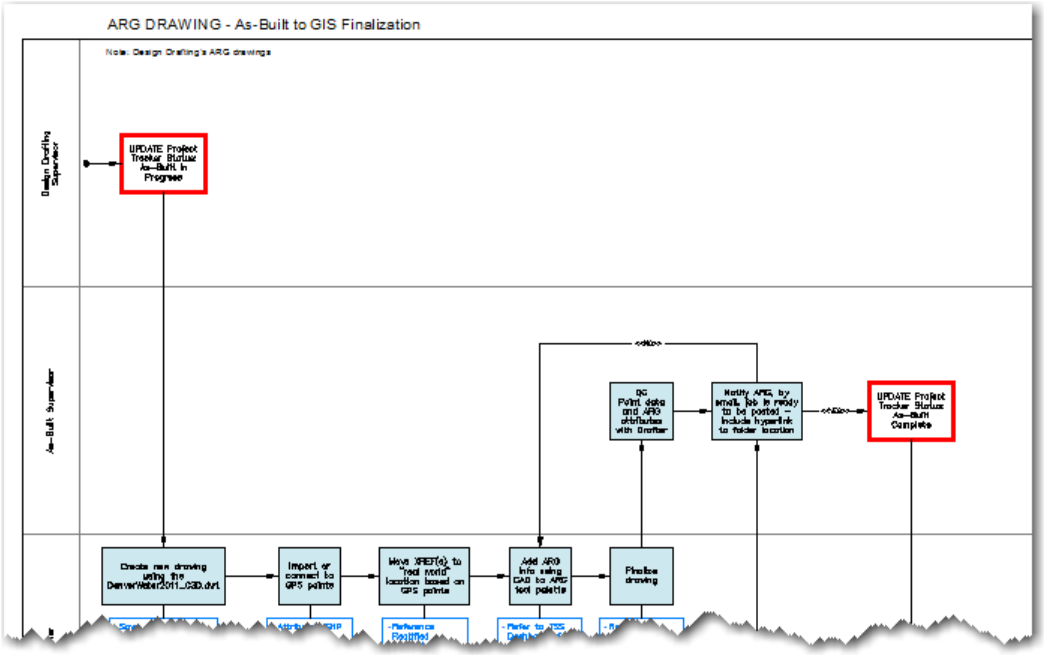
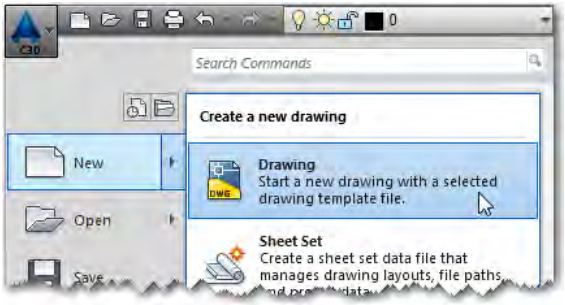
Workflow

ARG DRAWING – As-Built to GIS Finalization: See the *Engineering SharePoint* Site – Capital Projects Procedures Manual – to find the most current workflows:

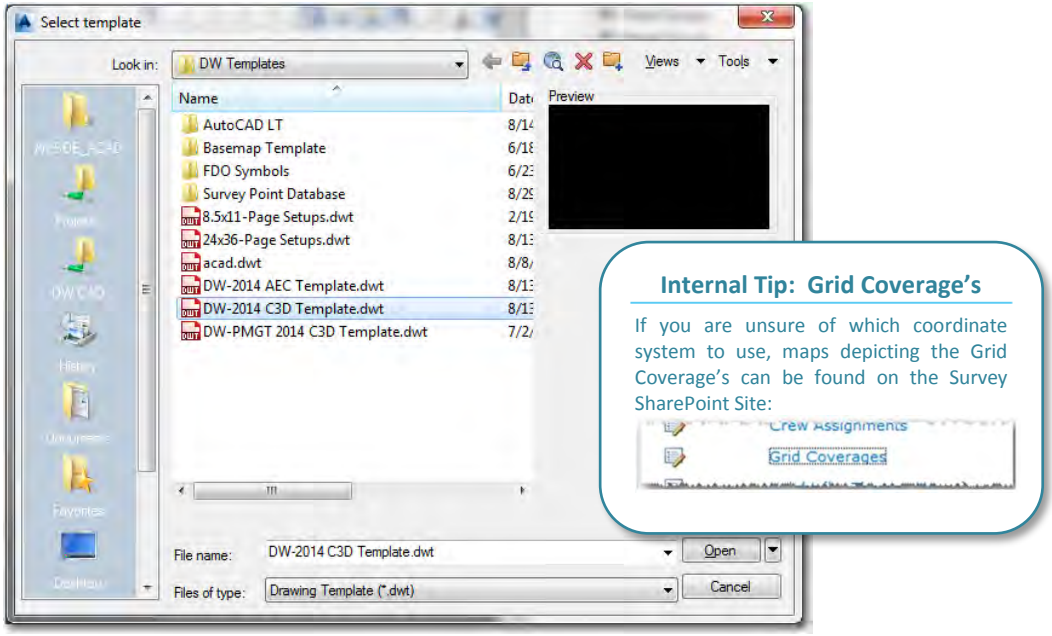


Start a New Drawing

Create a new drawing by clicking the *Application Menu* pull-down, select *New* and then *Drawing*:

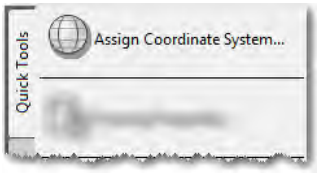


The Select template pop-up window will appear, choose the ***DW-2014 C3D Template.dwt*** and click <Open>:

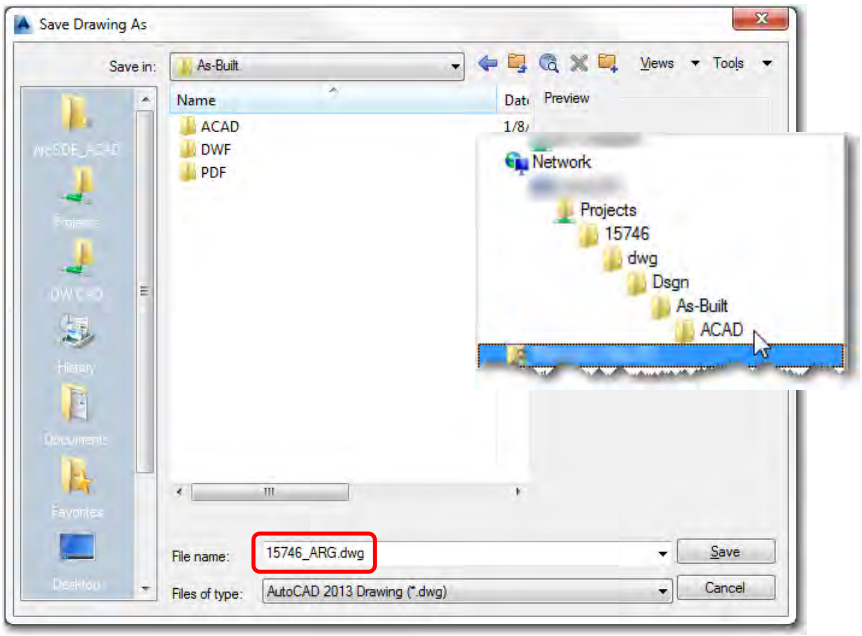


Set Coordinates

To set the coordinate system in the drawing, follow the steps in *Section 11.0 – Coordinate Systems*. To make this step easier a shortcut has been placed on the *Quick Tools* Tool Palette:

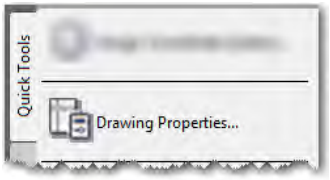


Save the drawing. Use the proper naming convention – ***PTNO_ARG.dwg*** – and save the drawing to the ***Dsgn/As-Built/ACAD*** folder:



Drawing Properties

Use the Drawing Properties to automatically populate the "global" fields of the ARG Attributes, see *Section 18.0 – CAD to GIS ARG As-Built Drawings*:



GPS Data (GPS Points)

When GPS points (SHP files) are available they can be used to orient the project, gather important information and in some cases they can be used to automatically populate the ARG Attributes [see *Section 18.1 – CAD to ARG Tool Palettes & ARG Attributes*]. As of now there are various types of SHP files, however as processes become more standardized these will become easier to use.

DW's SHP files can be reduced to two categories: **Non-Standard** and **Standard**. In most cases these will not be used together.

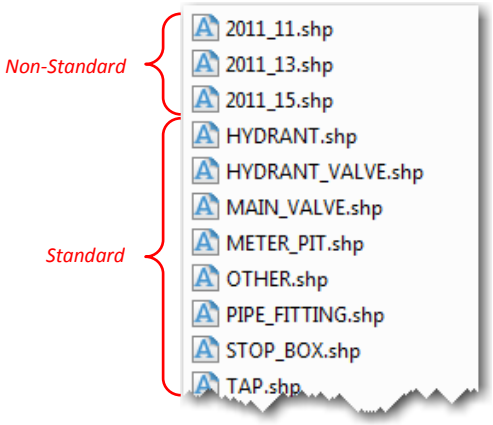
Non-Standard is defined as: any GPS point (SHP files) not collected to the current DW standard; values *will not* translate directly into the ARG attributes. These SHP files contain minimal information and should be primarily used for location purposes.

- Naming conventions will be less consistent and all features will be grouped into one SHP file. For example a SHP file named *2011_11.shp* may contain GPS points for hydrants, valves, fittings, etc.

Standard is defined as: any GPS point (SHP file) collected to the current DW standard; values *will* translate directly into the ARG attributes.

- Can easily be identified by the consistent naming conventions; each feature will be grouped together in a single SHP file. For example the SHP file named *HYDRANT.shp* will contain only GPS points for the hydrants related to that project.

This graphic shows an example of a folder containing both Standard and Non-Standards SHP files:

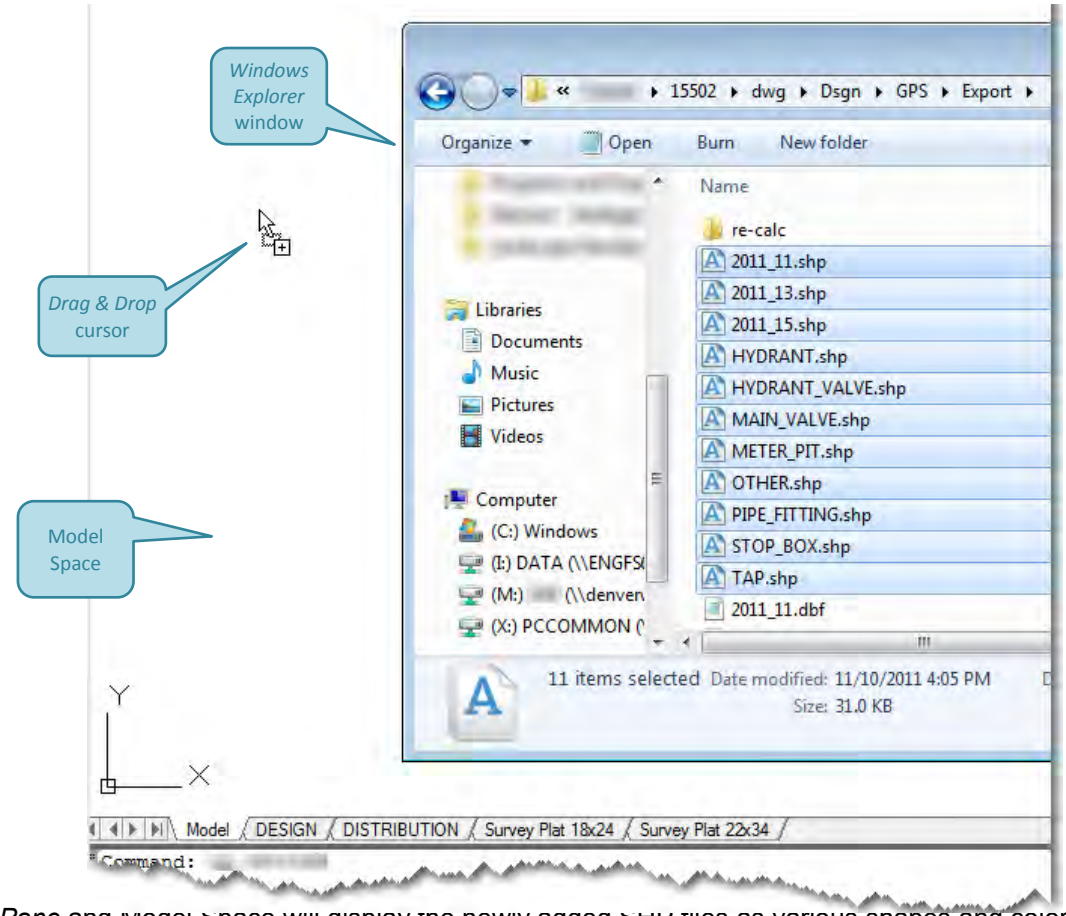


List of Standard SHP Names:
ACCESS_OPEN.shp
AIR_VENT.shp
BACKFLOW.shp
CONDUIT_VALVE.shp
CONNECTOR_VALVE.shp
DW_WELL.shp
ENCL_ENTR.shp
FIRELINE_TAP.shp
FIRELINE_VALVE.shp
FLOW_METER.shp
HYDRANT.shp
HYDRANT_VALVE.shp
MAIN_VALVE.shp
METER_PIT.shp
MSTR_METER.shp
OTHER.shp
PIPE_FITTING.shp
PROCESS_VALVE.shp
PUMP.shp
SAMP_STA.shp
STA_POINT.shp
TAP.shp

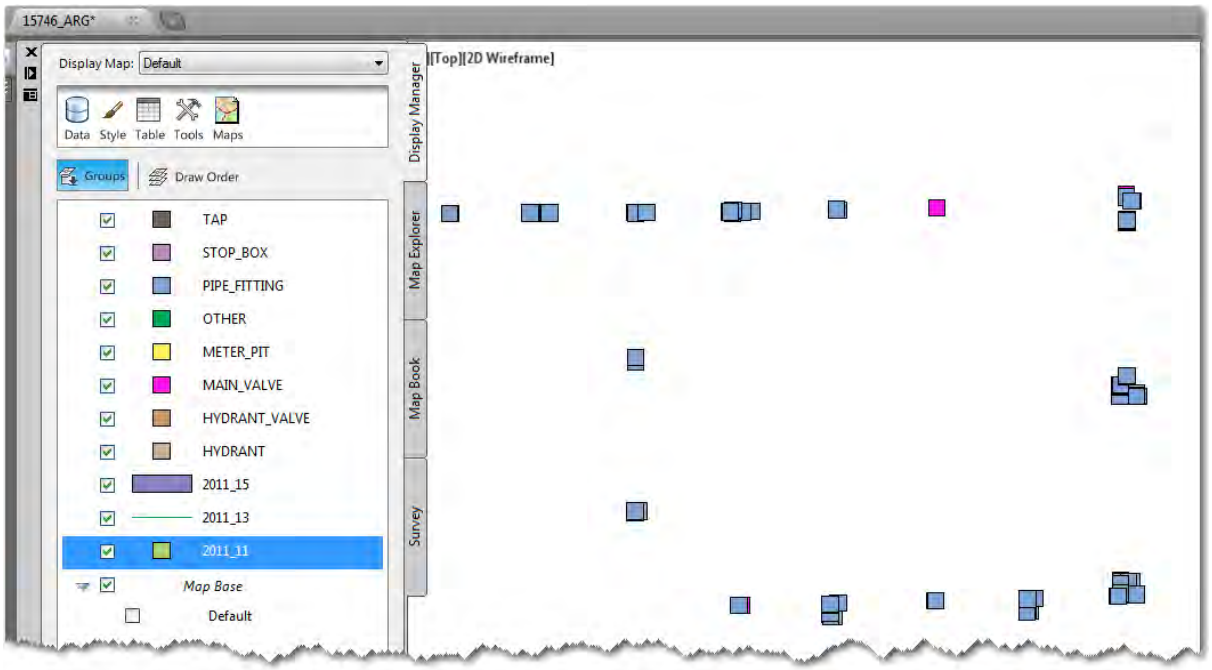
Typical naming convention for Standard SHP files

Connecting to GPS data (SHP files)

The most efficient way to connect to SHP files is to drag and drop. Using *Windows Explorer* navigate to the ***Dsgn/GPS/Export**** location. Select the desired SHP files and drop into Model Space:

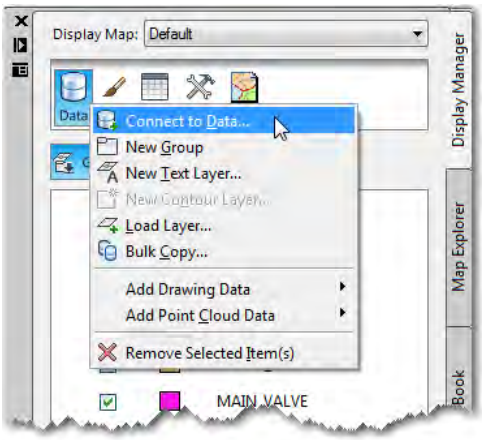


The *Task Pane* and Model Space will display the newly added SHP files as various shapes and colors:

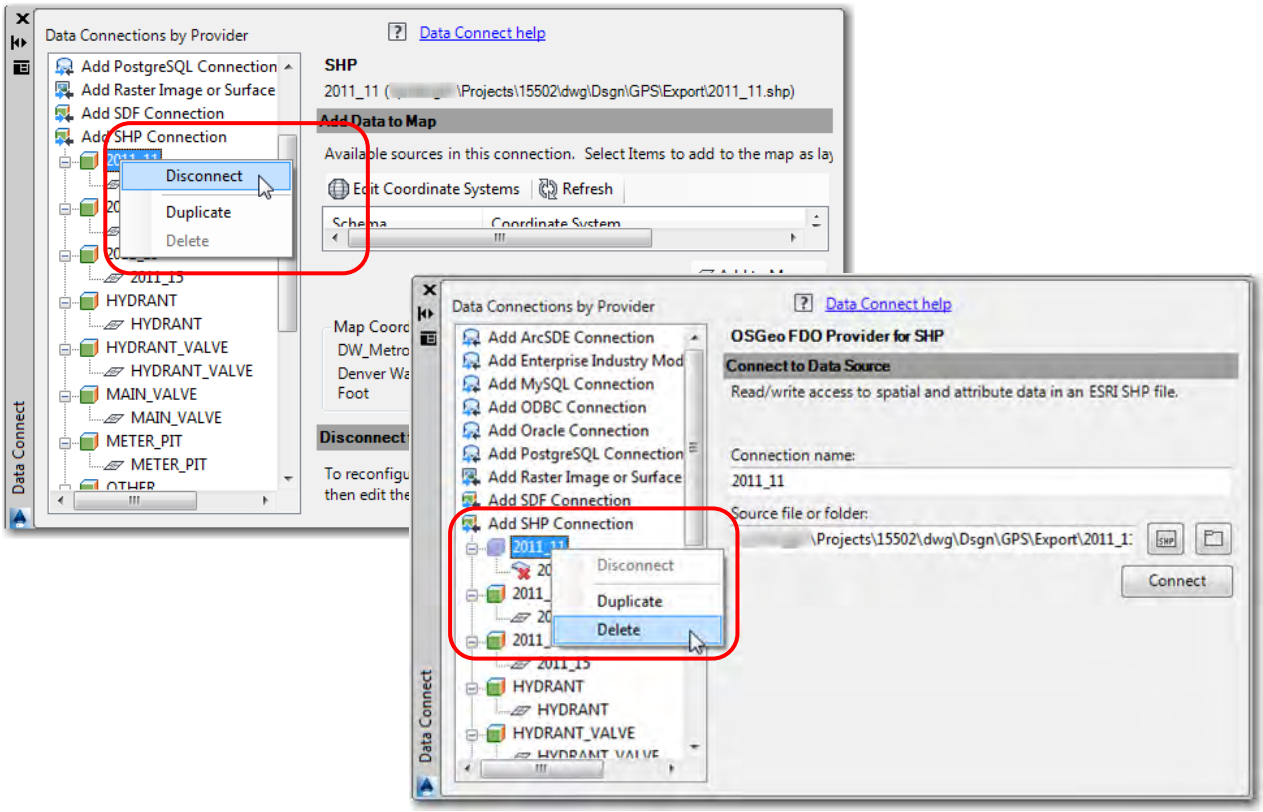


Remove SHP References

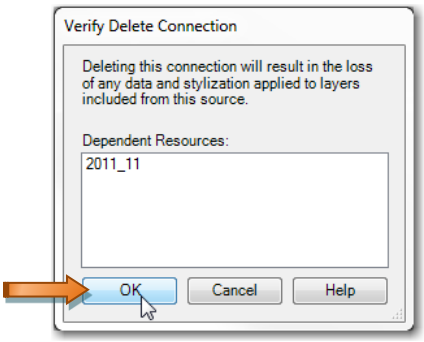
The SHP files must be disconnected and removed from the drawing once finished using them. In the *Task Pane*, click the Data icon and select *Connect to Data…*:



In the Data Connect fly-out palette, right-click on the SHP connection (typically SHP_1) and select **Disconnect**. Repeat the right-click process and select **Delete**:

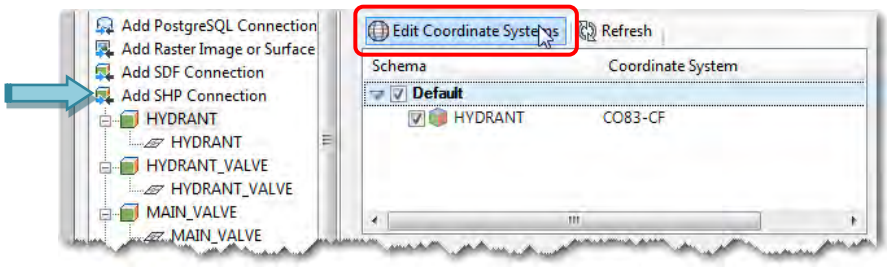


The *Verify Delete Connection* pop-up window will appear, click <OK>:

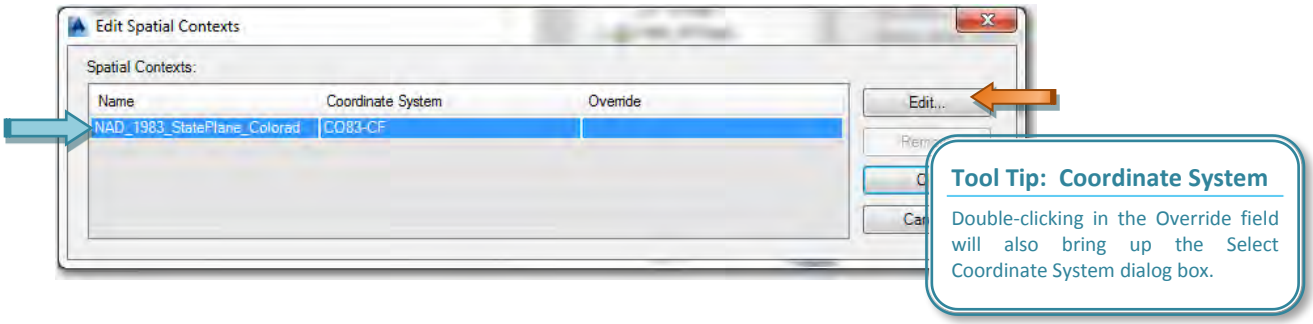


Differing Coordinate Systems

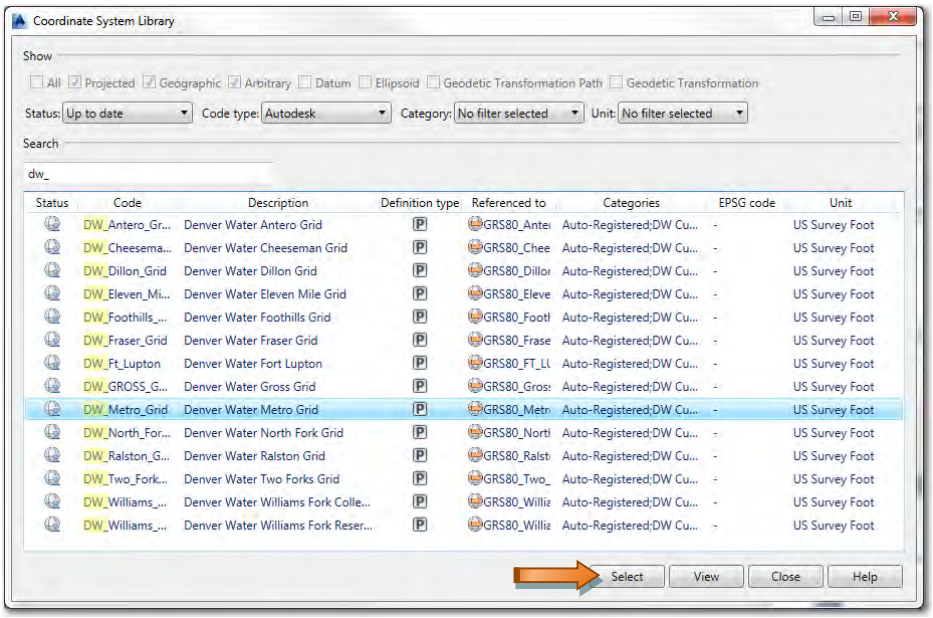
If the SHP files are on a different Coordinate System than the current drawing, they must be edited. To do this, while in the *Data Connect* fly-out palette, select the SHP connection and click the **Edit Coordinate Systems** button:



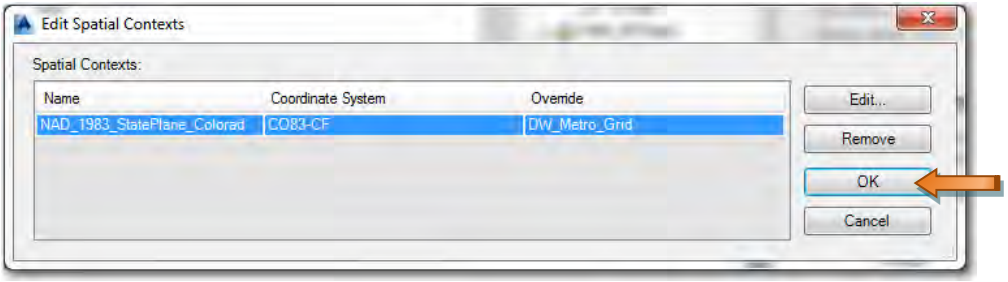
In the *Edit Spatial Contexts* pop-up window, pick the name and click <Edit>:



The *Select Coordinate System* dialog window will appear. Choose the appropriate Coordinate System based on the current project. Click <OK> when finished:



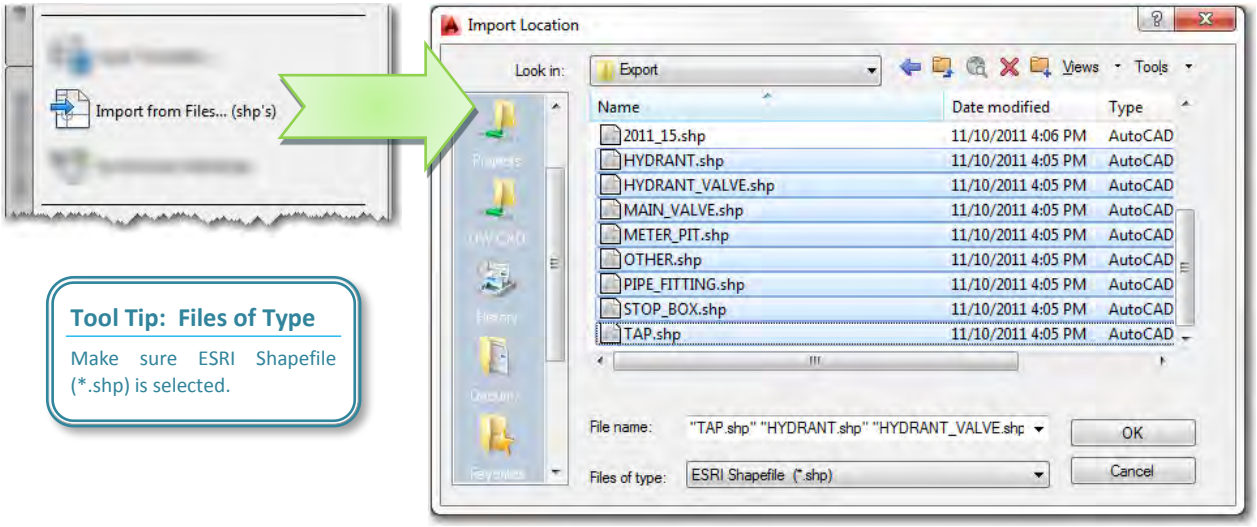
The Edit Spatial Contexts pop-up window will reappear, click <OK>:



Import GPS Data

Use the following steps to import GPS points (SHP files) and translate them to ARG Attributes (for use with standard GPS points).

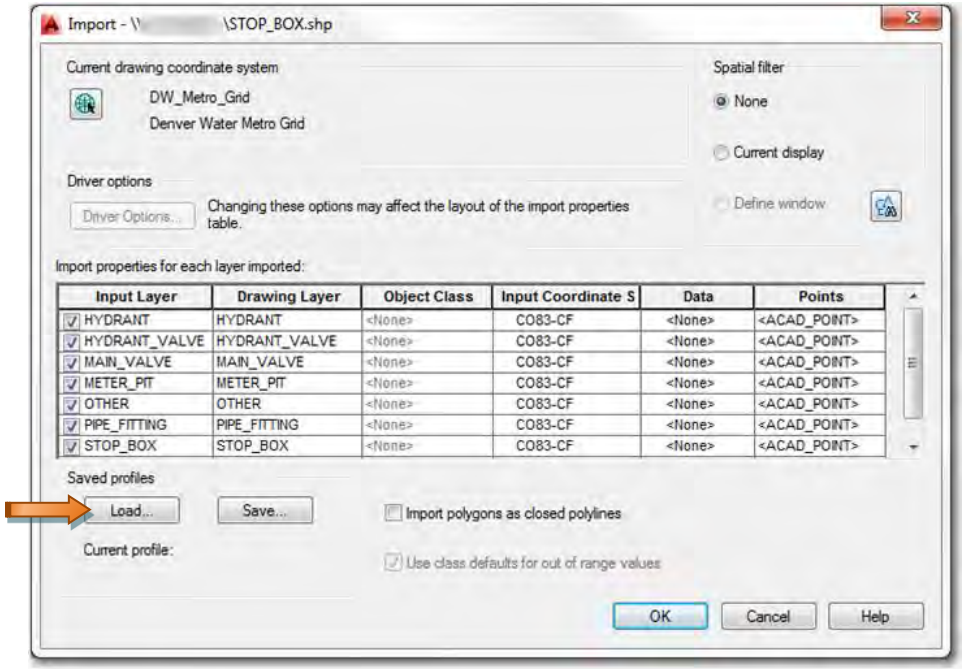
On the Quick Tools tool palette, click **Import from Files… (shp's)**, the Import Location window will appear. Navigate to the project folders' GPS location - typically ***Dsgn/GPS/Export*** - and select ALL of the SHP files desired; click <OK>:



Tool Tip: Files of Type

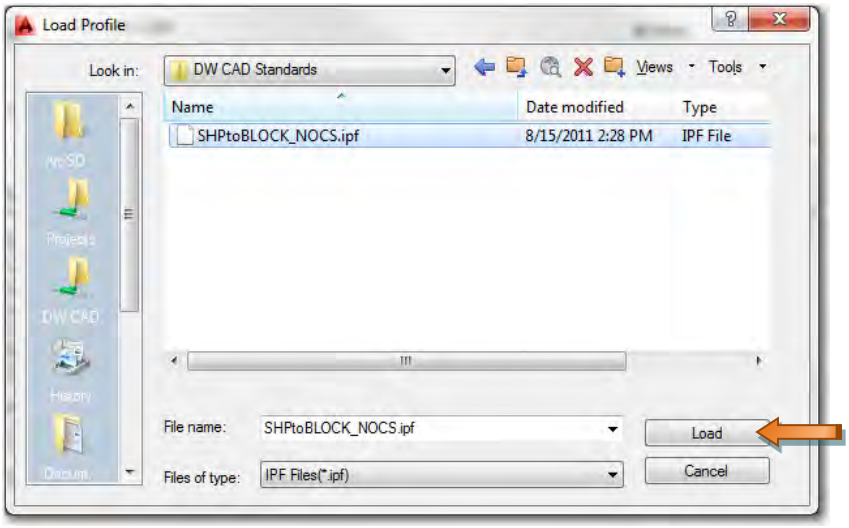
Make sure ESRI Shapefile (*.shp) is selected.

The Import window will appear; in the **Saved profiles** section click <Load…>:

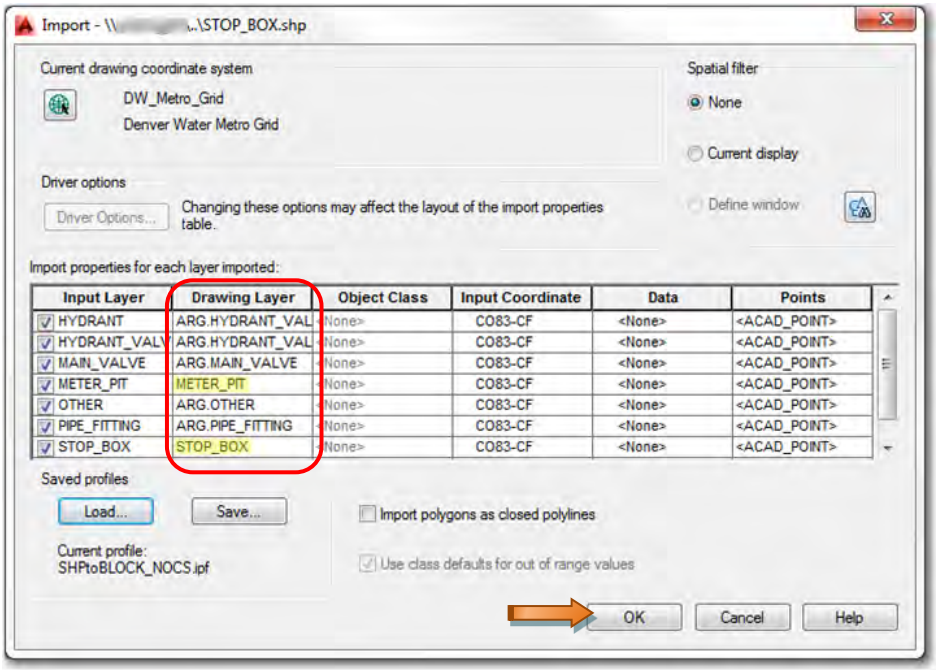


ATTENTION
The names of the SHP files must be "Standard" for this procedure to work properly.

In the Load Profile pop-up window navigate to *...\DW CAD\DW CAD Standards*; select the ***SHPtoBLOCK_NOCS.ipf*** file and click <Load>:

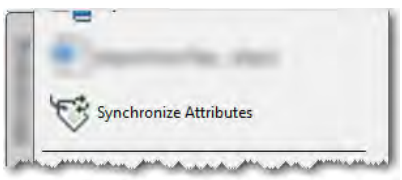


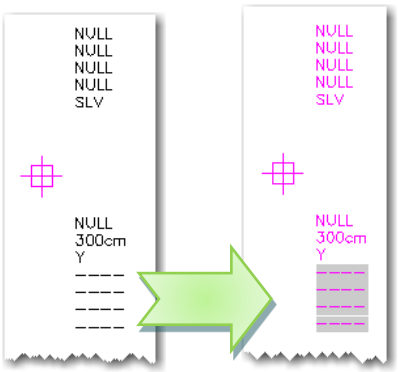
The *Import* pop-up will reappear. Where applicable, change the *Drawing Layers* to the appropriate ARG layers, click <OK>:



NOTE: Changing layers may be done manually as well.

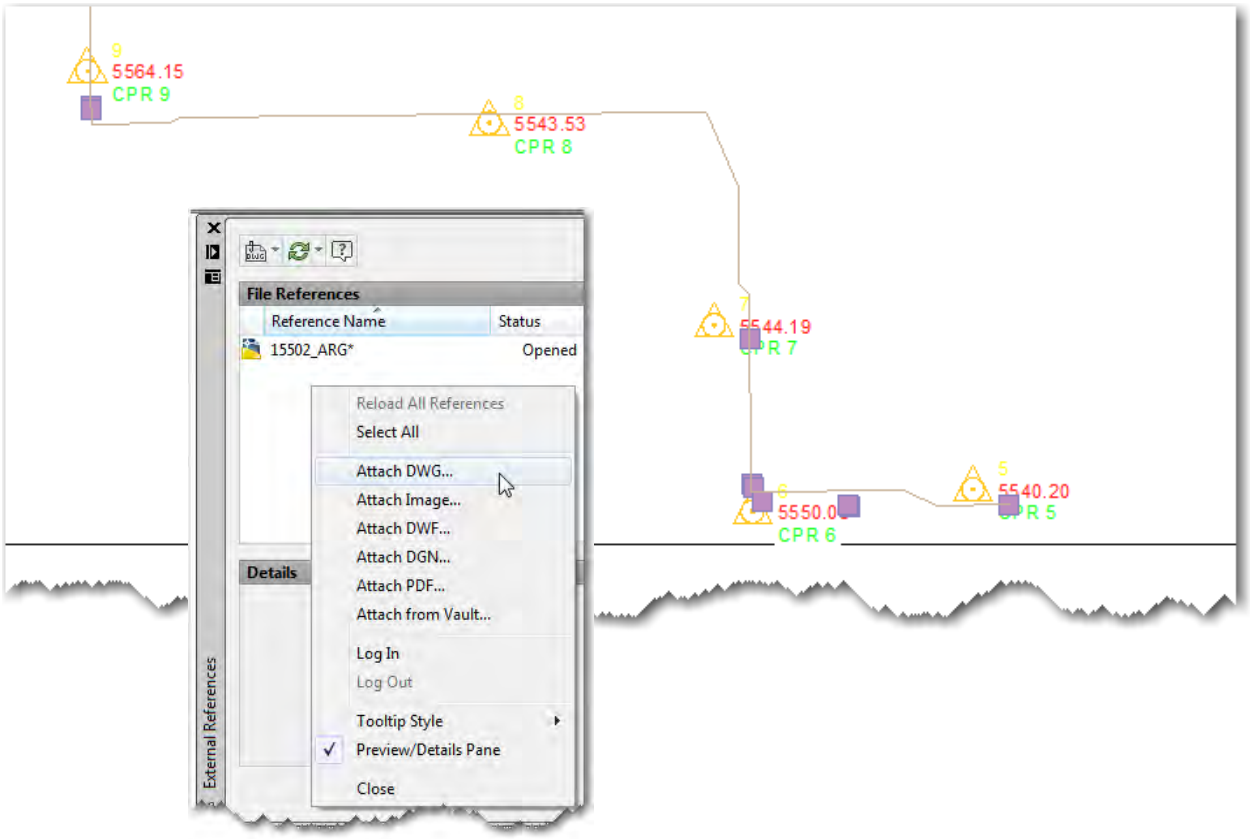
On the *Quick Tools* Tool Palette, click **Synchronize Attributes**; this will add the fields, (links to from the *Drawing Properties*) to the ARG Attributes:





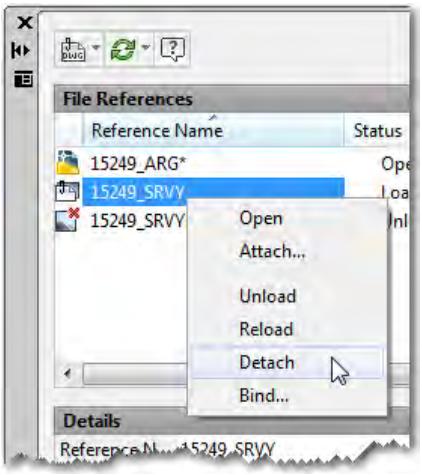
XREF Survey/Civil

XREFs can be used to ensure the drawing follows the proper alignment and gets placed in the correct location. The purple boxes in the example below are the locations of the GPS points (SHP files). Everything else depicts the XREF'd drawing, notice how the two closely line up indicating the drawing is in the proper location:



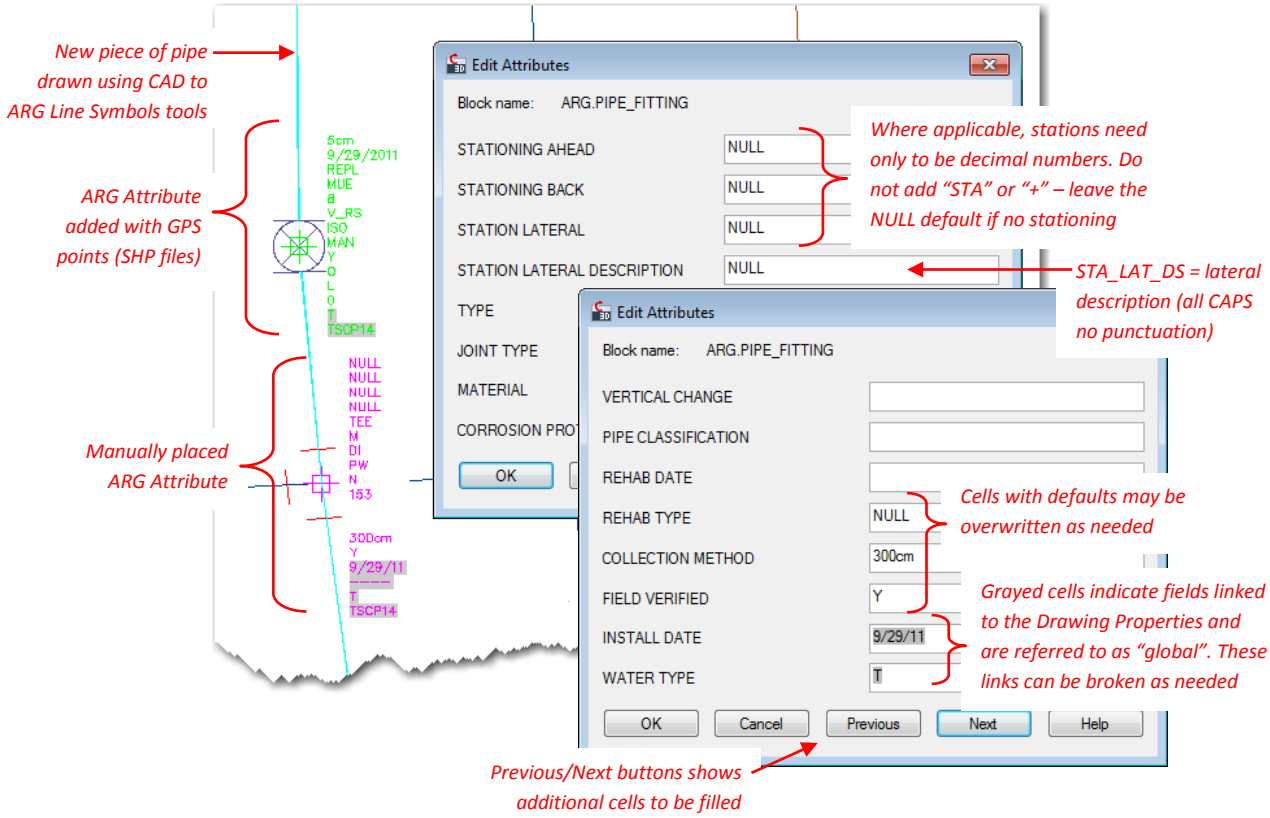
Detaching

Once the XREF is no longer needed it must be detached from the drawing before being sent to the Asset Recording Group:



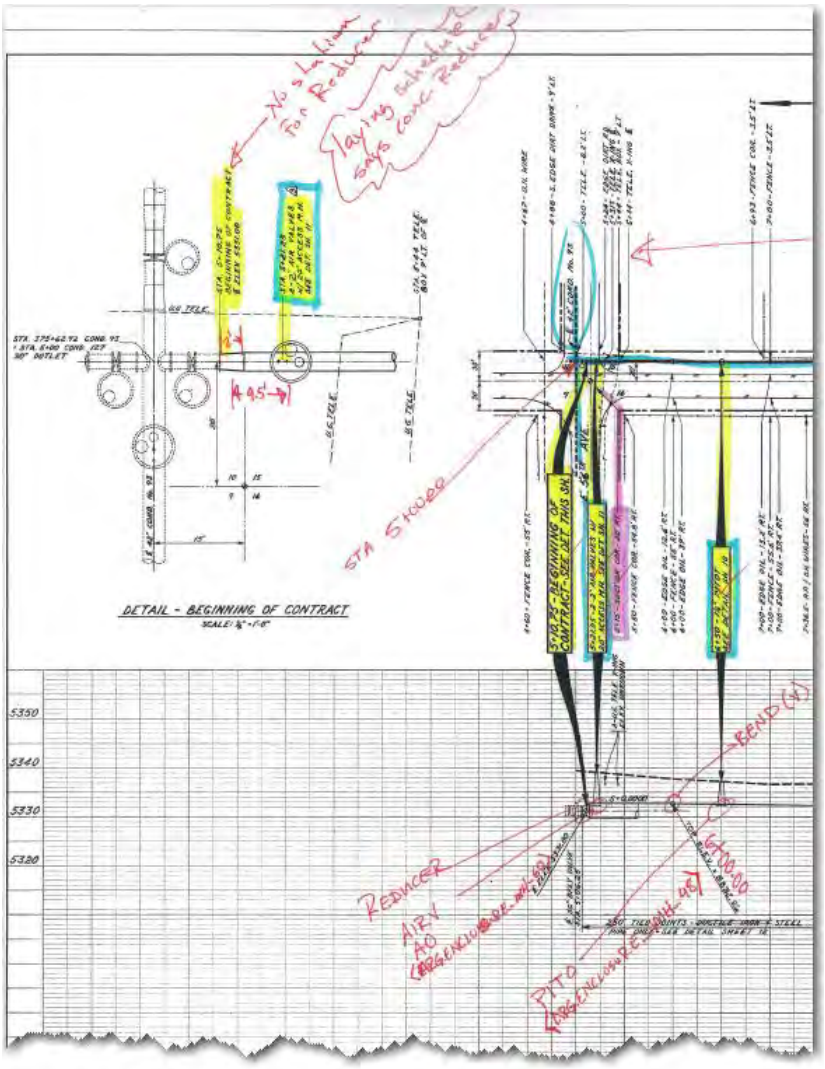
Placement of Line and Point Symbols

Using the XREF'd drawings, SHP files, etc… utilize the ARG tools on the *CAD to ARG* Tool Palette to recreate the waterline alignment - utilize the OSNAP commands:

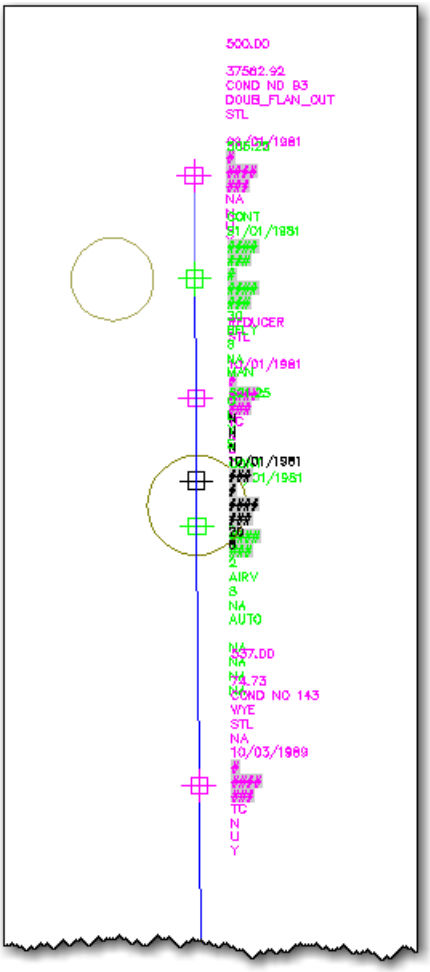


Continue along entire length of project utilizing the ARG tools on the *CAD to ARG* Tool Palette. Pay close attention to the profiles in the plan set to add any vertical information:

Using the As-built drawings and Inspector's notes, begin recreating the "new" waterline alignment, including all appurtenances. Be sure to use the appropriate tools\buttons from the ARG tools on the *CAD to ARG* Tool Palette [see *Section 18.1*]:



The highlighted items in this example shows features identified to be included in the ARG drawing.



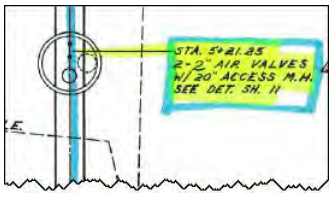
This example shows what the .dwg file will look like once the items highlighted above have been added.

Placement of Polygon Symbols

On the *CAD to ARG* Tool Palette there is a section labeled **Polygon Symbols;** these buttons will be used to represent vaults, manholes or other specified structures.

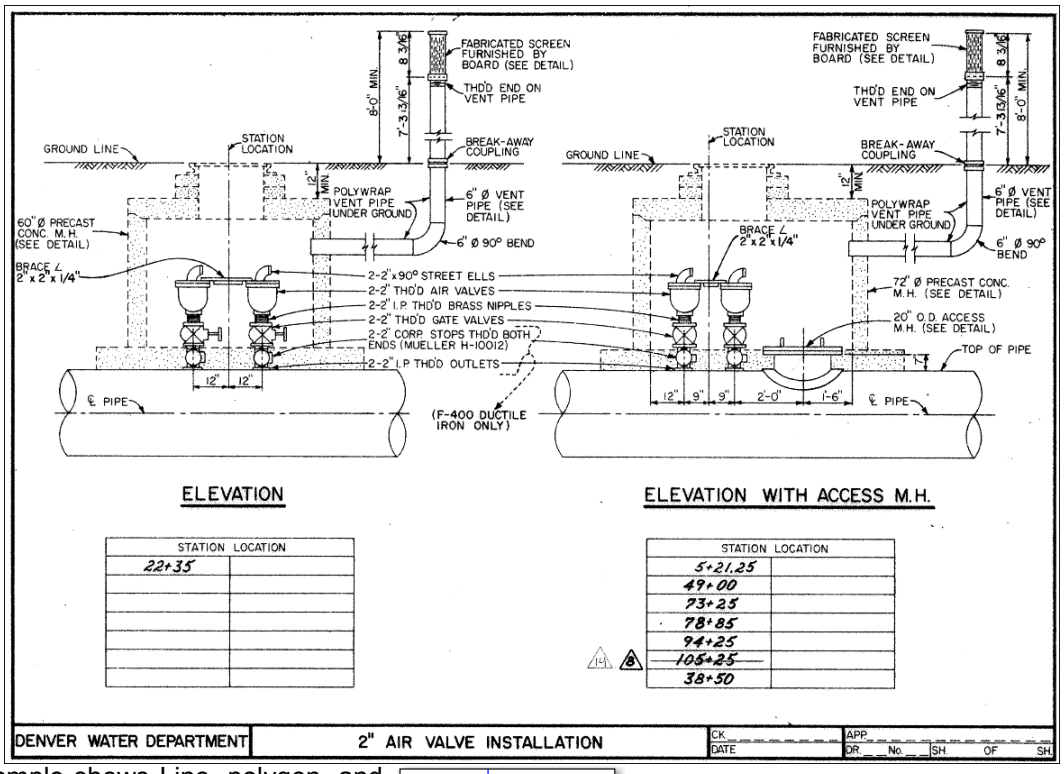
The most commonly used button will be the **Enclosure** button, used mainly with manholes and vaults [see *Section 18.2* for use and proper naming schemes].

When the plan and profile set indicate the use of a manhole, the exact location in relation to the waterline and valves are very important. Review the detail referenced in the drawing, and place the polygon according to the dimensions given. Keep in mind symbology in plan view may not be accurate and may be used for graphic representation.

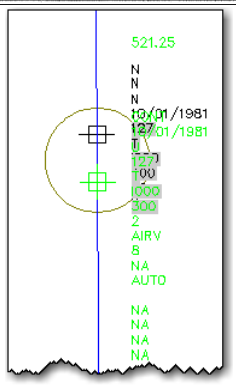


This example shows the plan view of the **2 – 2" Air Valves w/ 20" Access MH**, of the detail below.

The example below shows the corresponding detail of the **2" AIRV** above:

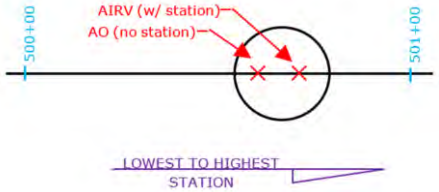


This example shows Line, polygon, and attribute placement, in Model Space, of the CAD .dwg; the polygon has been placed in the drawing according to the detail.



Tool Tip: Access Opening (w/ Air Valves)

ACS are always placed on the side of the lower station number. These access opening do not need stationed. See the Pipe Rules:



Using FDO for References & Tie-in

FDO is the interface used in CAD to access GIS data and imagery. Refer to *Section 8.0* of the CAD Standards Manual for a full explanation.

ATTENTION

Each project is unique and may require different methods of tying into existing projects. Some projects will maintain stationing, while others will use the GPS points or GIS.

If it is uncertain which method to use on a project a quick meeting may be set up with representatives from the Distribution or Design Drafting, ARG and TSS.

ARG Drawing Cleanup

Within Model Space of the project drawing, turn off all layers except prefixed "ARG" layers. On the *Quick Tools* Tool Palette, click *Drawing Cleanup…*; follow the steps in *Section 17.3*.

Remember always run a spell check on all drawings

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Section 18.3

ARG Drawings for Distribution Engineering

Overview - Section 18.3

Internal Use: Full compliance

Contractor Use: Reference only

The intension of this section is to streamline the Distribution As-Built process and workflows. All steps are in compliance with Denver Water's CAD Standards and will be followed as closely as possible, with the understanding that every project is unique and may require special circumstances.

Distribution Record Drawings are the final plan sets created to document a historical record of constructed site conditions upon the completion of a project.

In cases where deviation from or clarification of a reference CAD related step is needed, additional information has been included.

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Supporting external documents

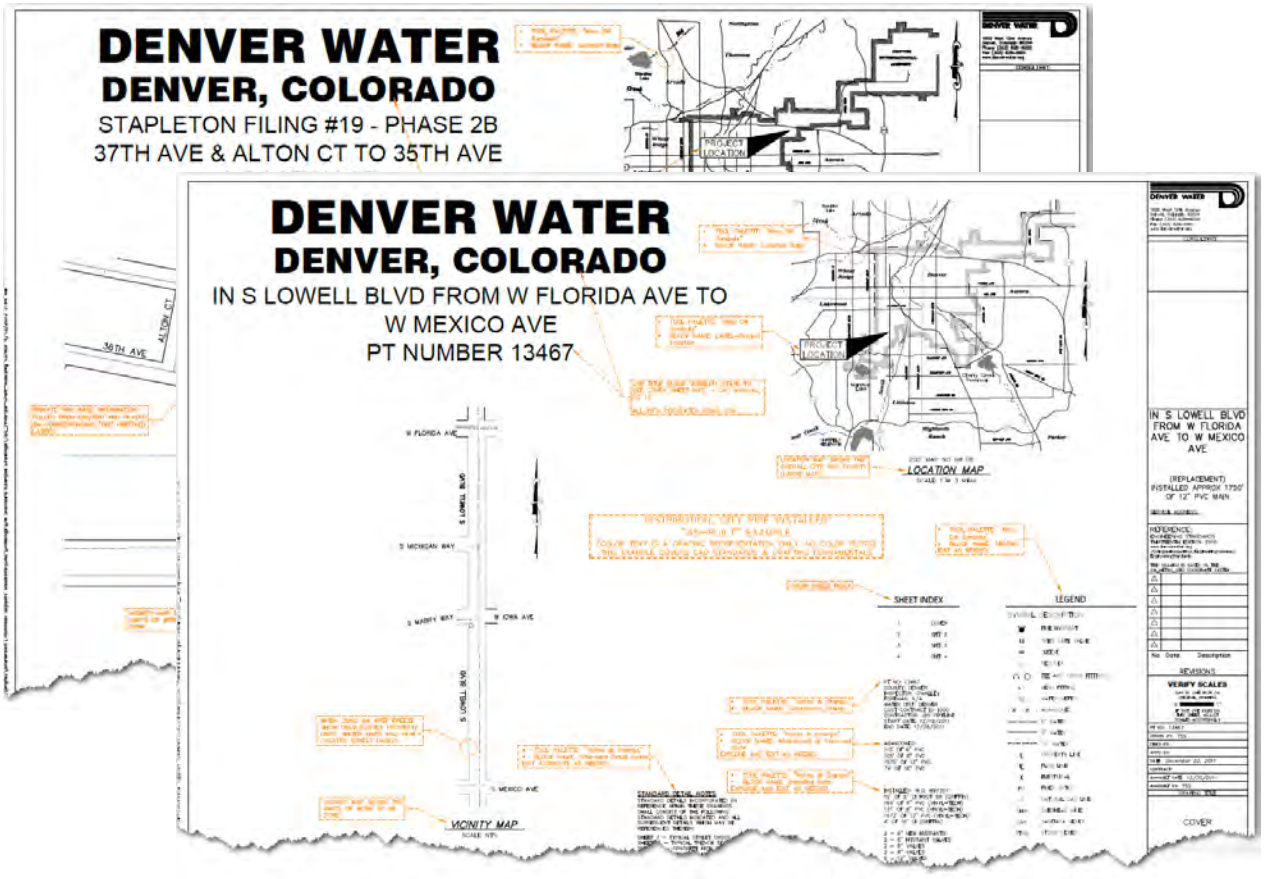
Throughout this document, other documents are referenced and can be found in the following locations:

- ✓ *Domain List* → Asset Recording Dashboard
- ✓ *Pipe Rules* → Asset Recording Dashboard
- ✓ *"Matrix"* Database→ Userguide
- ✓ *Project Tracker-Distribution As-builts* → Userguide
- ✓ *SOP: Distribution As-Builts* → Userguide

Setting Up Sheets

It is the discretion CAD Technician's discretion to determine when the COVER and WATER PLAN sheets are created. In some cases it is easier to set them up on the front end of a project and work through the locked viewports, and in other cases it's easier to set the sheets up after the work has all been completed in Model Space. For documentation purposes the set-up of sheets is being shown at the end of the project.

The *Example Sheets* included in this section for the different job types indicate where most components can be found and the "how to's" of using them:

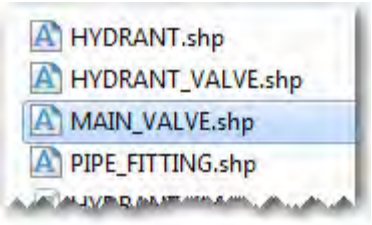


The following may be useful when setting up sheets:

- Use Sheet Set Manager to modify the Title Block and cover information – do not double click, or use the Properties palette to edit the title block unless specified on the Example Sheets
  - It is suggested to fill out as many Sheet Set properties as possible before any sheets are added to lessen edit time and keystrokes by the user
- Viewports on the Cover sheet are for guidance only, they can be removed and/or manipulated as needed
- On the Cover sheet and title block, additional grips (shown as triangles) have been added to allow for more space with Project Title and Project Descriptions
- Viewports go on layer **_VPORT** and should always be locked
  - The maximum scale of a drawing is 1" = 40'

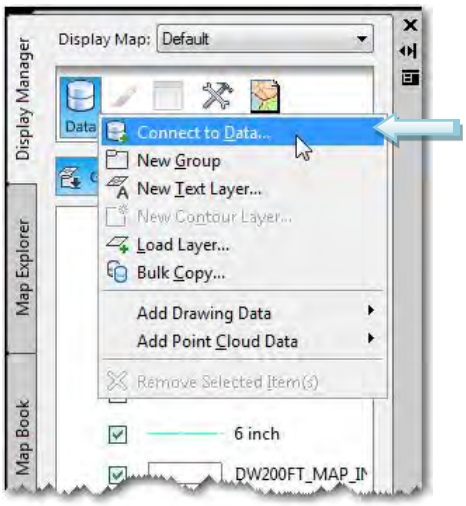
SHP References

Before proceeding to the "Query Data" step in *Section 8.0-9-FDO Instructions*, the inspector's GPS points (SHP files) can be loaded to help determine the project area in the drawing:

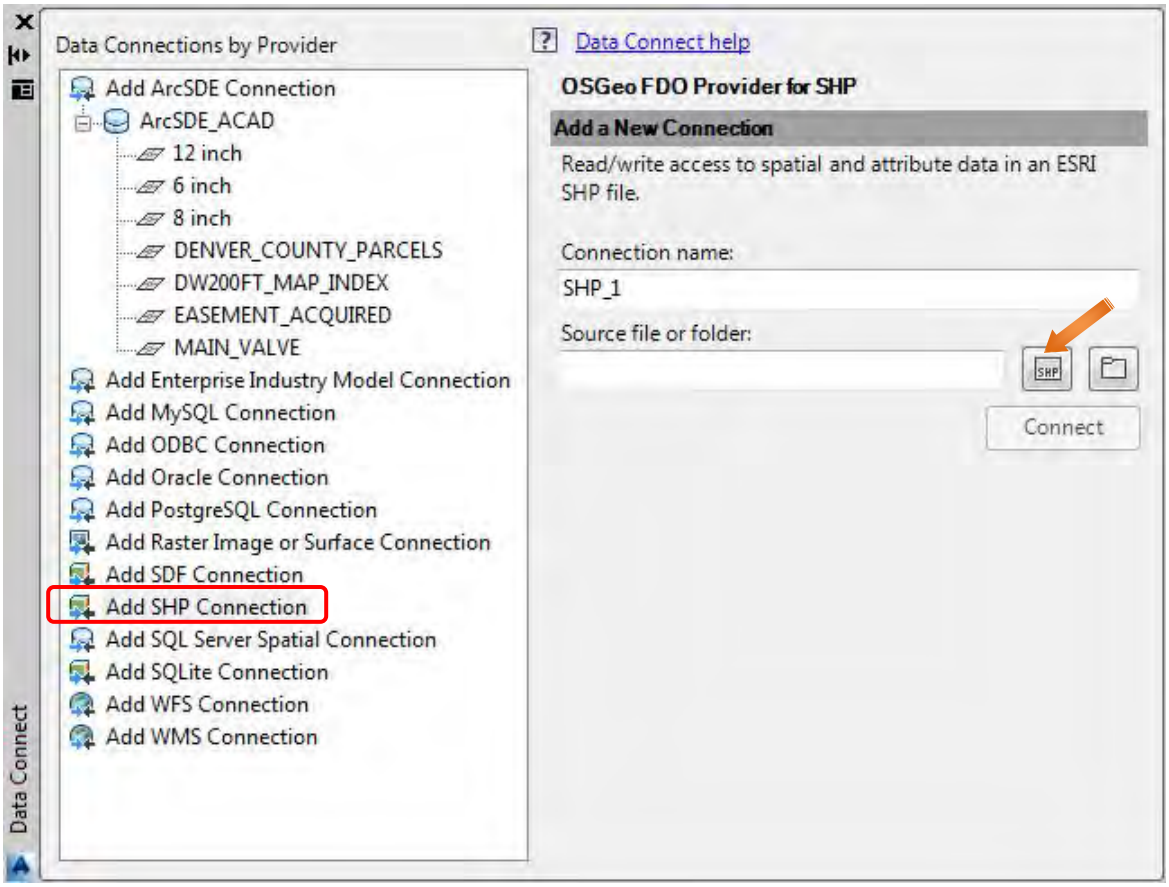


NOTE: This is optional to help verify the project location and must be done in AutoCAD Map 3D 2016.

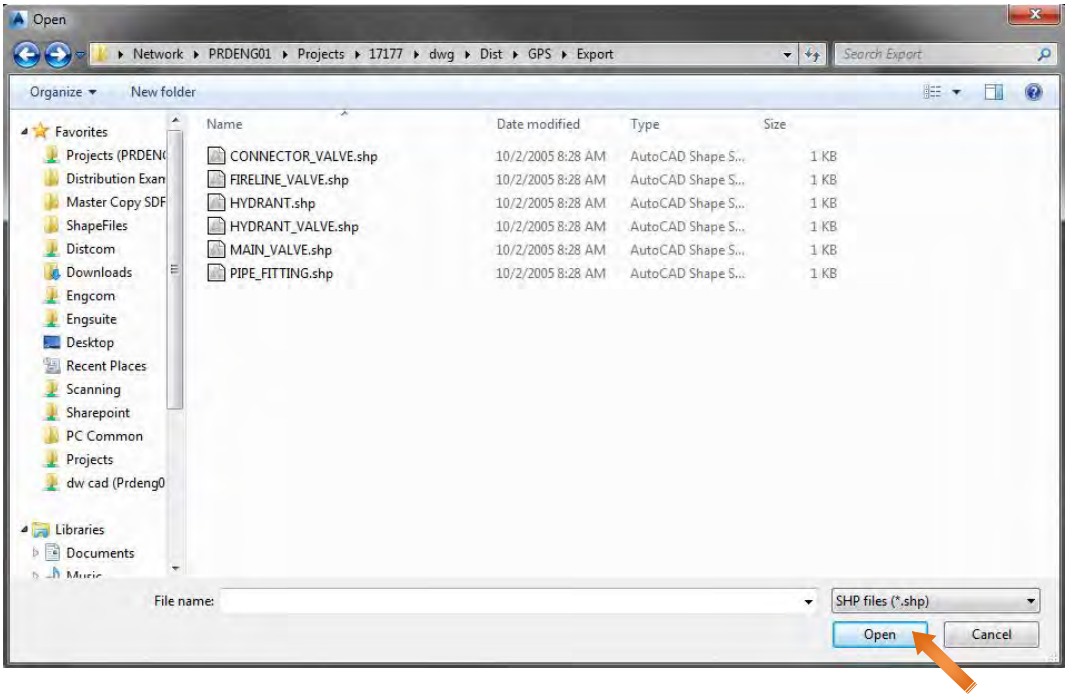
In the Task Pane, on the Display Manager tab, click the Data icon and select *Connect to Data…*:



The *Data Connect* fly-out palette will appear. Choose *Add SHP Connection* from the list on the left and click the <**SHP**> button:

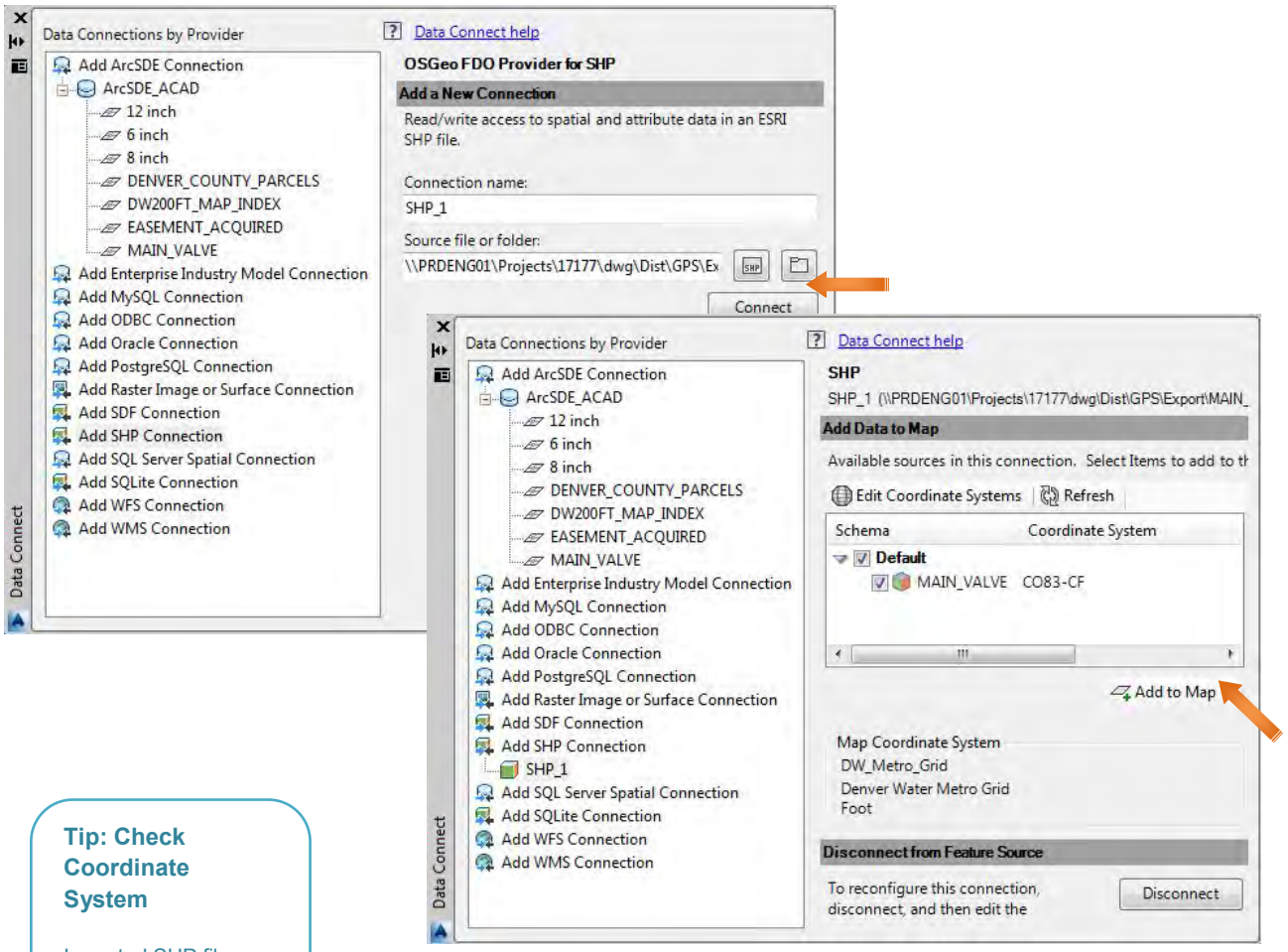


The *Open* pop-up window will appear. Navigate to the project folder's GPS location (**PTNO/dwg/DIST/GPS/Export**). Select ONE of the SHP files (preferably MAIN_VALVE) and click <Open>:



NOTE: The intent of this step is to locate the project area on the screen as a precursor to Querying Data.

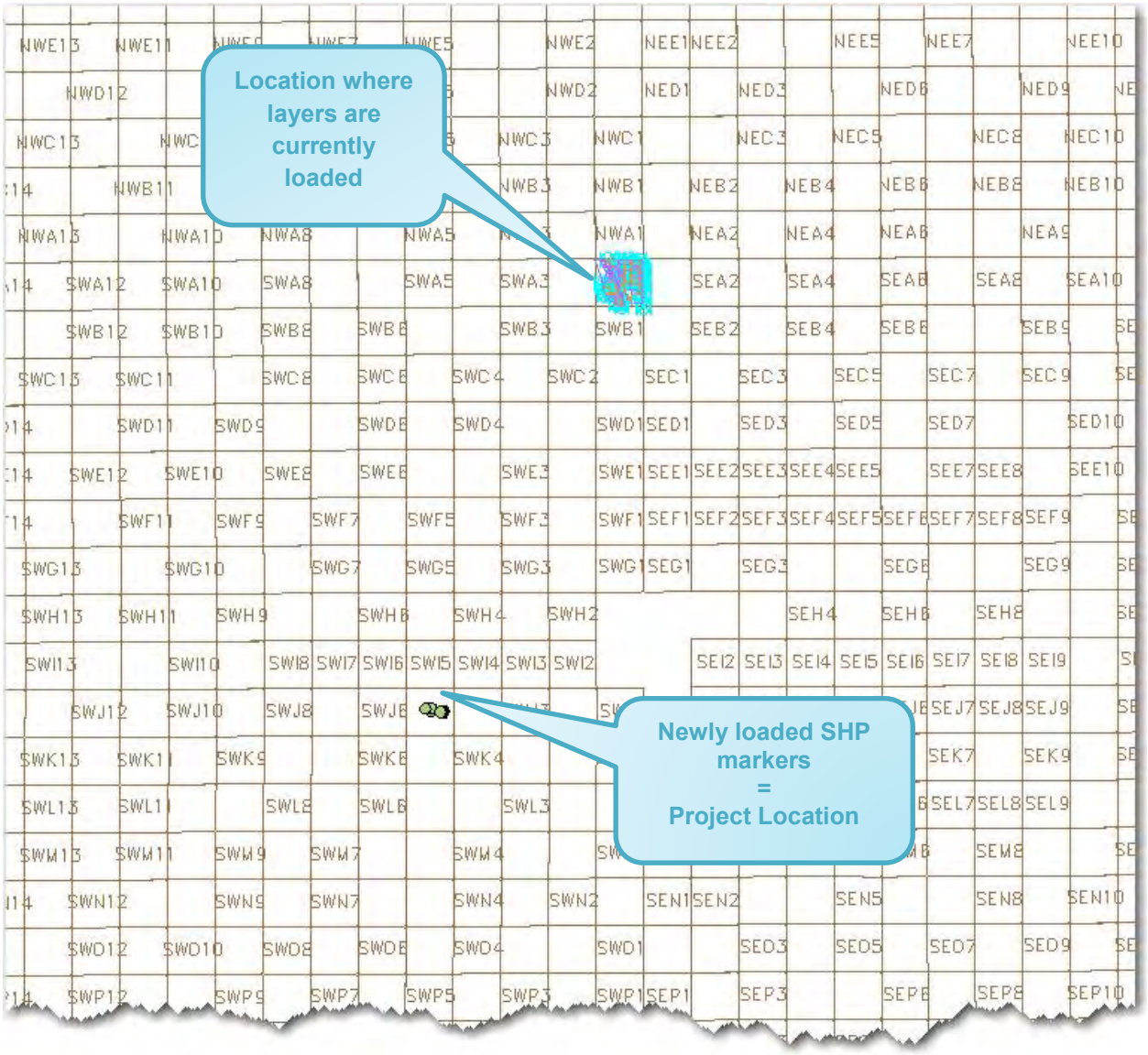
In the *Data Connect* fly-out palette, click <Connect>; then <Add to Map>:

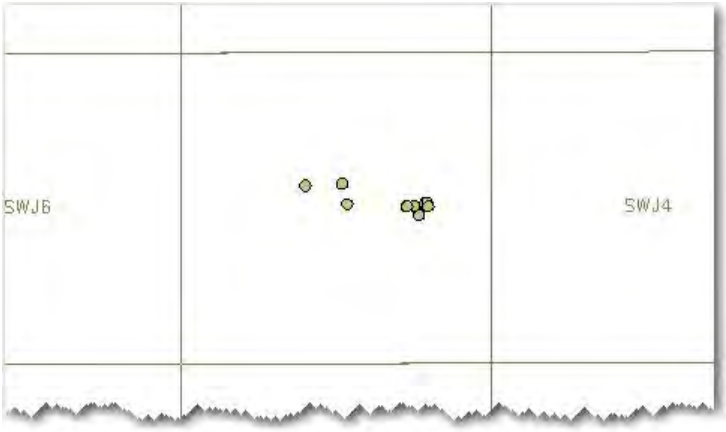


Tip: Check Coordinate System

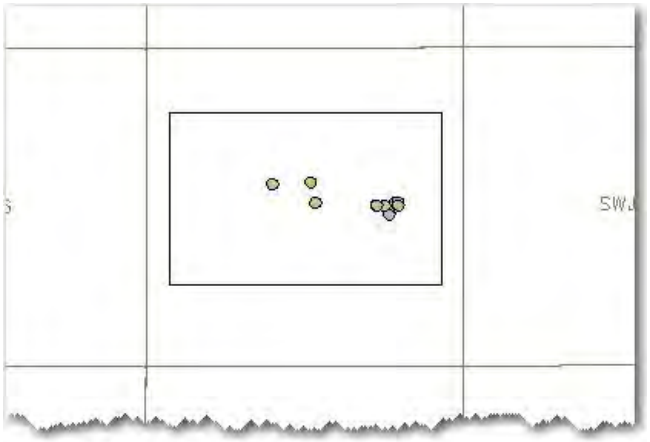
Imported SHP files should have the proper Coordinate

In Model Space, zoom extents. The newly loaded SHP files should appear as markers elsewhere in the drawing (from where layers are currently loaded):



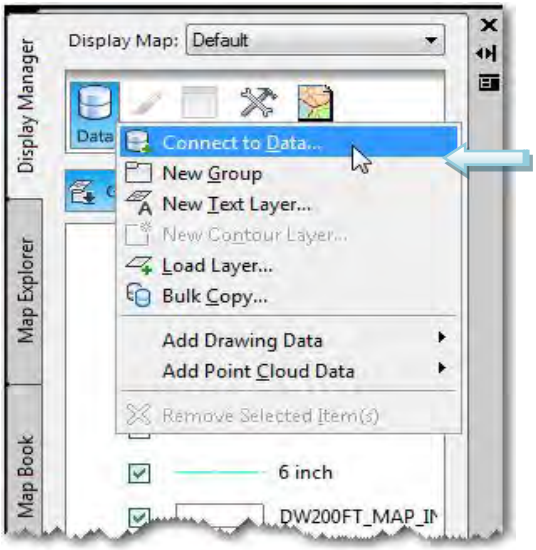


Using the RECTANGLE (REC) command, draw a rectangle around the SHP files, this is will be used as a Query reference:

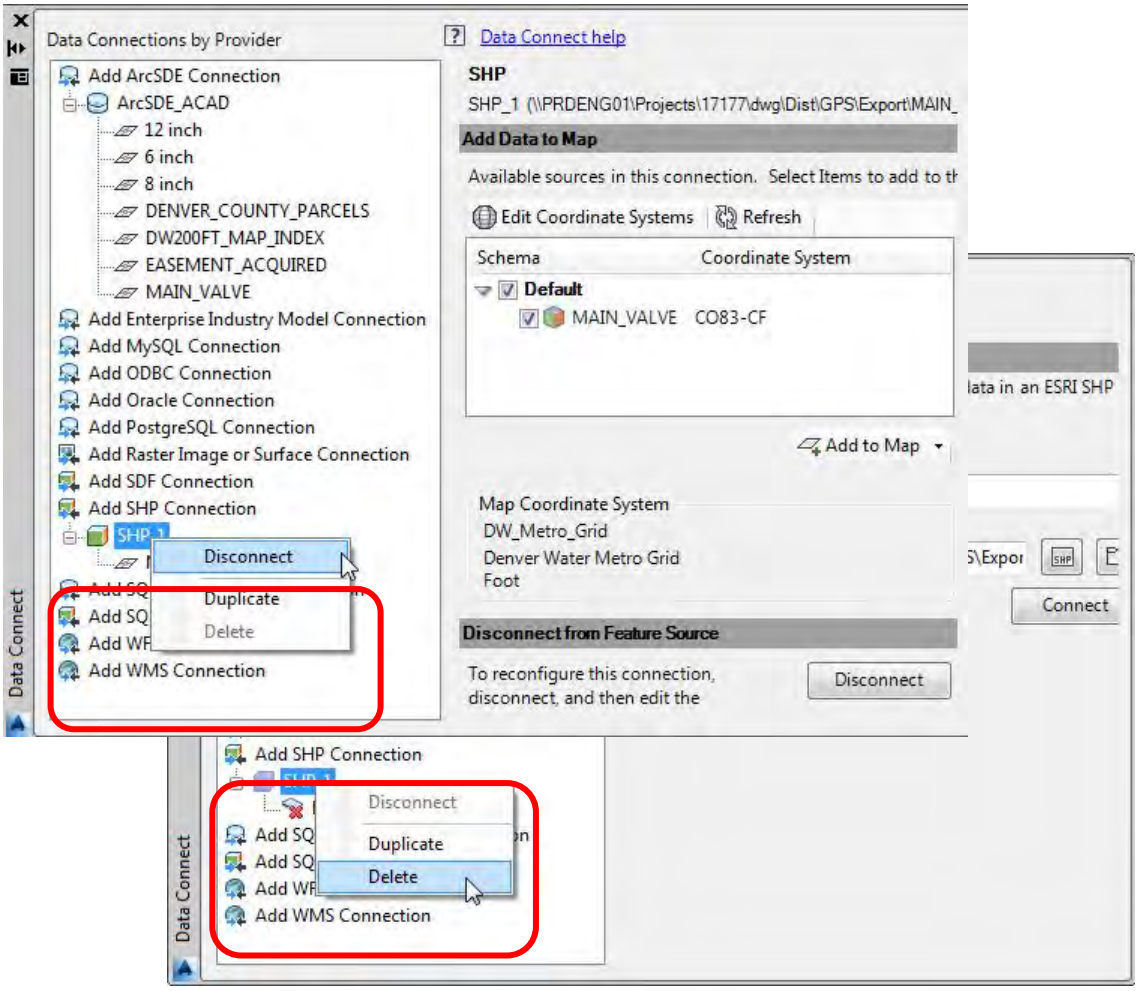


Remove SHP References

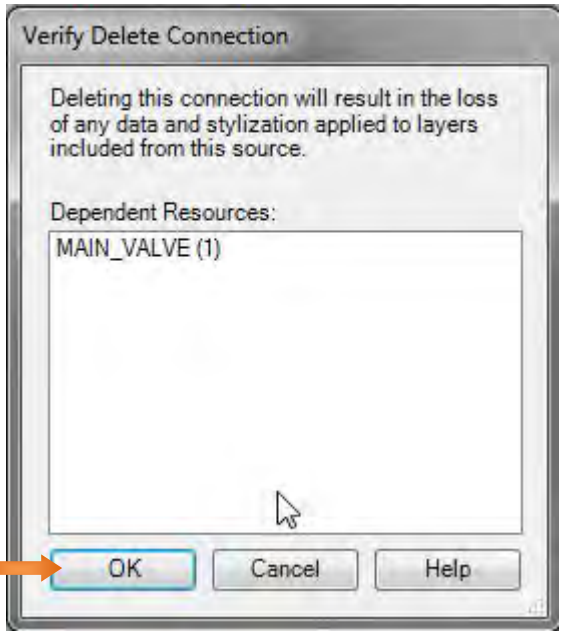
The SHP files must be disconnected and removed from the drawing. In the Task Pane, click the Data icon and select *Connect to Data…*:



In the *Data Connect* fly-out palette, right-click on the SHP connection (typically SHP_1) and select **Disconnect**. Repeat the right-click process and select **Delete**:



The *Verify Delete Connection* pop-up window will appear, click <OK>:



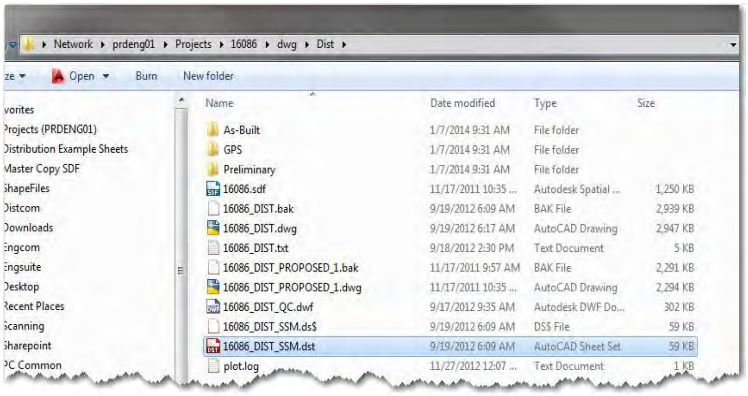
PROJECT DRAWING USING SHEET SET MANAGER

The Project Drawing must now be created. If CAD is not already open, re-launch it using the Desktop Icon, or another preferred method.

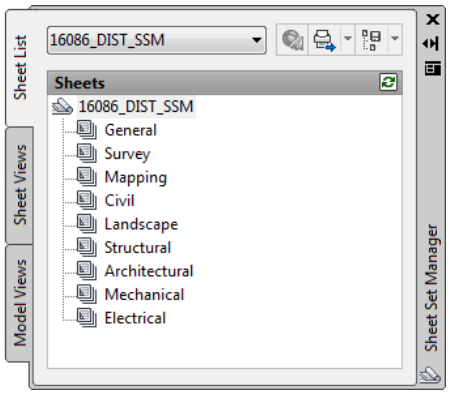
The Sheet Set must be created first and then the drawing. For this process, See [*Section 7.0-Sheet Set Manager*].

SHEET SET TIPS

Sheet Sets shall be named with the PT NO, discipline and SSM: (i.e., **PTNO_DIST_SSM**), and saved in the DIST folder of the appropriate project:



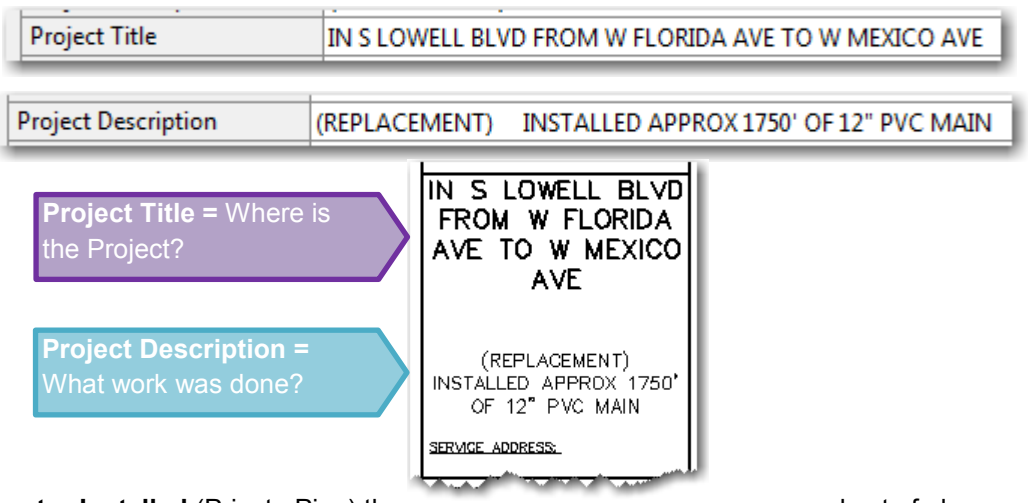
It is important to remember creating the Sheet Set does not create a drawing; they exist independently of each other. The image below shows only the newly created Sheet Set, without any “sheets”:



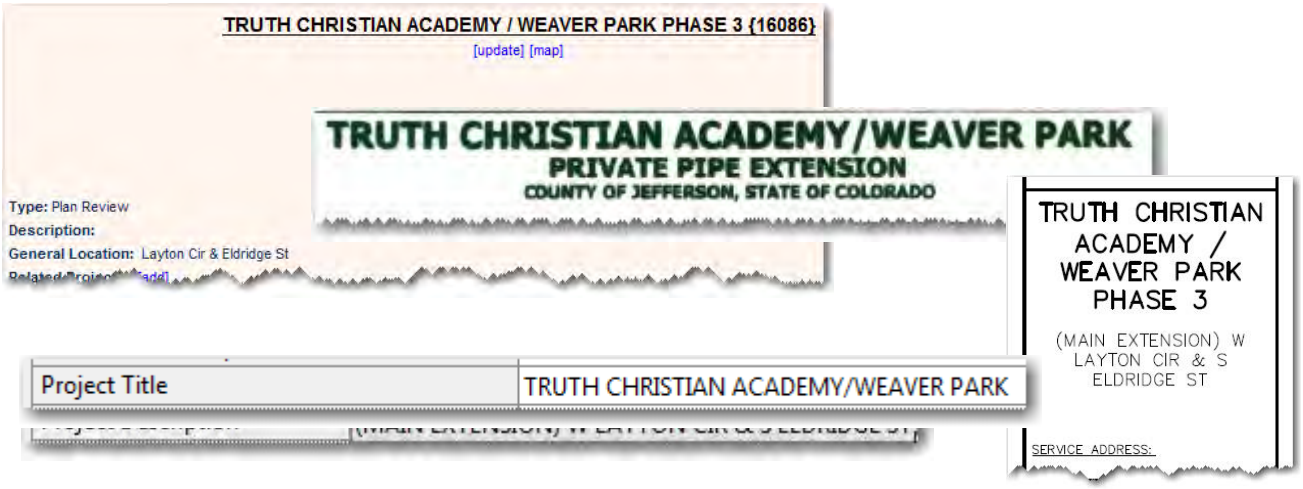
When creating a new sheet it is important to remember that any time the word **file** is mentioned, an actual drawing (with a .dwg extension) is being created:

The **Project Title** and **Project Description** (edited within the Sheet Set properties) will vary depending on the job type. The Project Title stays the same on every sheet (Sheet Set Property) and the Project Description may vary from sheet to sheet, but is not typical. T&D jobs and Contractor jobs receive this information from slightly different locations.

When populating the **City Pipe Cover Page and Title block** the information shall match the proposed set of plans, it is helpful to think about what Project Title and Project Description mean:



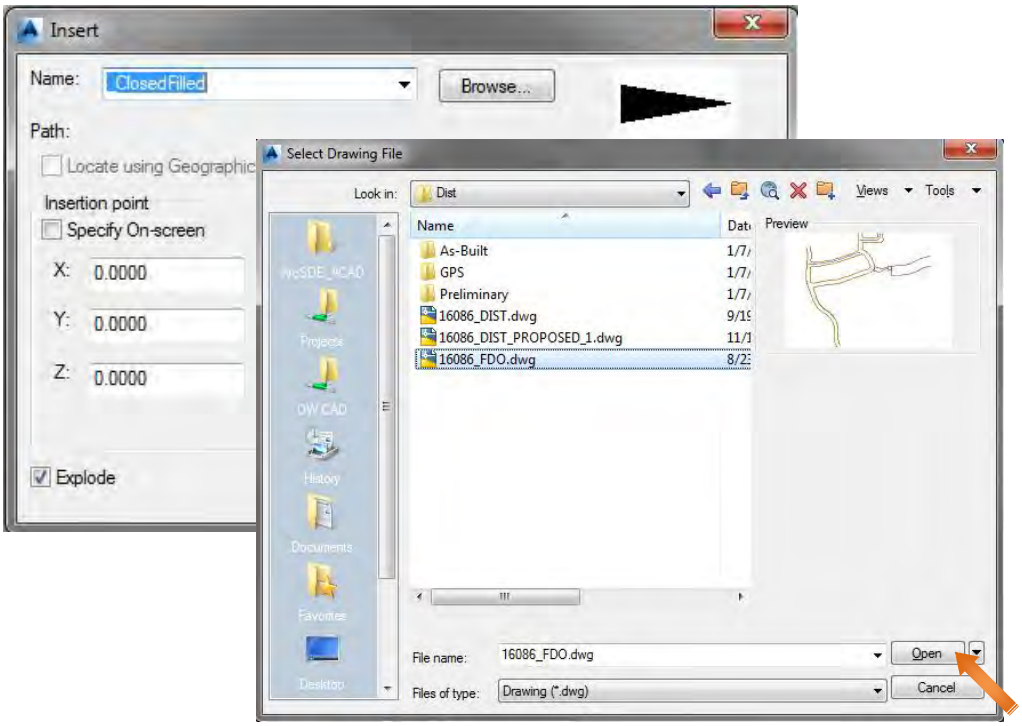
For **Contractor Installed** (Private Pipe) the information shall match the approved set of plans, and/or Project Tracker:



Always REGEN the drawing after Sheet Set properties have been modified, save changes.

FDO Base Information

While in Model Space type INSERT at the command line. Browse to the project location and select the desired drawing, click <Open> and see [*Section 8.0-FDO Instructions*], to see the specifics on inserting the FDO drawing:

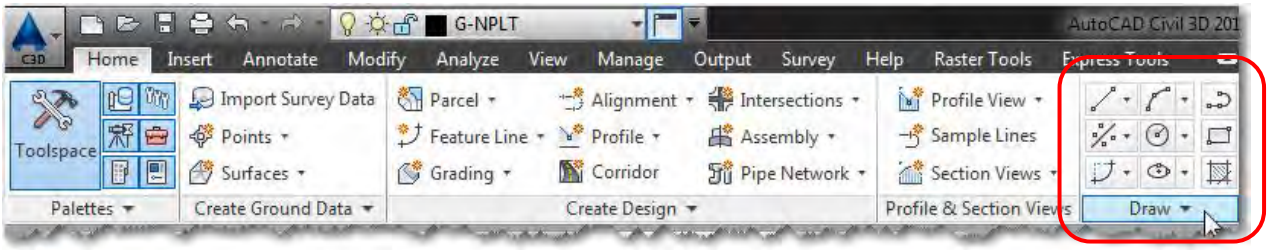


NOTE: When there is Survey Data an XREF would be performed in place of an Insert of FDO information, see Page 59 of the CAD Manual.

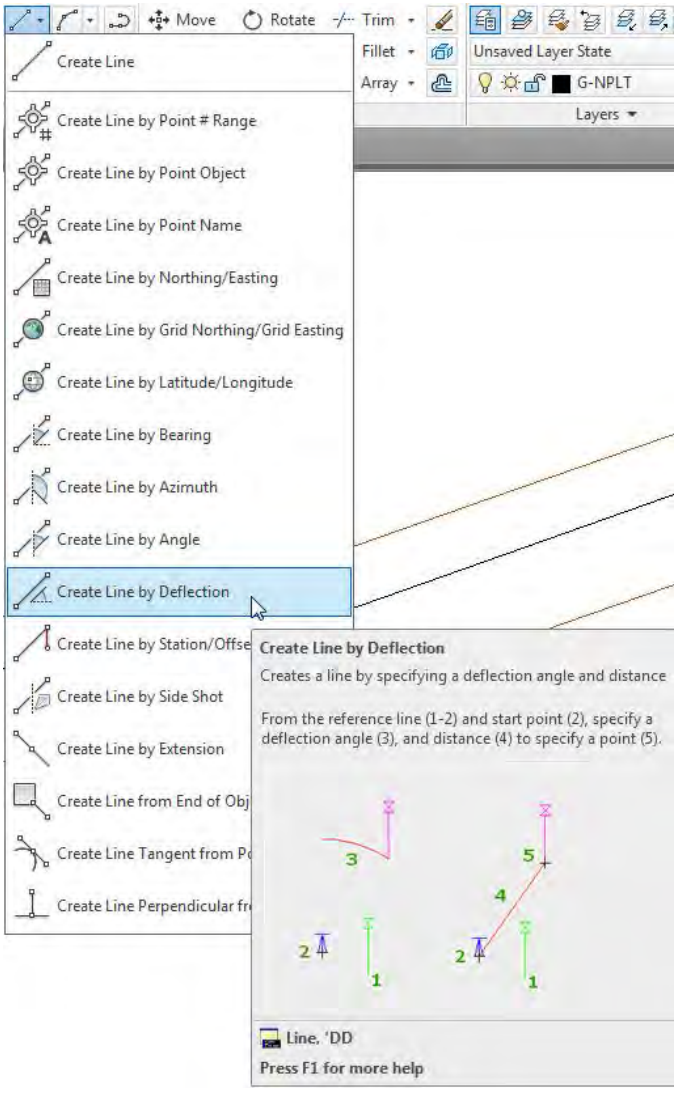
Sketch Waterline

Using a "junk" layer, such as G-NPLT set current, sketch in the waterline using the inspection notes, GPS points, Engineering Standards, E-Map, and any other supporting applications or documents. *This is a difficult process to fully document and may vary slightly on a project basis.*

When drawing pipe deflection, the **Distance Deflection** command may be very useful. To use this command another command must be active, such as PLINE. Once the first point is selected while in the PLINE command, navigate to the Home tabs' Draw panel:



On the Draw panel pick the line pull down and select *Create Line by Deflection*:

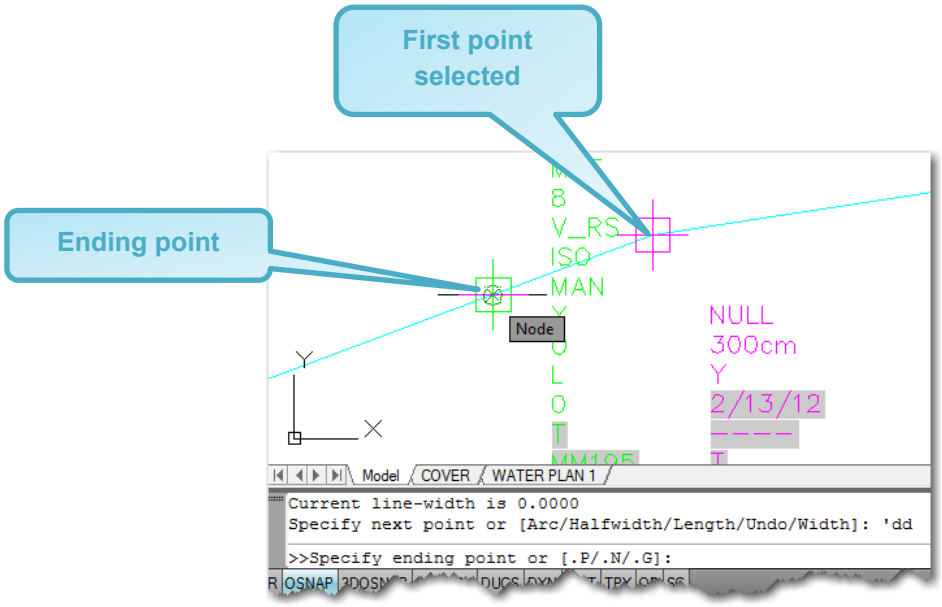


Tip: Deflection Distance

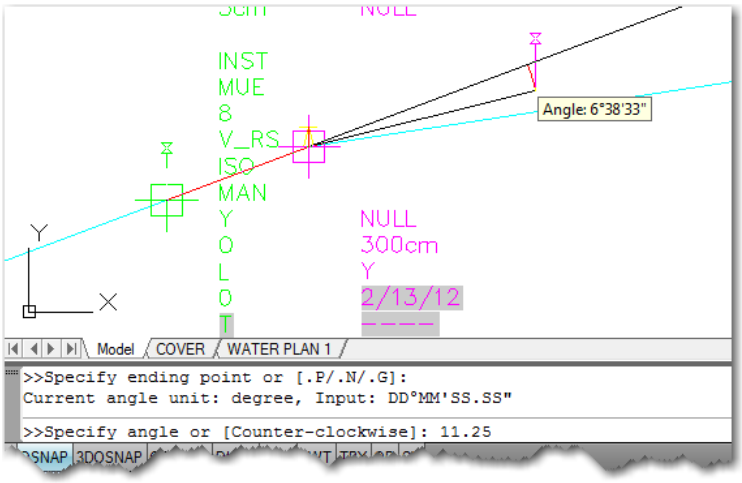
Alternately this command can be found on the *Transparent Commands* toolbar:

Or **'DD** can be typed at the command line while in the PLINE command:

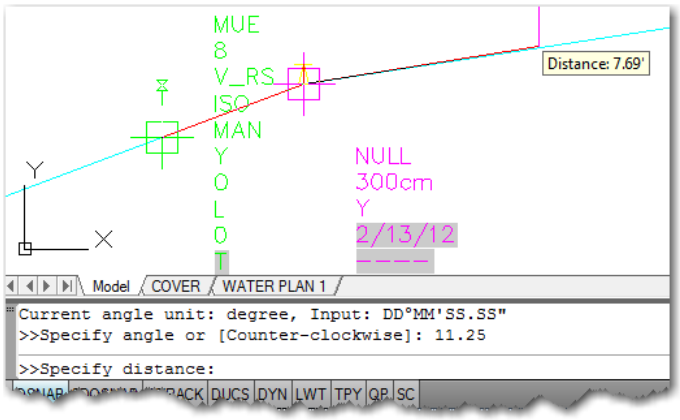
Follow the command prompt to utilize the Deflection Distance command; the first point selected should be the closest point to angle desired, and then work backwards toward the *ending point*:



Once the ending point is selected the command line will prompt the user to specify an angle, type in the desired angle and hit Enter:

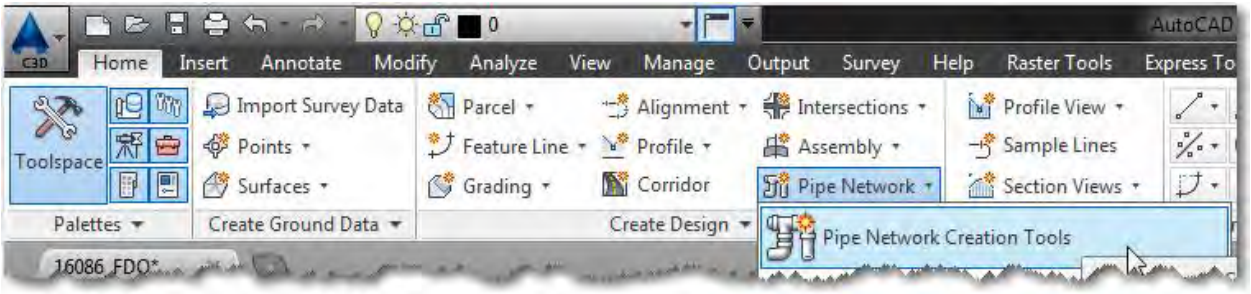


The line will now reflect the desire angle, the line distance can be typed in or just pick a point on the screen:

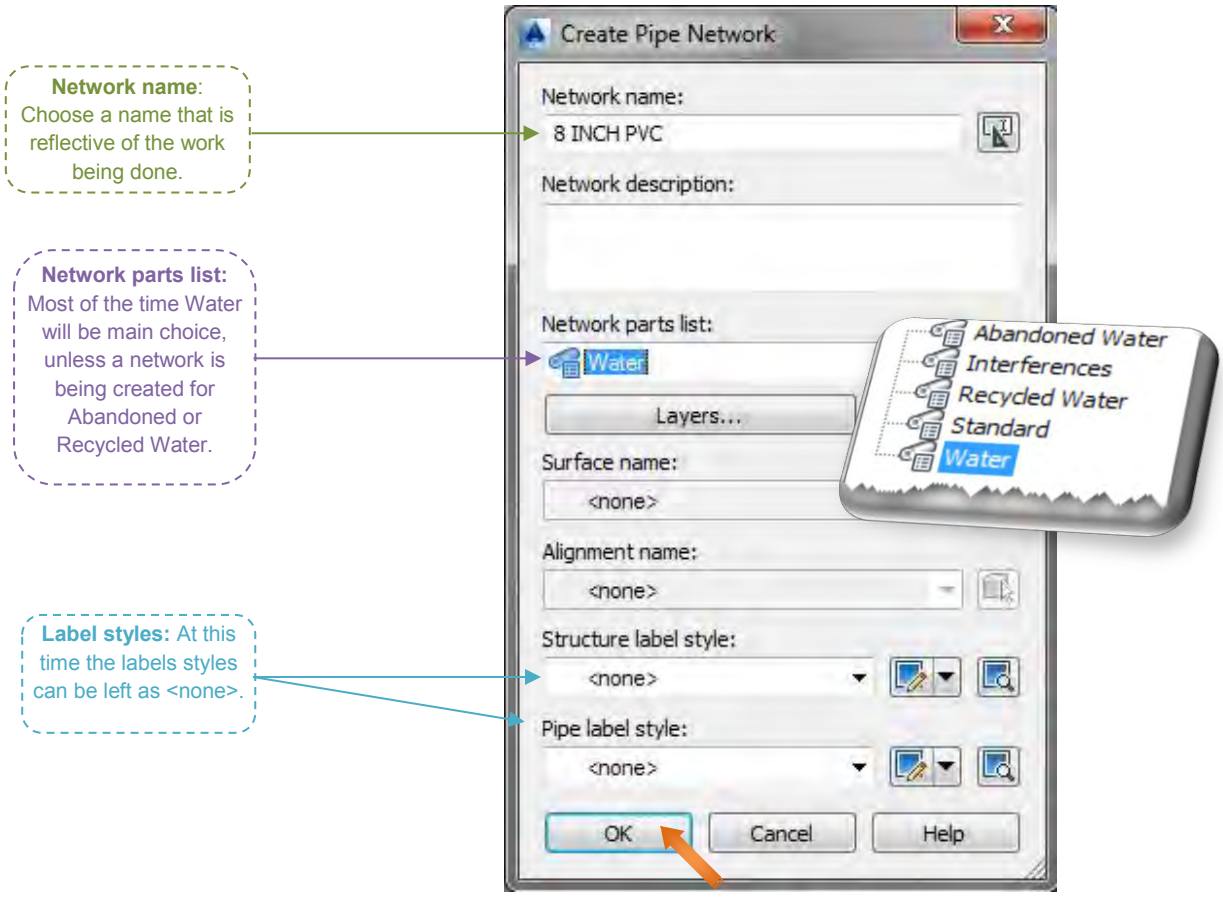


Adding a Pipe Network

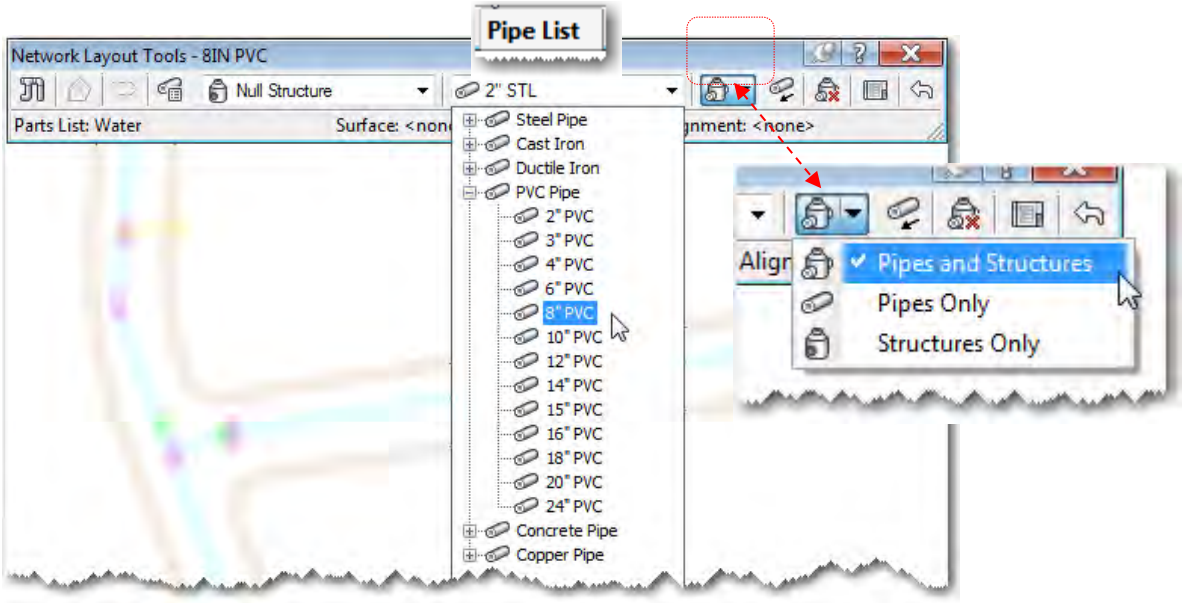
For projects without an alignment, use the following process (typically Private Pipe and Contractor installed jobs). On the Home tab, Create Design panel (of the Ribbon), click the Pipe Network pull-down and choose **Pipe Network Creation Tools**:



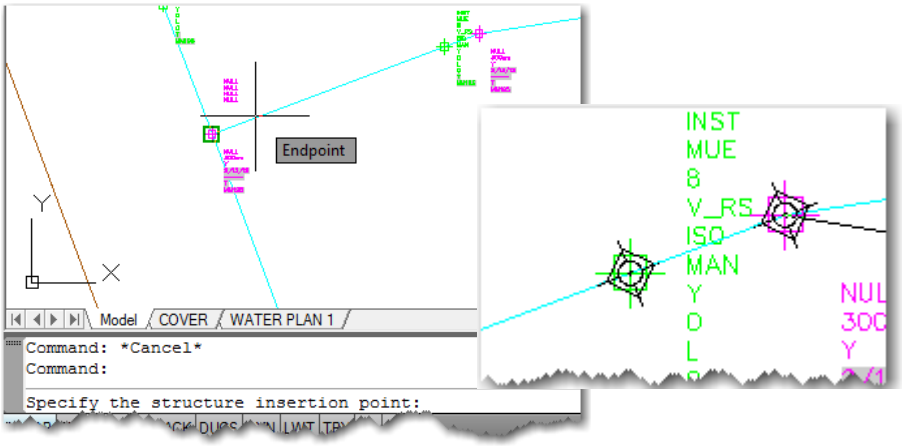
The *Create Pipe Network* pop-up will appear, match the options as close to the example below as possible, and click <OK>:



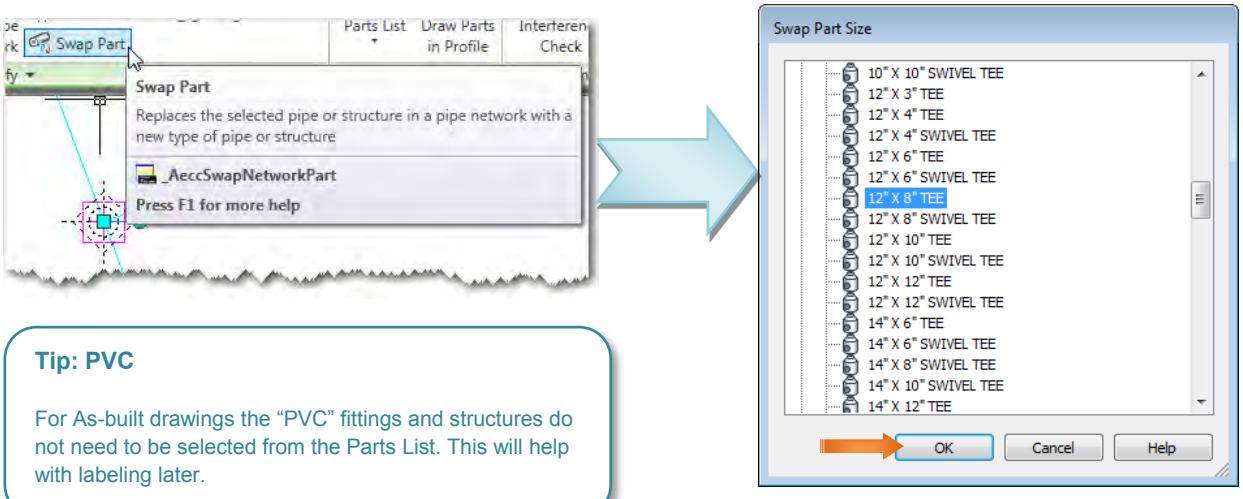
A floating toolbar will appear. Leave the structures as Null; select the correct pipe material and size from the Pipe List pull down; choose how to draw the network using the proper button (see example below):



The command line will prompt *Specify the structure insertion point*; utilize OSNAP to pick the correct insertion points, trace along the previously created ARG information – notice Null Structures are being added at each node; hit Enter once finished:



The Null Structures can now be replaced by swapping parts (found on the contextual ribbon or by right-clicking) and choosing the appropriate appurtenance, click <OK>:



Tip: PVC

For As-built drawings the "PVC" fittings and structures do not need to be selected from the Parts List. This will help with labeling later.

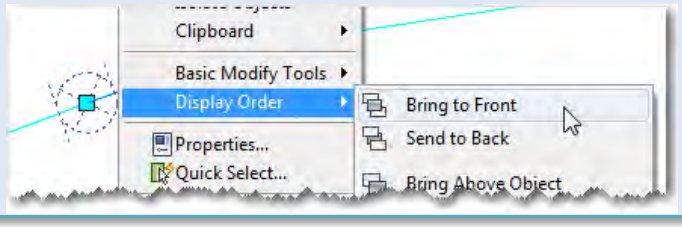
Each symbol will need to be reviewed as it is placed, to make sure the rotation and draw/display order is correct:

Incorrect rotation and draw/display order.

Correct rotation and draw/display order.

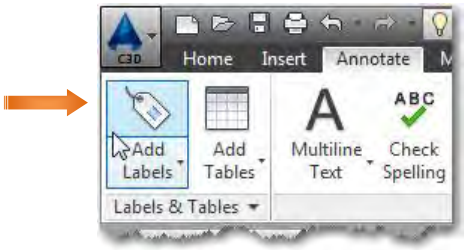
Tip: Display Order

The Display order of an object can be modified by right-clicking once the object is selected

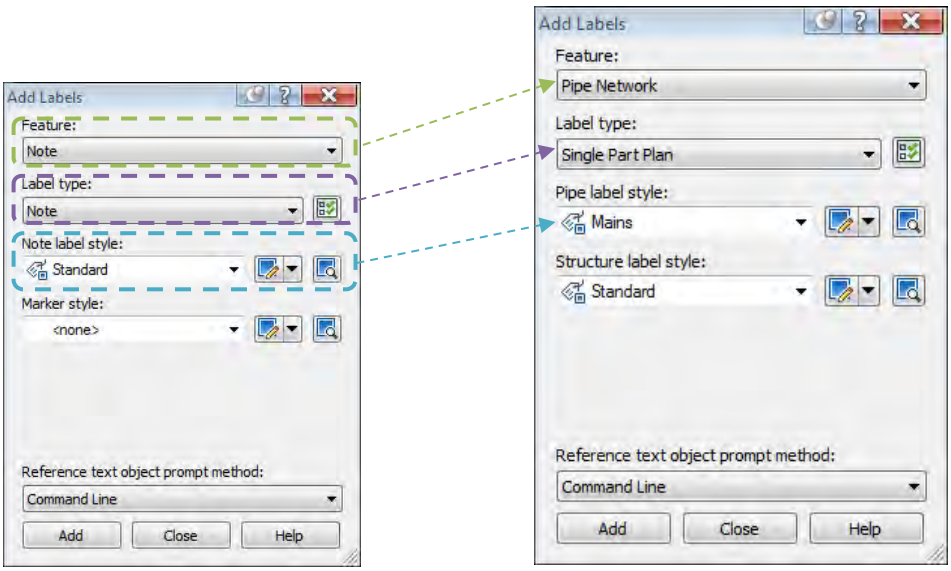


Annotate Pipe Network

Once the entire pipe network is finished the plan is ready to be annotated and labeled. On the Annotate tab, of the ribbon, click the *Add Labels* button [*Section 13.0-Labeling & Annotation*]:



The *Add Labels* pop-up will appear. Choose **Pipe Network**, under Feature, and **Single Part Plan**, under Label type and **Mains** under Pipe label style:

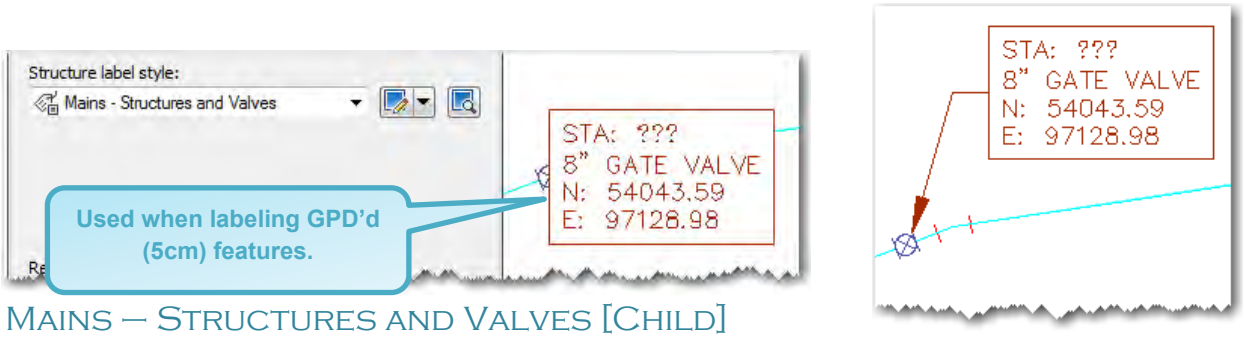


Structure Label Styles

The *Structure label style* consists of 5 different label types; the following examples show what each usable label style looks like:

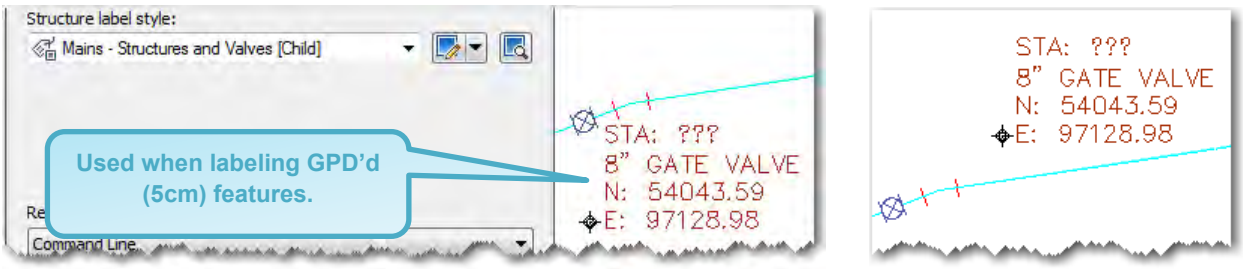
Mains – Structures and Valves

Automatically draws a masked text box around the text, and includes a leader when moved:



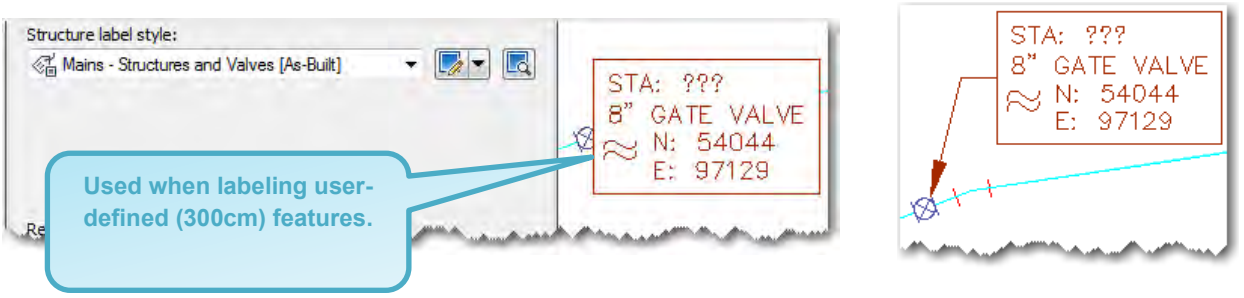
Mains – Structures and Valves [Child]

Does **not** include a text box or leader when placed or moved, includes marker for label placement:



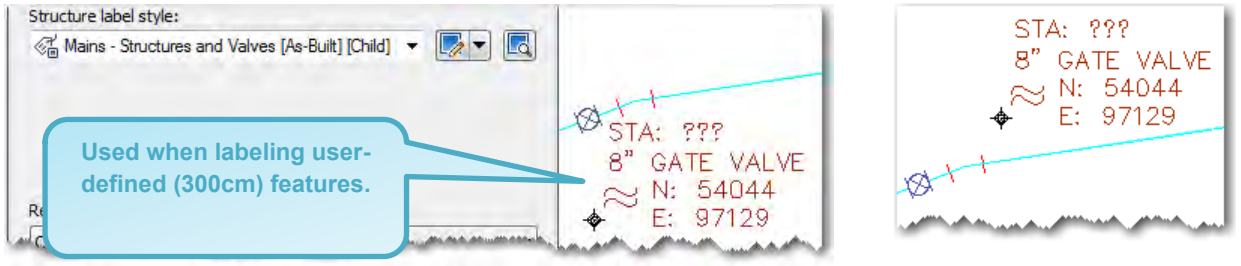
Mains – Structures and Valves [As-Built]

Automatically draws a masked text box around the text, and includes a leader when moved. Also includes an approximate sign as a separate text component:

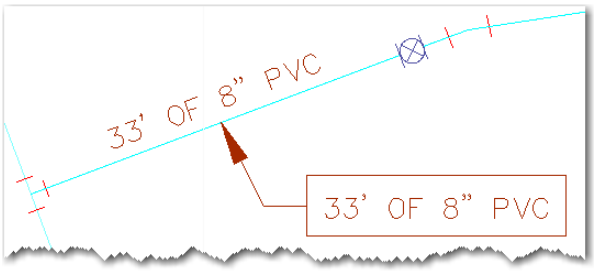


Mains – Structures and Valves [As-Built] [Child]

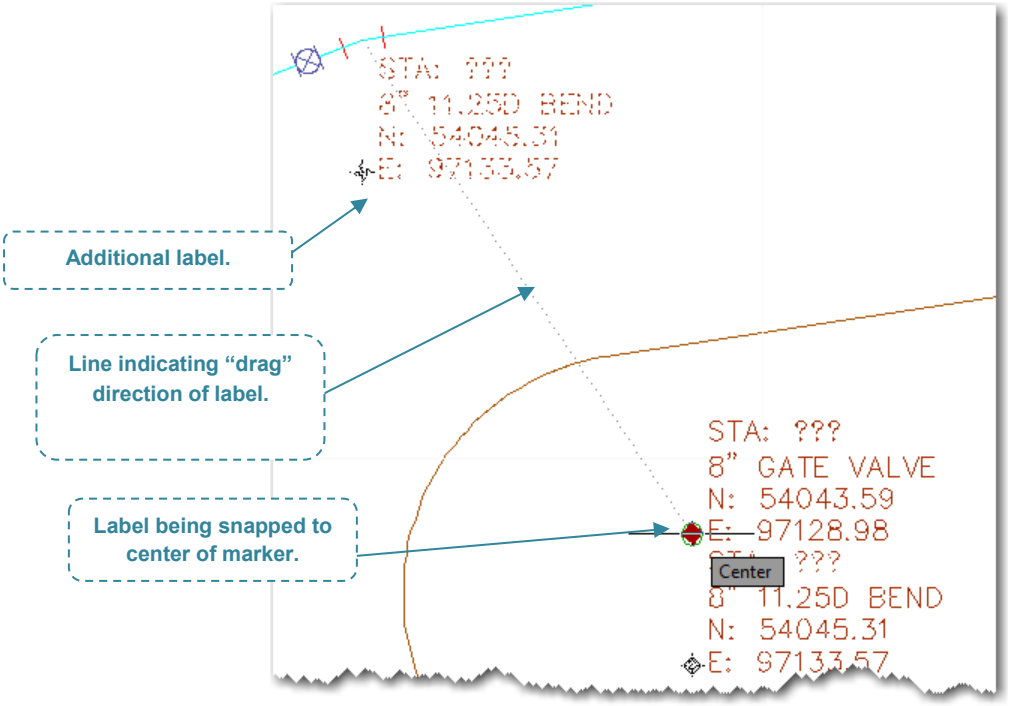
Does **not** include a text box or leader when placed or moved. Also includes an approximate sign as a separate text component, and a marker for label placement:



Each of the 4 previously listed label styles will include a masked text box and leader when the label is moved off of the pipe:

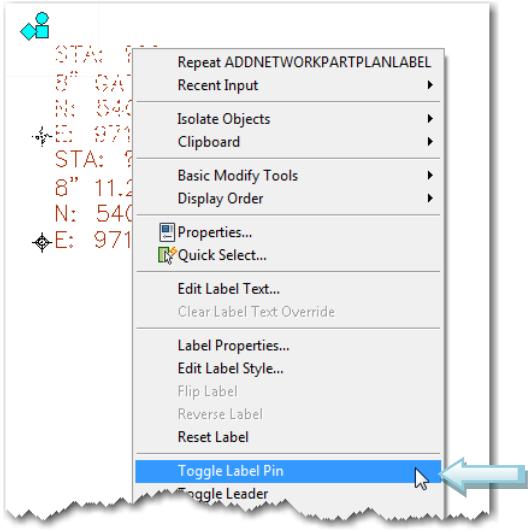


The "Child" label styles include a symbol that is useful when stacking notes in the same text box. Use the cyan colored grips to move the annotation to the desired location. When placing an additional label, snap to the center of the marker to line up the labels:



Note: OSNAP "nearest" when lining up with a text box

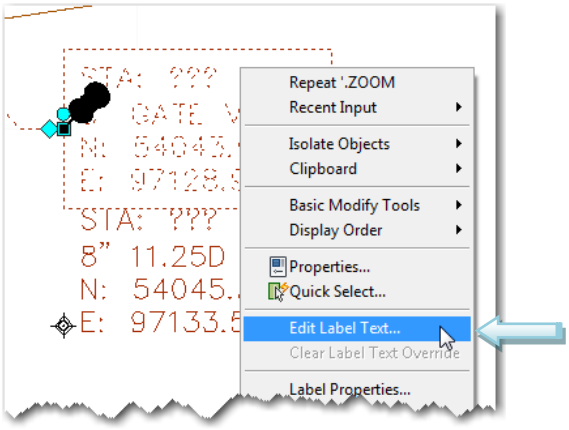
Civil 3D labels tend to "jump", to avoid this pin each label once it is placed. Select the desired label, right-click and choose *Toggle Label Pin*; the label will now show a pushpin:



Edit Label Text

Each label may need to be modified, either to remove stationing, add pipe lengths, expand text boxes or various other reasons.

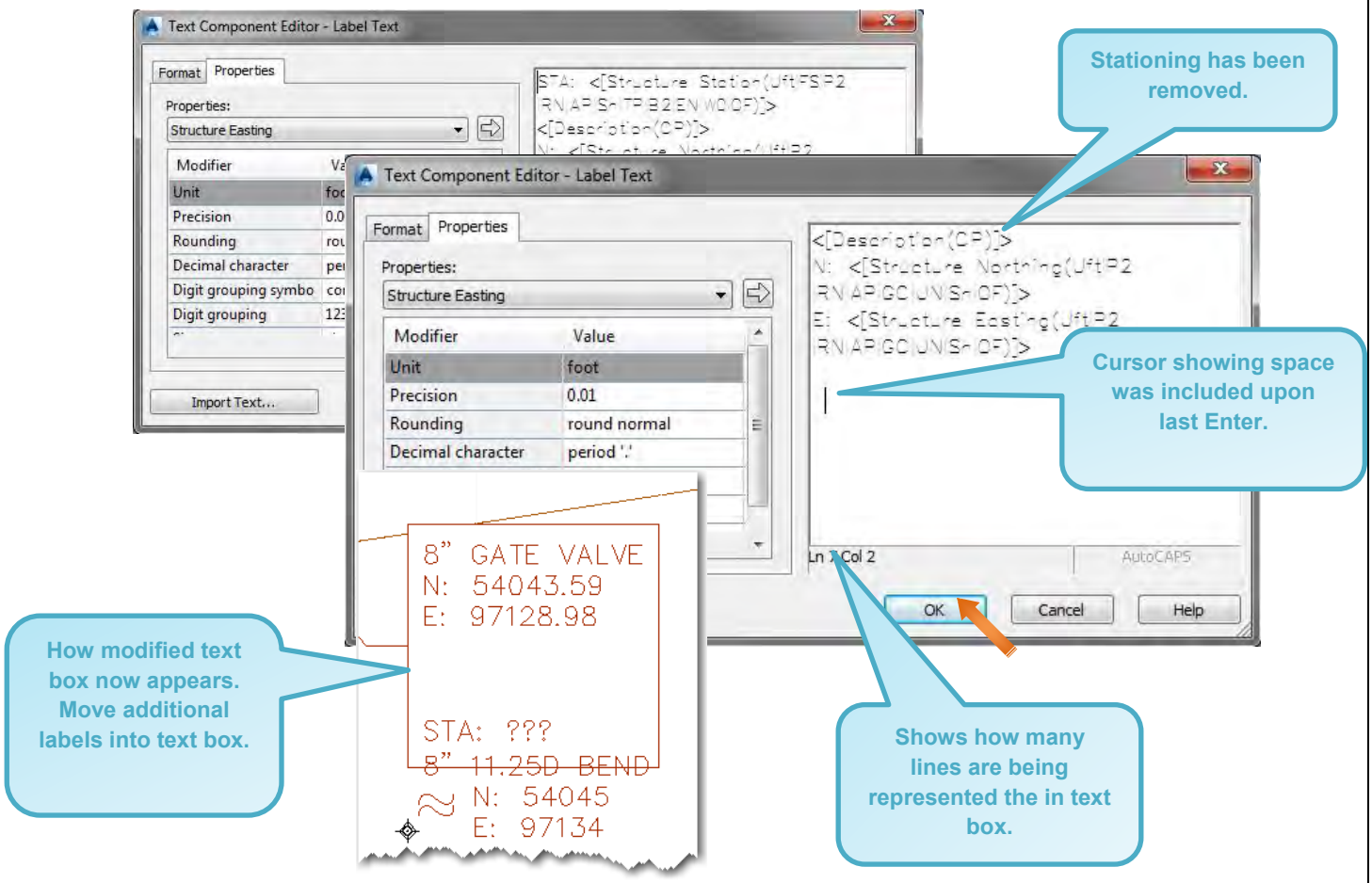
Select the label to be modified, right-click and choose *Edit Label Text*:



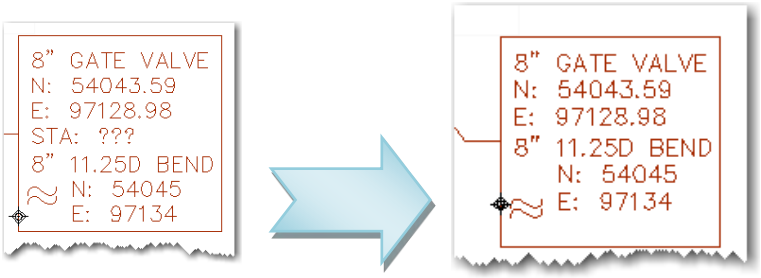
The *Text Component Editor – Label Text* pop-up window will appear. The window on the right of the pop-up is where the text can be modified.

Begin by removing any text not needed in the label, such as stationing.

To expand text boxes, place the cursor after the last line of text and hit Enter as many times as needed, be sure to include a space upon the last Enter. Click <OK> when finished:

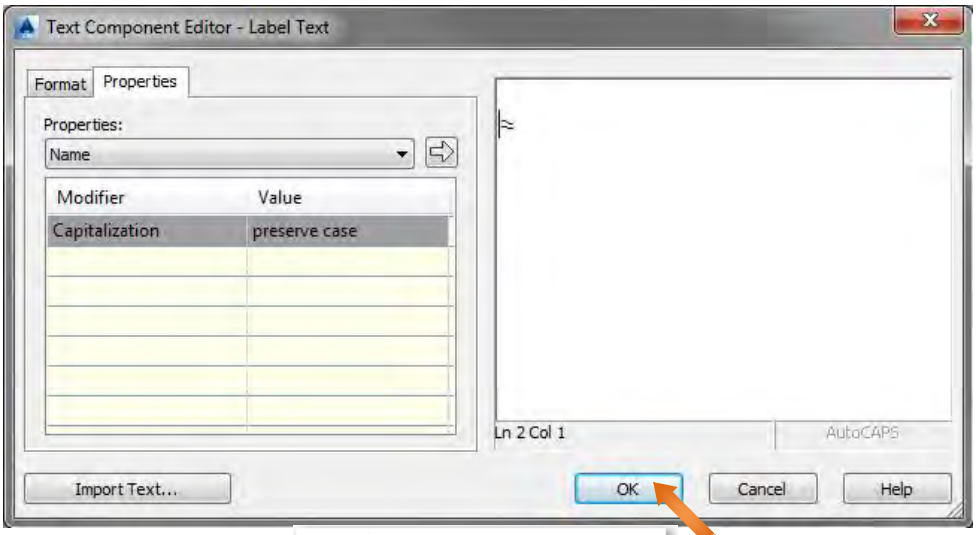


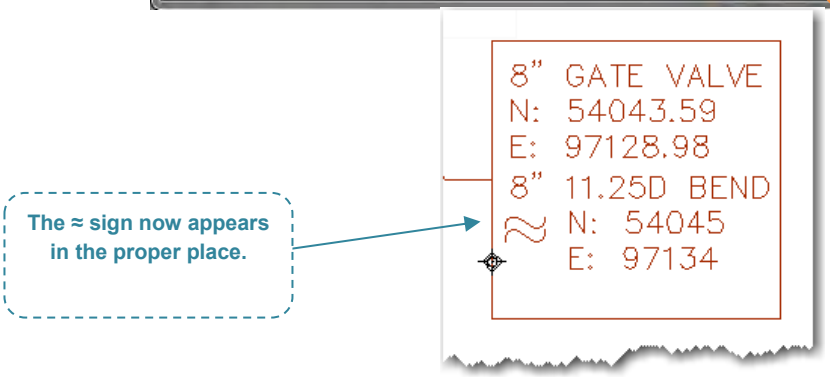
The"Approx" (≈) sign is a separate component of each applicable label style and must be edited separately. After a label is edited the ≈ sign may appear to be out of alignment:



Select the label, right-click and choose *Edit Label text*, the command line will prompt the user to *Select a text component to edit*, pick the ≈ symbol in the label:

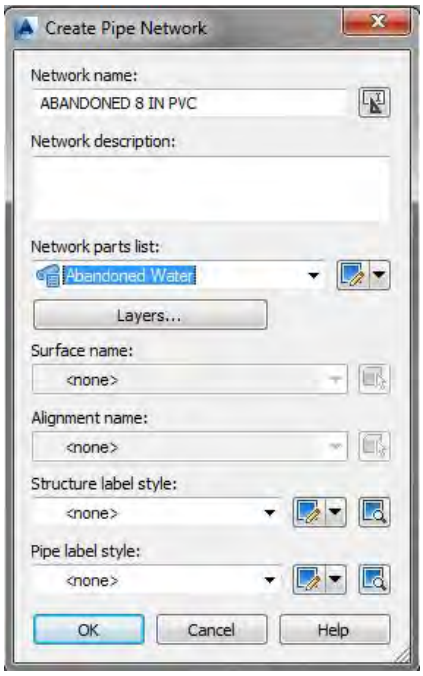
The *Text Component Editor – Label Text* pop-up window will appear, showing only the ≈ sign. To move the ≈ sign up, click above it and hit Backspace on the keyboard. Alternately to move it down hit Enter. Click <OK> when finished:



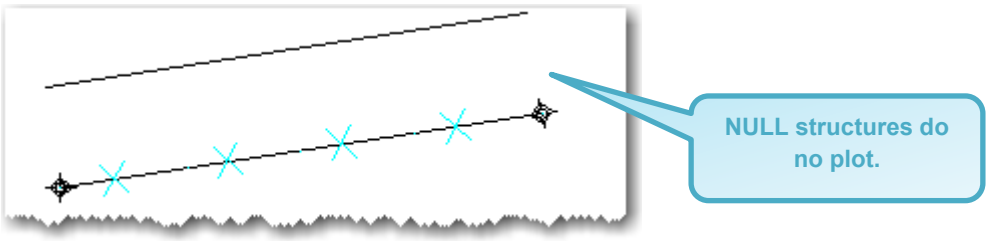


Add an Abandoned Pipe Network

Follow the same steps for *Adding a Pipe Network, [Page 40, this section]*, except choose **Abandoned Water**, for the Network parts list; name the network appropriately:



Leaving the line work in place, draw on top of it. The nodes at any intersections will not plot:

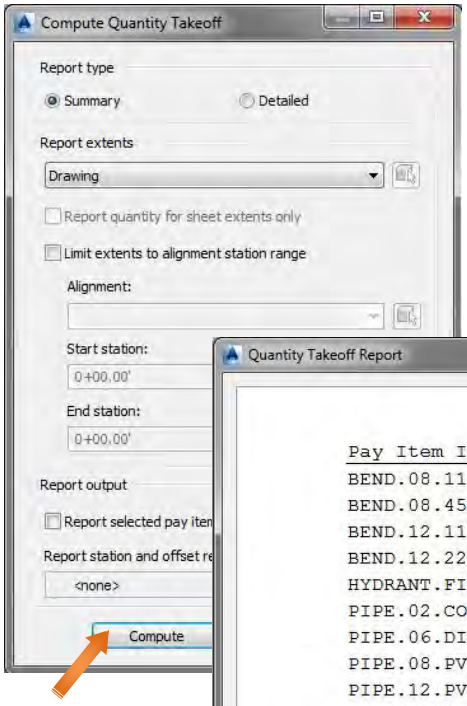


Quantity Takeoff

The Cover sheet, along with Matrix, requires a count for all pipe, valves, hydrants, etc. Civil 3D comes with a tool that can help automate this process.

On the Analyze tab, QTO panel, of the ribbon (while in the project drawing), click **Takeoff**:

The *Compute Quantity Takeoff* pop-up will appear, use the settings shown below, and click <Compute>. The *Quantity Takeoff Report* window will appear, select the desired Summary type:



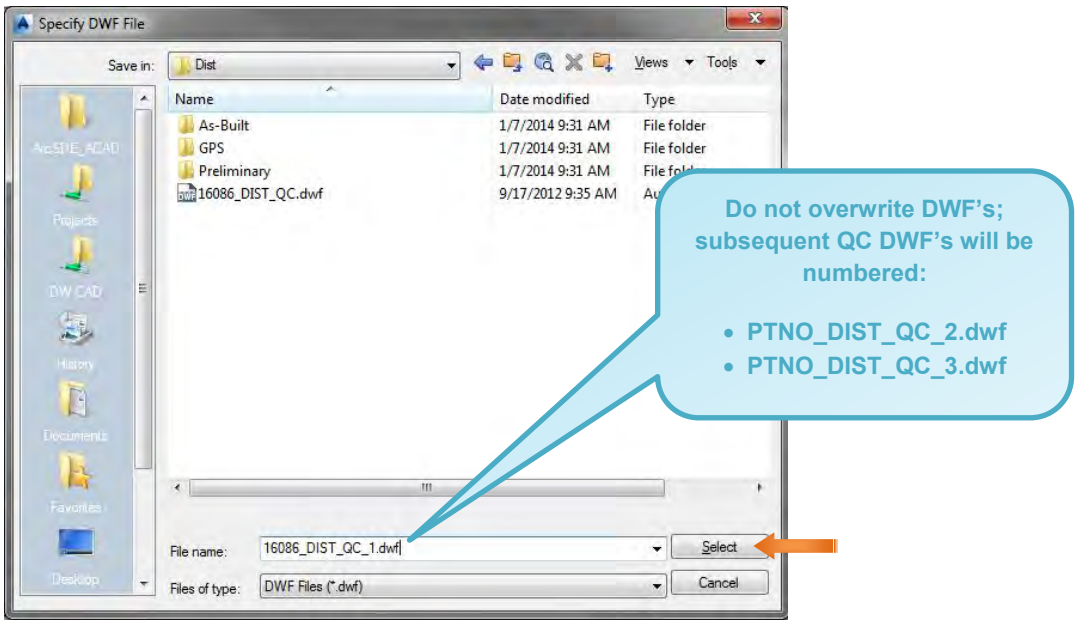
This tool builds an accurate list of all the pipe network objects in the drawing and creates a report. This report can be used to help with the "accounting" of a project.

Quantity Takeoff Report

Summary Takeoff Report

Pay Item ID	Description	Quantity	Unit
BEND.08.1125D	8" 11.25D BEND	2	EA
BEND.08.45D	8" 45D BEND	1	EA
BEND.12.1125D	12" 11.25D BEND	2	EA
BEND.12.225D	12" 22.5D BEND	3	EA
HYDRANT.FIRE	FIRE HYDRANT	3	EA
PIPE.02.COPPER	2" COPPER PIPE	2.81	LF
PIPE.06.DI	6" DI PIPE	88.36	LF
PIPE.08.PVC	8" PVC PIPE	794.11	LF
PIPE.12.PVC	12" PVC PIPE	720.03	LF
SLEEVE.12	12" SLEEVE	1	EA
TEE.12X08	12" X 8" TEE	1	EA
TEE.SWIVEL.08X06	8" X 6" SWIVEL TEE	1	EA
TEE.SWIVEL.12X06	12" X 6" SWIVEL TEE	2	EA
VALVE.02.AIR	2" AIR VALVE	1	EA
VALVE.02.BO.TEMP.90D	2" TEMPORARY BLOWOFF VALVE-90D	1	EA
VALVE.06.GATE	6" GATE VALVE	3	EA
VALVE.08.GATE	8" GATE VALVE	3	EA
VALVE.12.GATE	12" GATE VALVE	4	EA

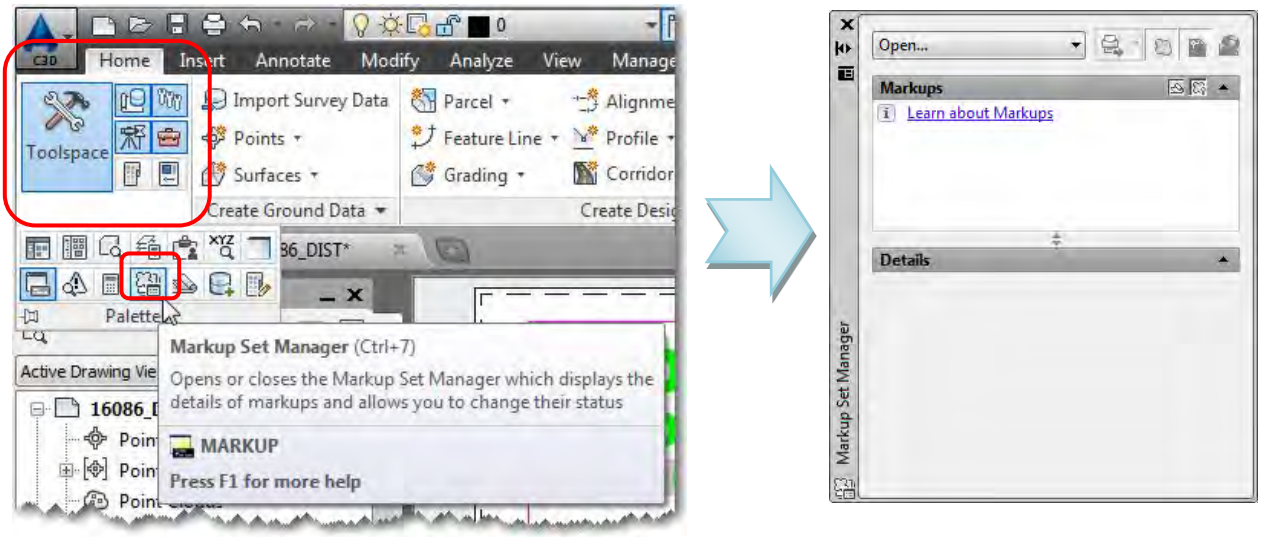
The *Specify DWF File* pop-up will appear, navigate to the project's DIST folder. Name the DWF accordingly (***PTNO_DIST_QC_1.dwf***), click <Select>:



DWF Markups in CAD

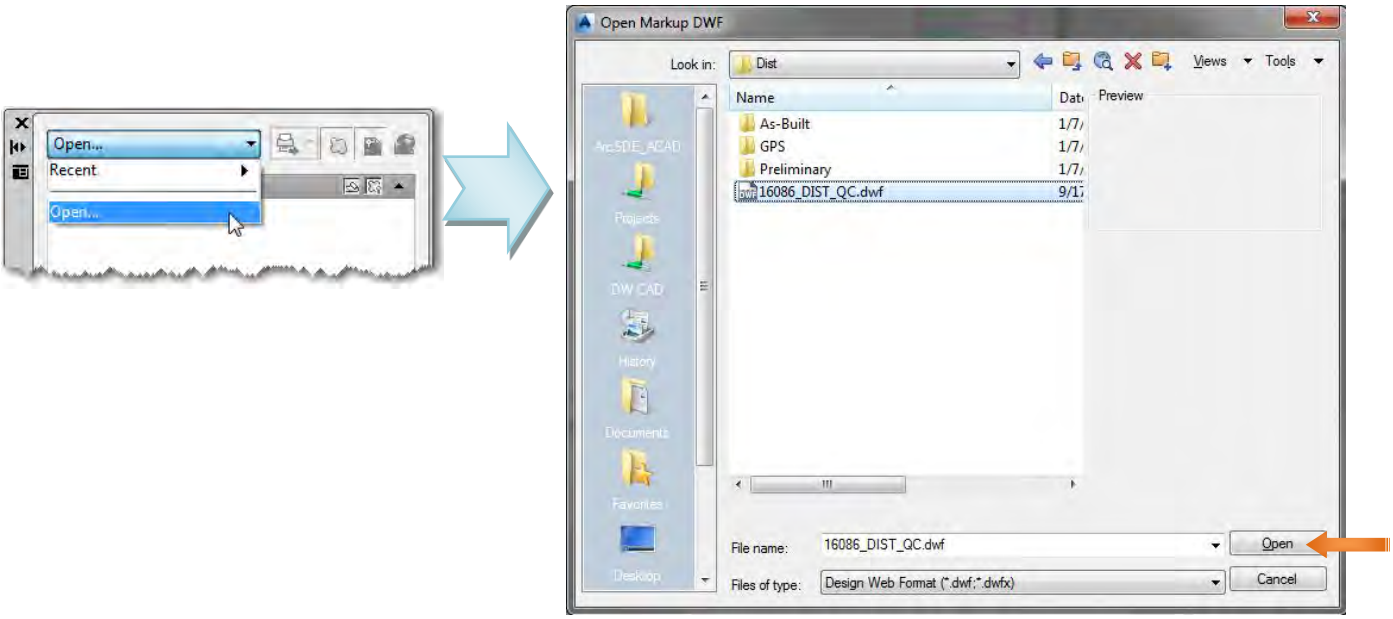
Open the Project Drawing using the Sheet Set.

Once the drawing is open, navigate to the Home tab on the ribbon, click the Palettes pull-down and click the *Markup Set Manager* icon. The *Markup Set Manager* palette will appear:

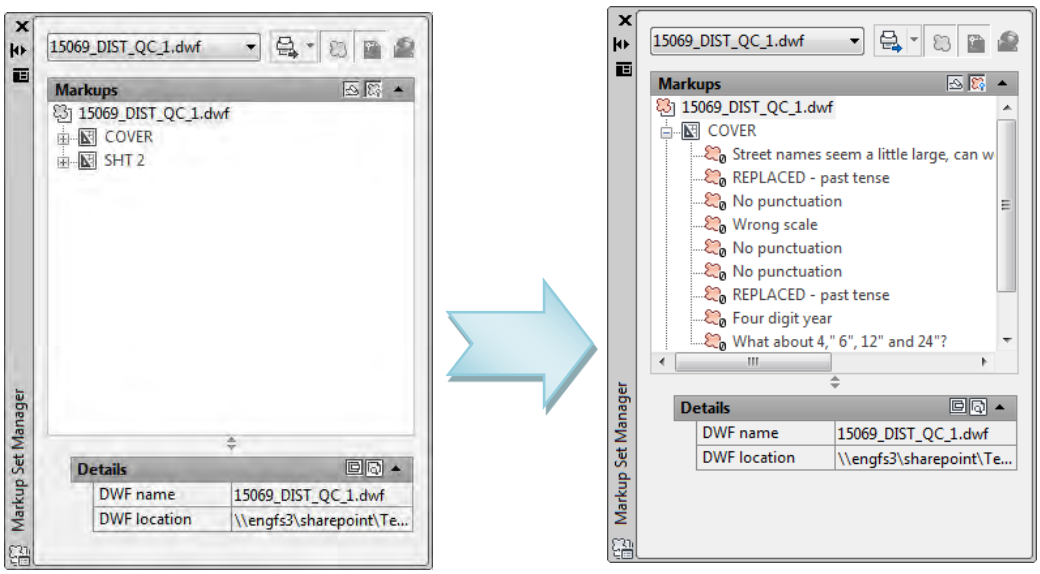


Alternately, type **_markup** at the command line.

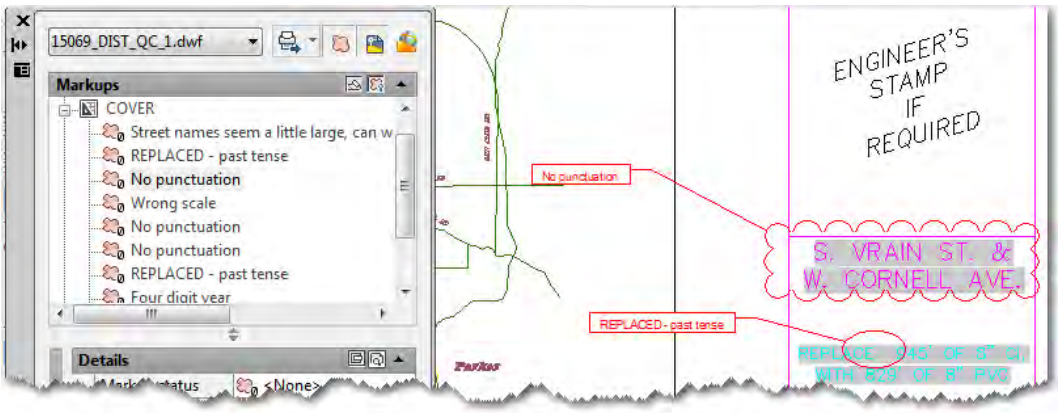
In the *Markup Set Manager* palette, select the down arrow next to *Open…* and choose *Open….* The *Open Markup DWF* dialog window will appear, navigate to the previously saved DWF file (now marked up) and click <Open>:



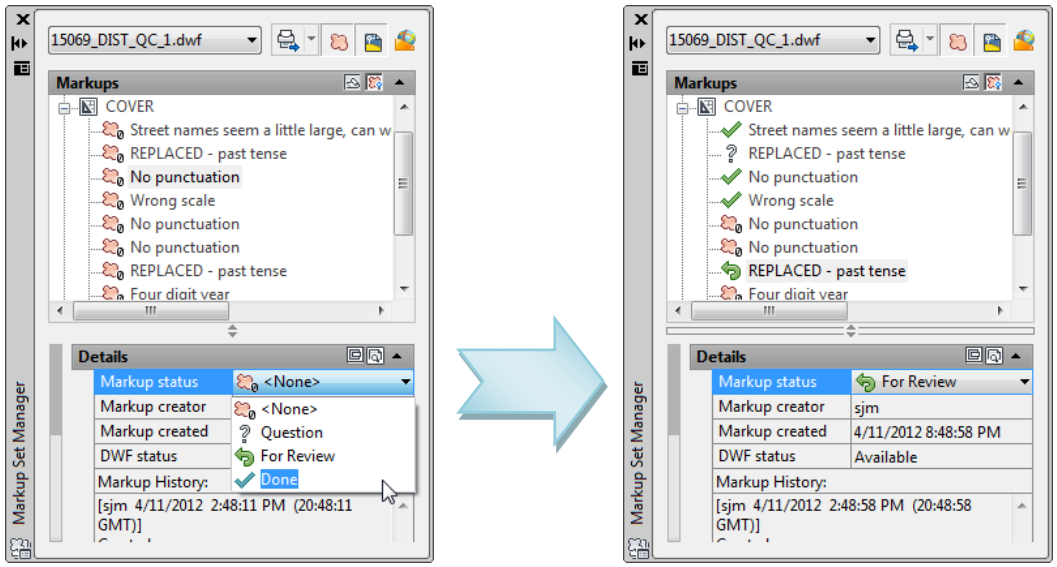
The *Markup Set Manager* palette will show the selected DWF, listing all sheets in the file. Use the plus sign to expand the sheets to see any markups:



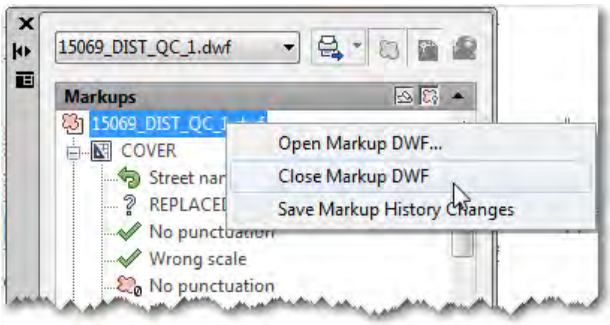
Double-click on one of the markups to show them in Paper Space within the Project Drawing:



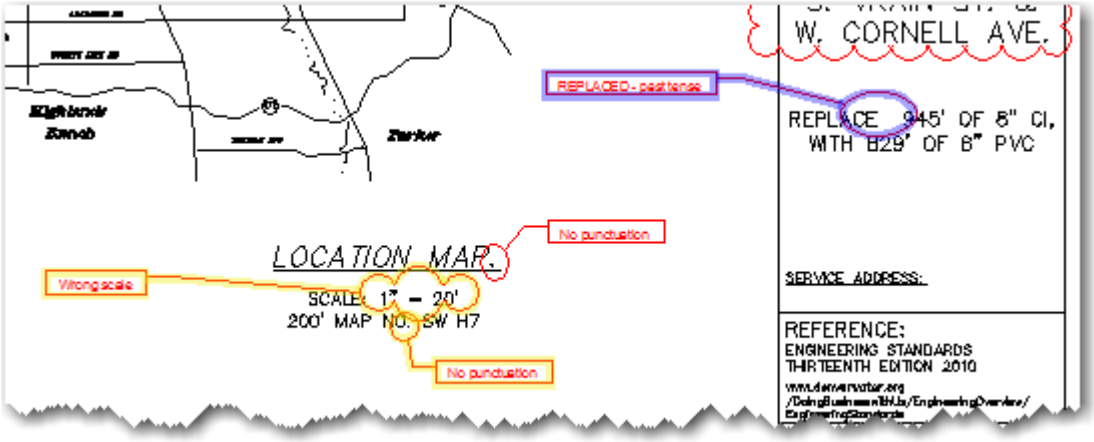
As each markup is corrected in the drawing, change the *Markup status* (under Details) accordingly:



Once all markups have been addressed, right-click on the DWF name and select *Close Markup DWF*:



Once opened, the DWF file will reflect the markup changes with highlights:



Following the steps in *Section 16.4 – Electronic Plots (PDFs & DWFs)*, this document, create a new DWF, name accordingly.

Section 18.4

Drawing Cleanup Tool for ARG Drawings

Overview - Section 18.4

Internal Use: Full compliance

Contractor Use: Reference only

It is important that ARG data is cleaned up, to make the translation to GIS easy and accurate.

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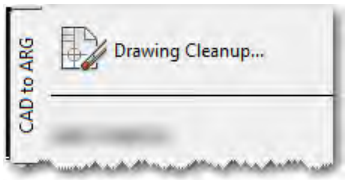
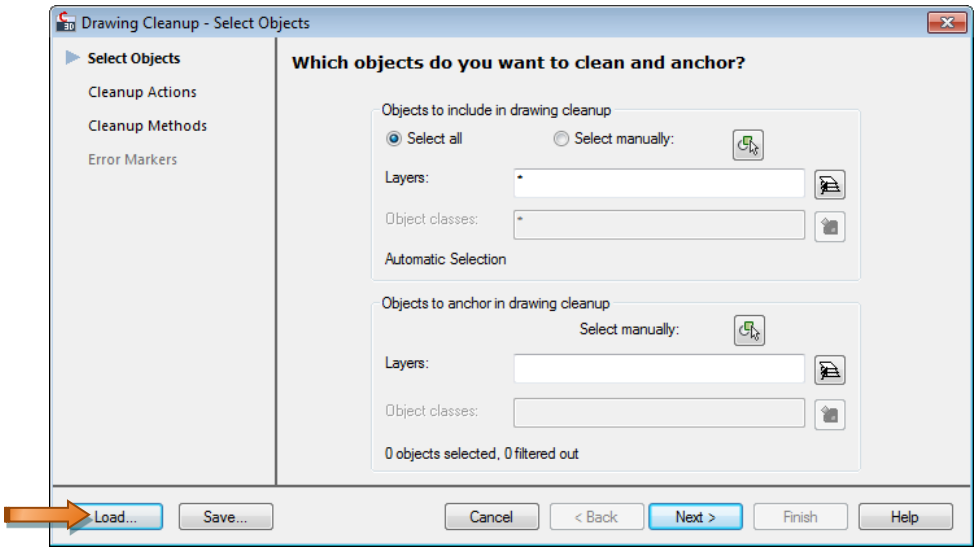
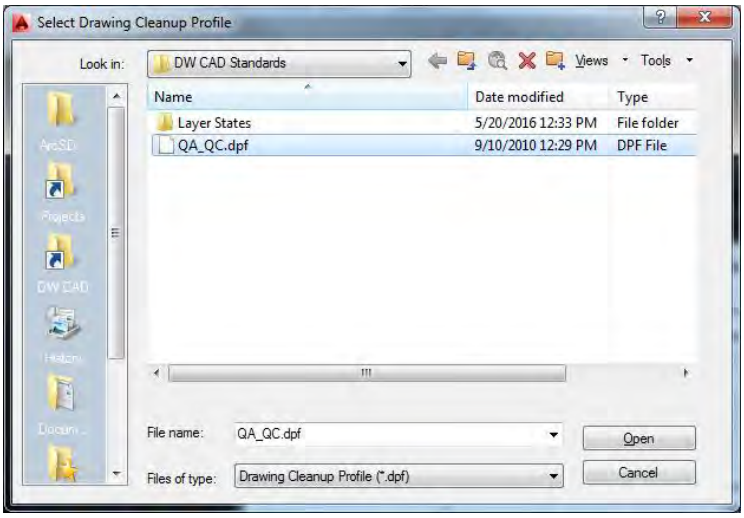
On the *CAD to ARG* Tool Palette, select Drawing Cleanup…:



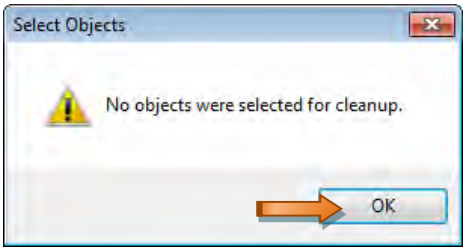
The *Drawing Clean up – Select Objects* window will appear, click <Load>:



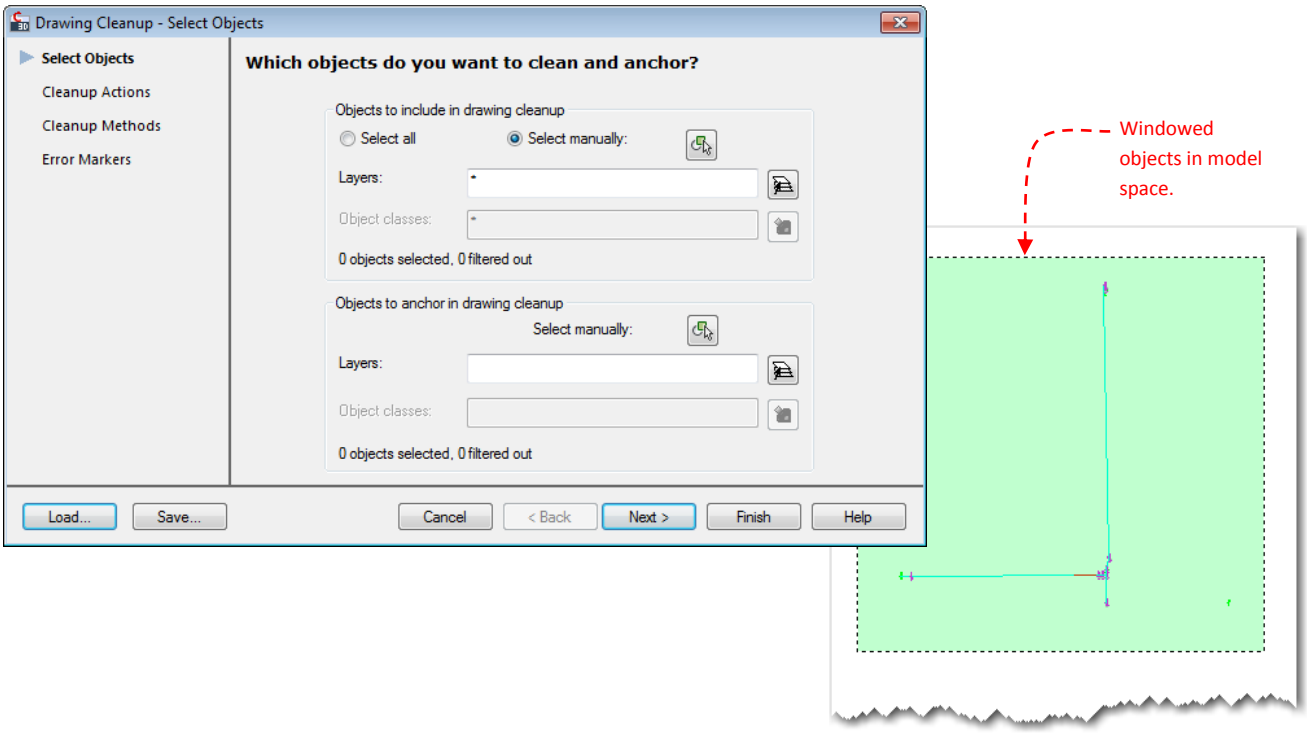
The Select Drawing Cleanup Profile window will appear; navigate to the *DW CAD* folder, select the *QA_QC.dpf* and click <Open>:



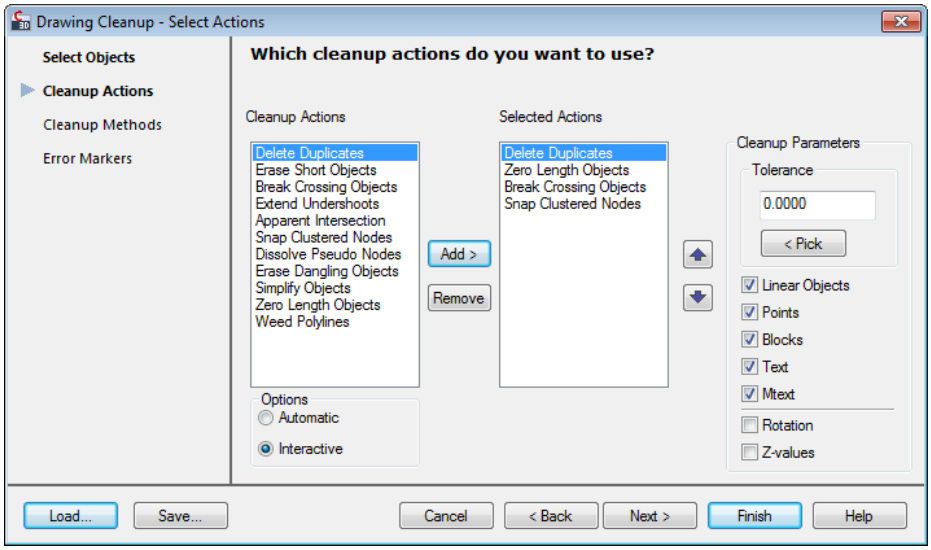
The Select Objects pop-up may appear, click <OK>:



In the Drawing Cleanup – Select Objects window, under Objects to include in drawing cleanup choose, Select manually: then click the selection button to the right. In model space, window all objects to be reviewed, hit enter (or right-click); then click <Next>:

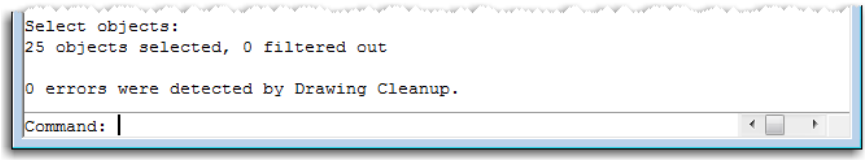


In the Drawing Cleanup – Select Actions pop-up the "Actions" have already been preselected, the Cleanup Parameters may need adjusted per users' preference (see Select Actions); click <Finish>:



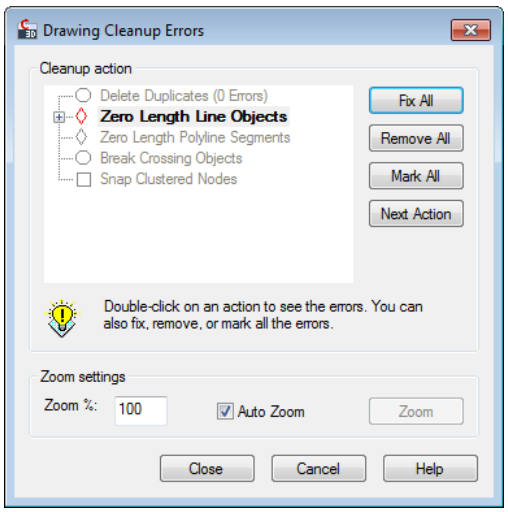
NOTE: See Select Actions for details about each action.

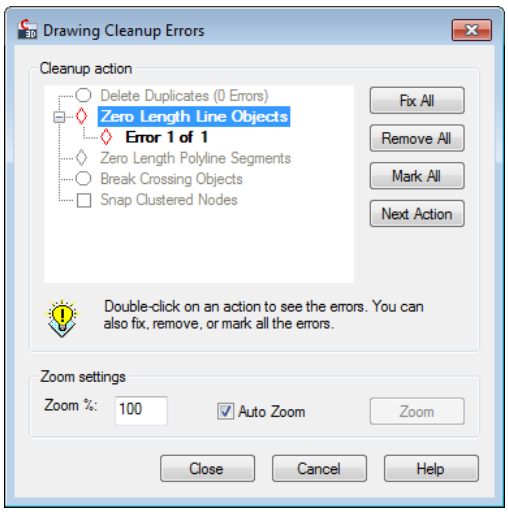
If there were no errors detected in the drawing the command prompt will appear similar to the example shown below:



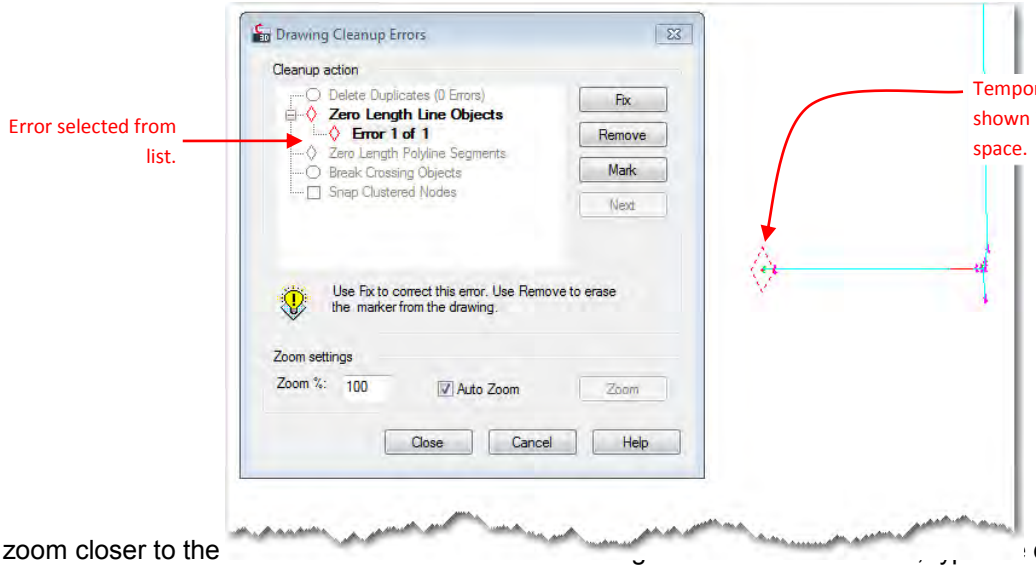
Drawing Cleanup Errors

In the Drawing Cleanup Errors pop-up the first Cleanup action with detected errors is selected; expand the Cleanup Action, by clicking the plus sign, to display the list of detected errors:

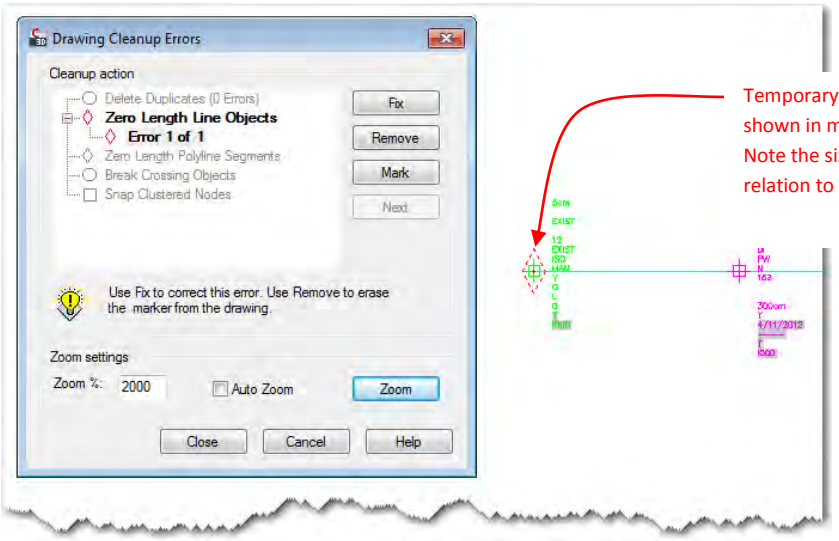




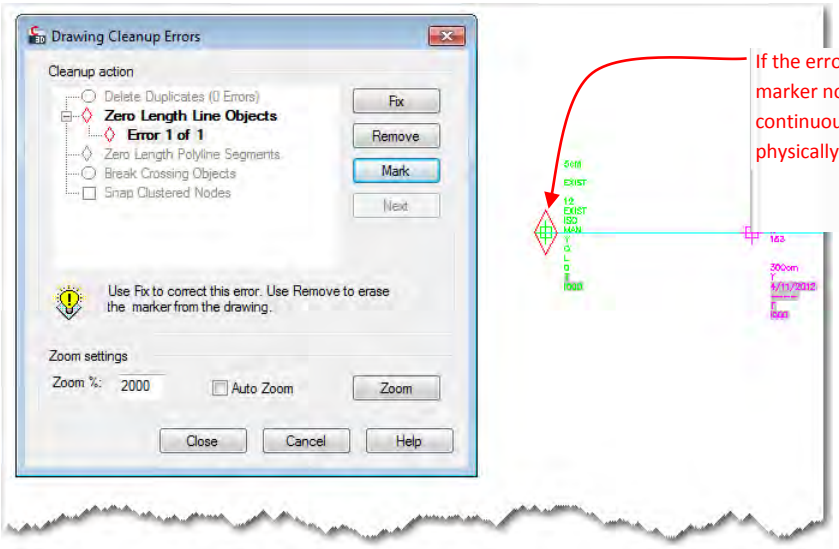
When the error is selected from the list, it will automatically zoom to the first error, and be shown with a temporary marker (dashed line):



To zoom closer to the desired number in the Zoom % field, and then click <Zoom>:



Decide whether the error is valid or not. If it is not, click <Remove>; if it is, click <Mark>:



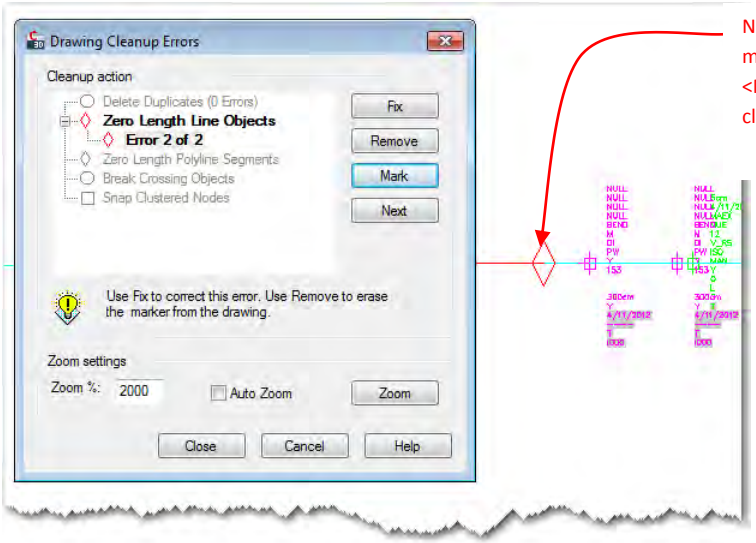
Tip: Marking
Keep in mind the marker size is always 5% of the screen area, be sure 0 is set as the current layer and turned ON before selecting <Mark>.

(1) By clicking the <Next> button the temporary marker will move to the next error within the current Cleanup Action;

(2) Click <Zoom> to see the error on screen;

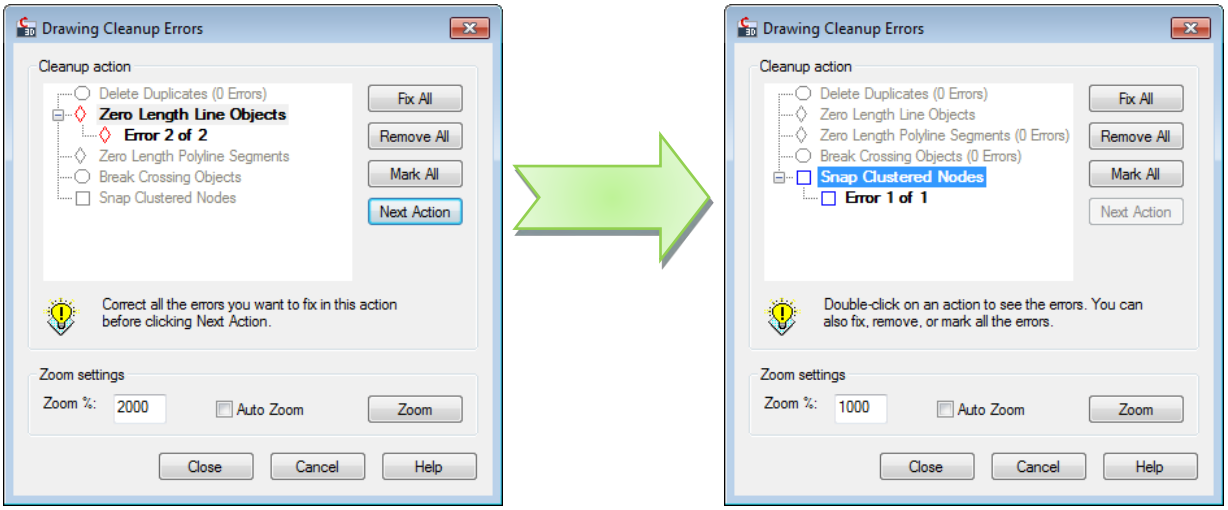
(3) Then click <Mark>, <Remove> or <Fix> ;

(4) Once finished marking all errors within the selected Cleanup Action click <Close>



Note: To help reduce the margin of error, do one Cleanup Action at a time so as not to confuse the errors. See Review Drawing Errors to correct the errors, then move on to the next step, after this one, for marking additional Cleanup Actions.

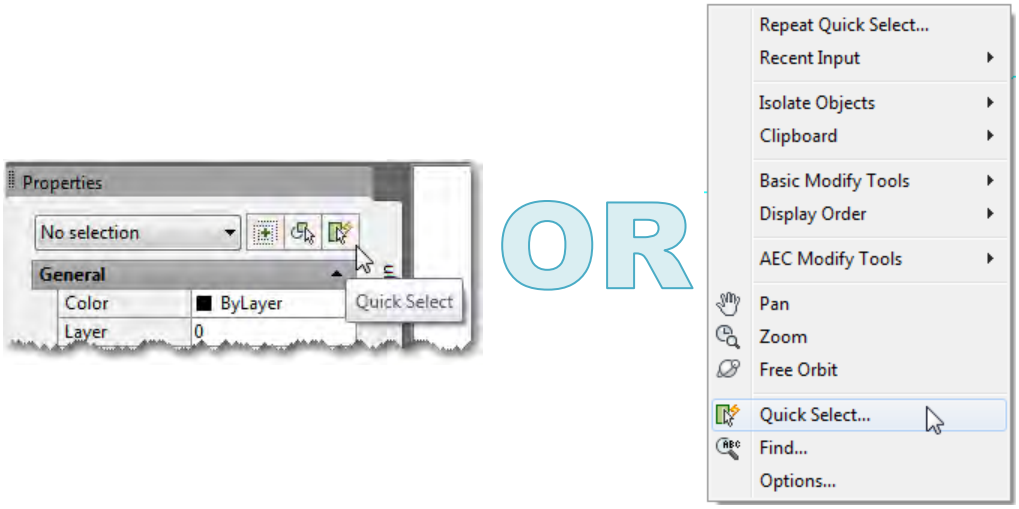
If there is more than one cleanup action, select the current Cleanup action, then click <Next Action>; this will display the next set of Cleanup Actions with errors, repeat previous steps for marking each error:



Review Drawing Errors

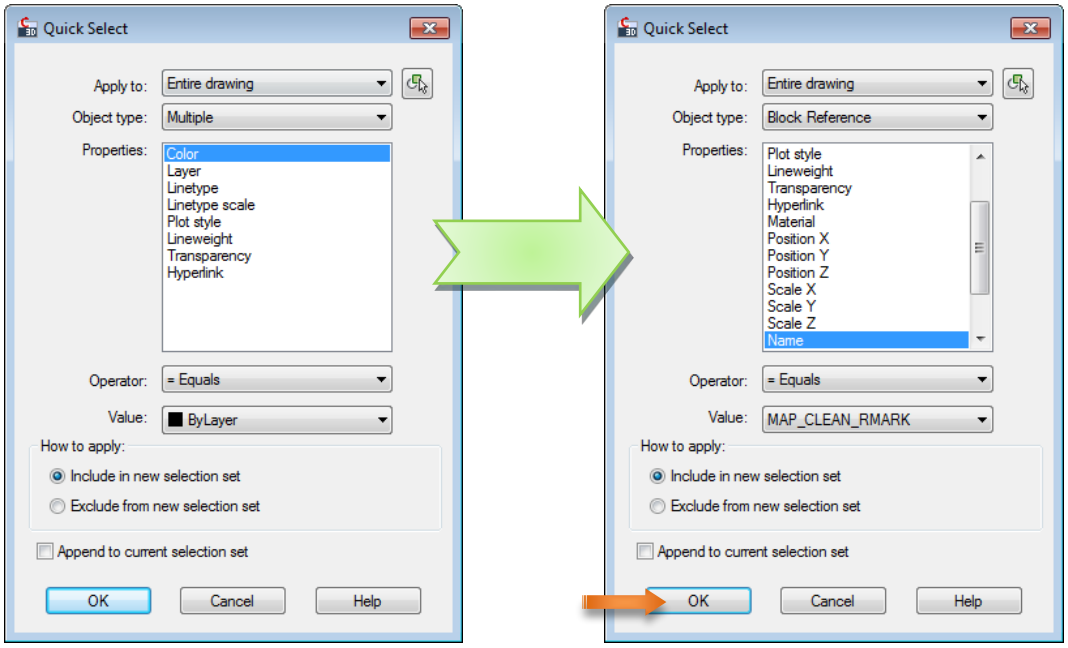
The following is just one example showing how to review errors. Each user may have a different preference, this is just a guideline.

Each marker placed, using the Drawing Cleanup, is now an AutoCAD block. To search for these blocks the user can utilize the Quick Select tool by either clicking the Quick Select button on the Properties palette or by right-clicking in model space and choosing Quick Select…:

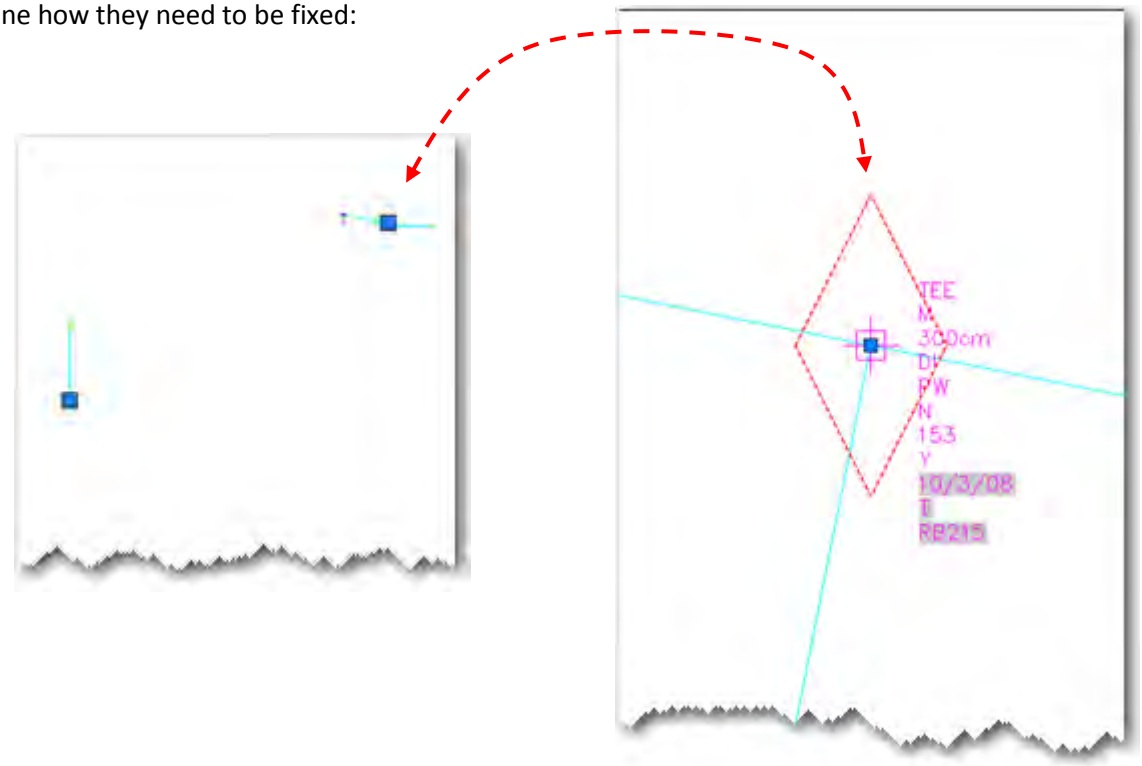


An error window may pop-up, click <OK> and move on to the next step:

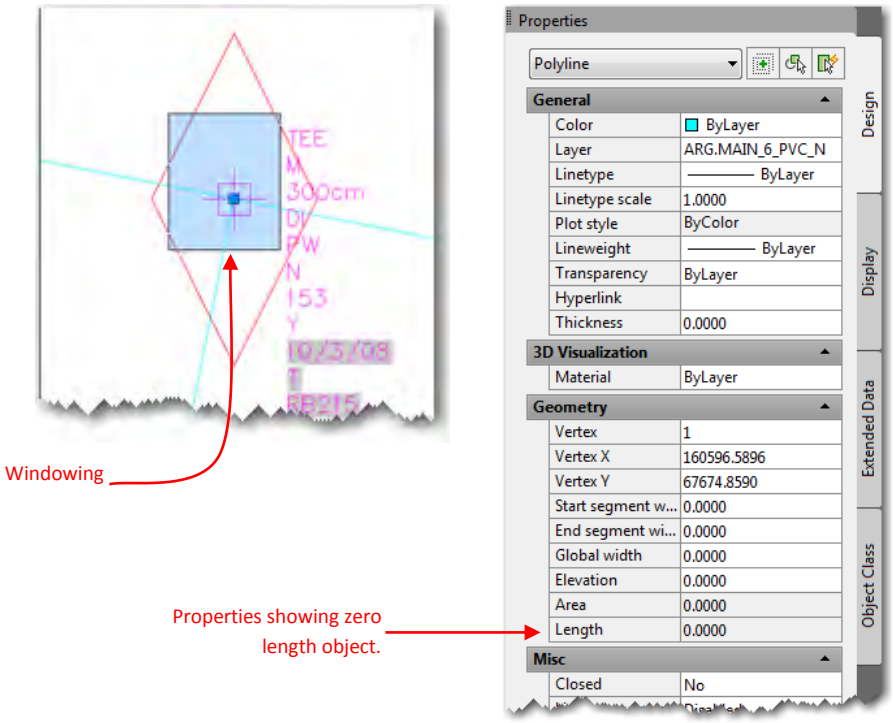
In the Quick Select pop-up window, select the following options: Apply to: Entire Drawing; Object type: Block Reference; Properties: Name, Operator: = Equals. In the Value pull down there should be blocks prefixed with MAP_CLEAN, select one of these and click <OK>:



In model space the markers selected will be highlighted with grips; zoom into these to assess the errors and determine how they need to be fixed:



Example: This particular error is a zero length object and can be checked by windowing and reviewing the properties:

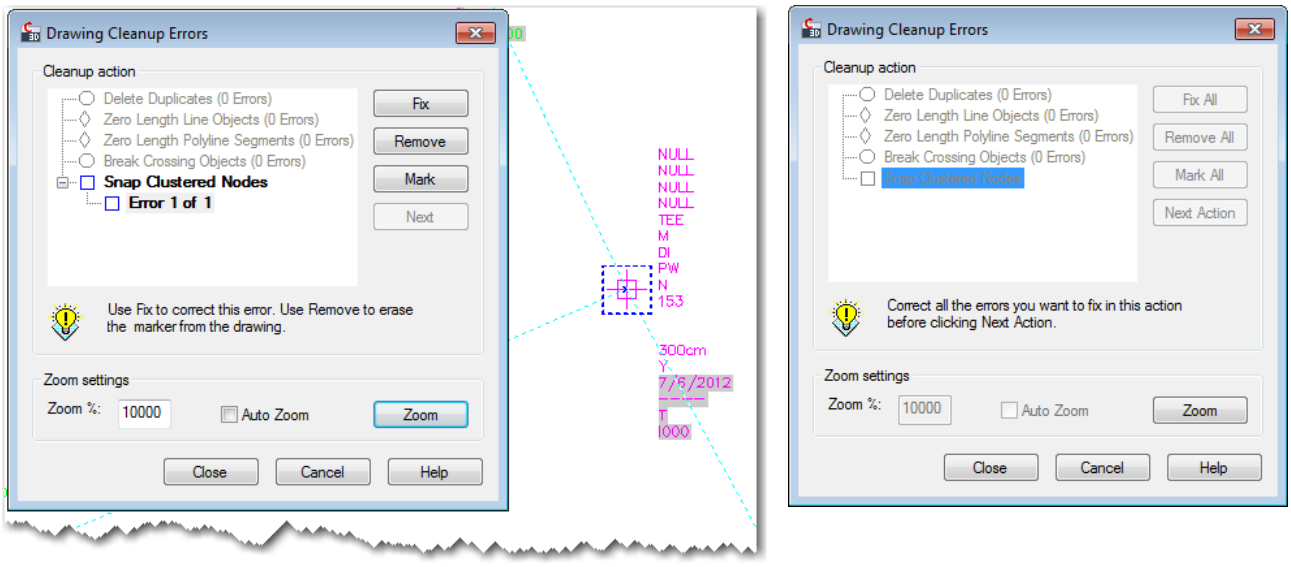


Simply erase the zero length object, and erase the Marker, then move on to the next error following the previous steps. Once all errors have been rectified refer back to the Drawing Cleanup Errors section of this document.

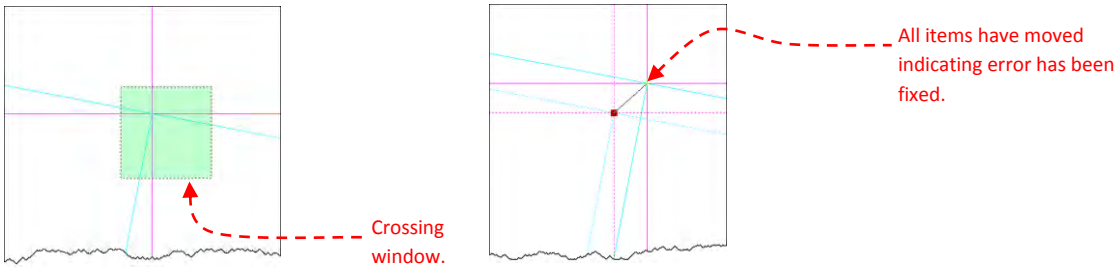
Fix Drawing Errors

Walk through the following steps to rectify errors using the Drawing Cleanup tools.

While in the Drawing Cleanup Errors window, and zoomed to an error, determine whether to use the tool to fix the error. If yes, simply click <Fix>, notice the temporary marker disappears. When zoomed into the area of interest the error has been fixed:



To double check use a crossing window, select the grip and move the cursor off to the side; the user can determine if the error was fixed if all items move together; press Esc to cancel without changing location of grip:



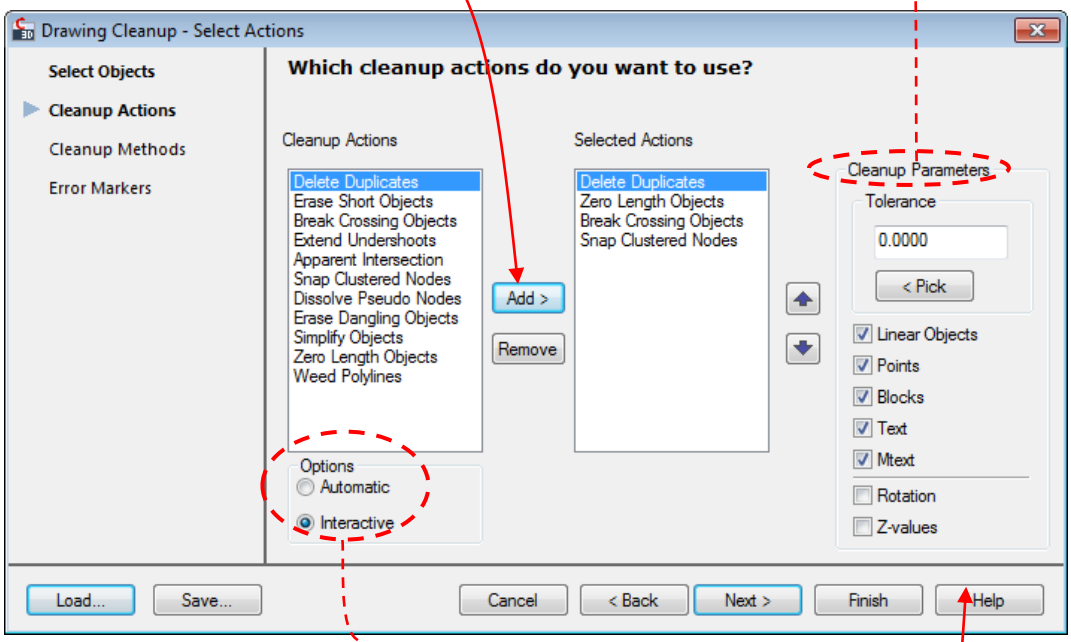
Select Actions

In the Drawing Cleanup – Select Actions pop-up window, each Cleanup Action can be selected individually by choosing from the Cleanup Actions list and clicking <Add>, this will copy the action to the Selected Actions column. Following is a description for each Action:

General Description:

Cleanup Parameters: Each action has a unique set of parameters that may need to be adjusted per project. See following sheets for brief descriptions.

Add/Remove buttons: Adds and Removes selected actions to/from the *Selected Actions* list



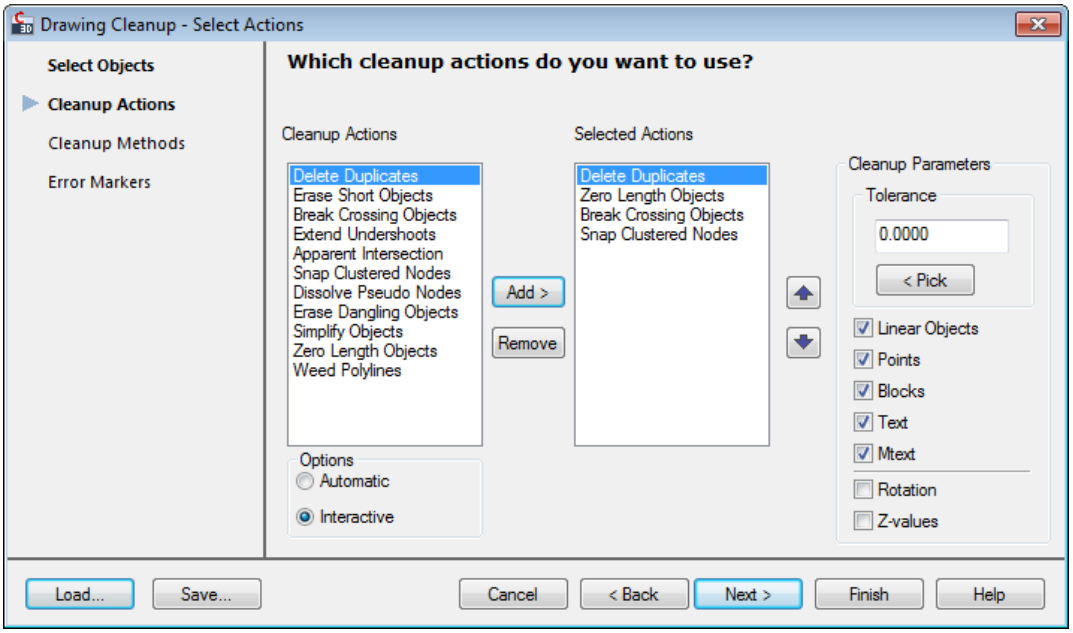
Options: Determines if errors are fixed automatically or if the user wants to review each error - *ALWAYS* select **Interactive**.

Tip: Errors
Some Cleanup Actions may cause null errors.

Help: Use this for more in depth descriptions on each action.

Delete Duplicates

Locates objects sitting on top of each other:



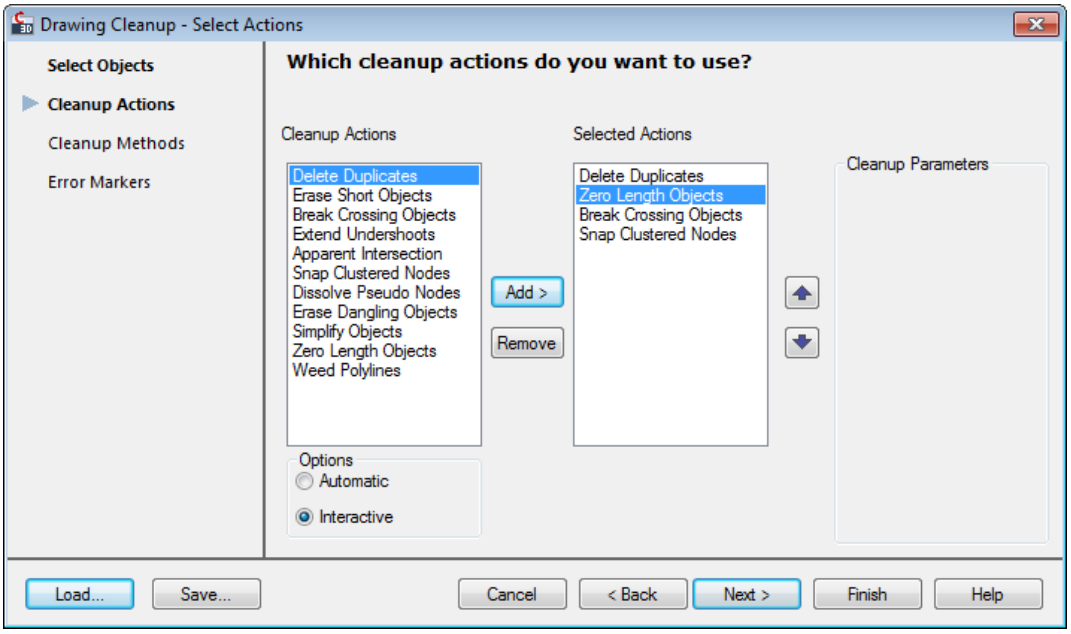
Cleanup Parameters:

Tolerance is set to 0 by default. This will alert the user to any duplicate objects that share the same location.

The items checked indicate what objects the cleanup tool will look at in the drawing.

Zero Length Objects

Locates lines with zero-length - for example, snapping to the same endpoint twice:

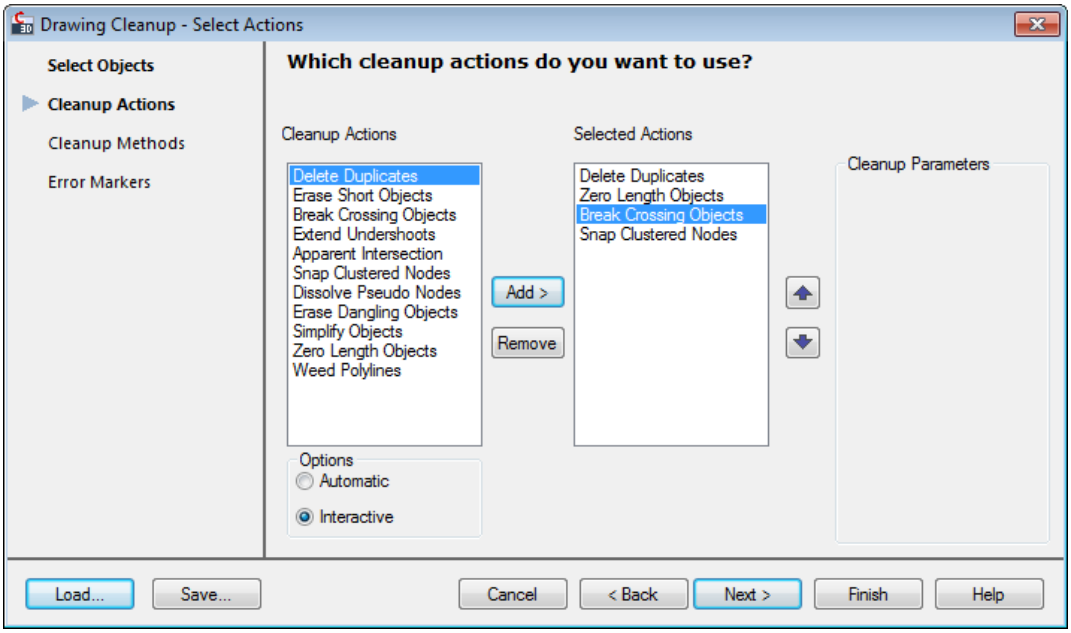


Cleanup Parameters:

No parameter to set on this Action.

Break Crossing Objects

Locates areas where two or more lines meet or cross and breaks the lines at the intersection:



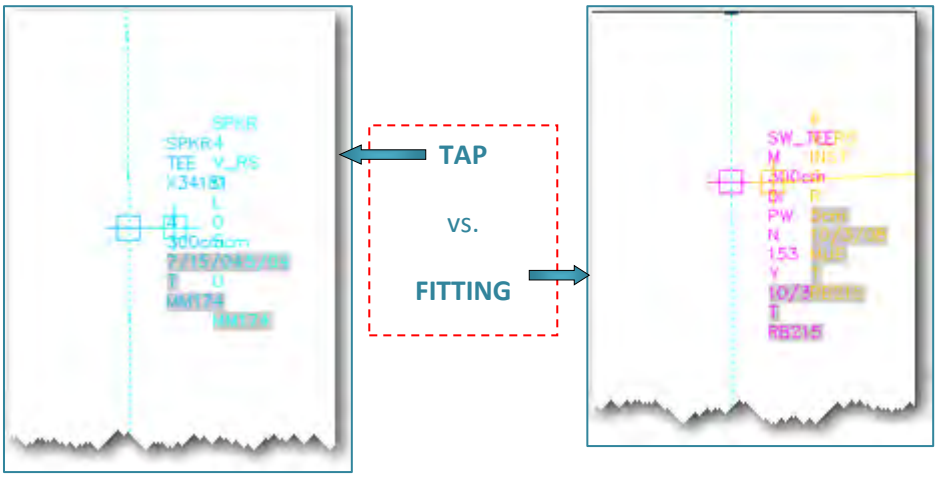
Cleanup Parameters:

No parameters to set on this Action.

EX:

Example shows instance where the user would **NOT** *Break Crossing Objects*.

Example shows instance where the user **WOULD** *Break Crossing Objects*.

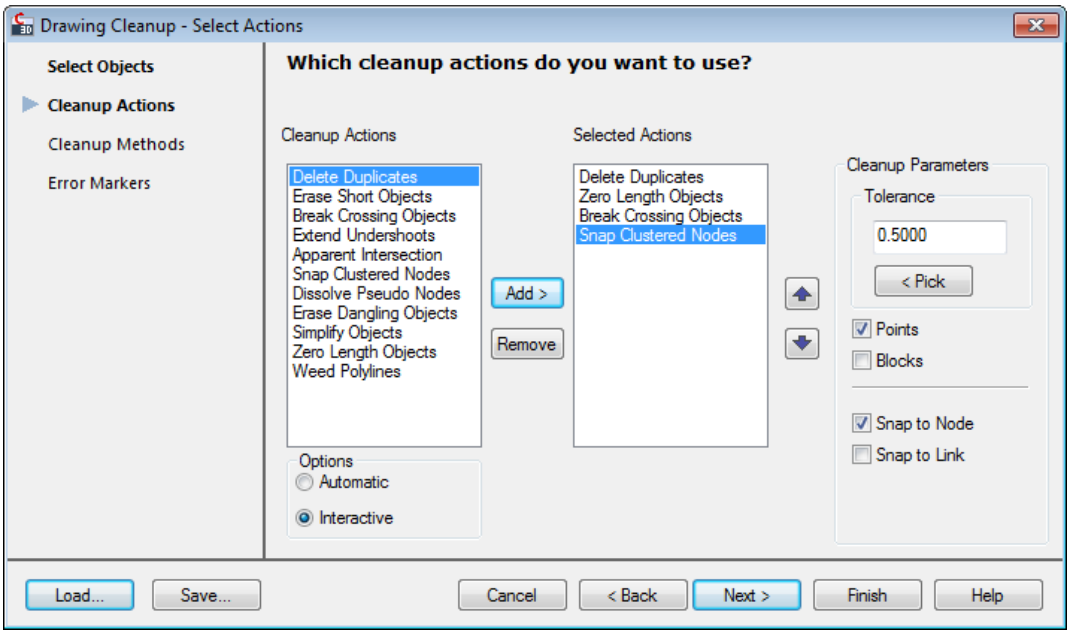


Tip: Polygons

It may be useful to turn off layers that house polygons, such as enclosures and structures, as this will prompt the user to break objects in incorrect locations.

Snap Clustered Nodes

Locates endpoints of lines near each other (within a specified tolerance radius) and snaps endpoints together.



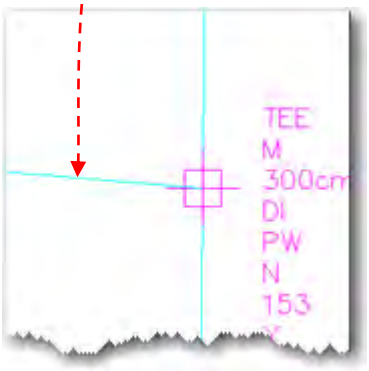
Cleanup Parameters:

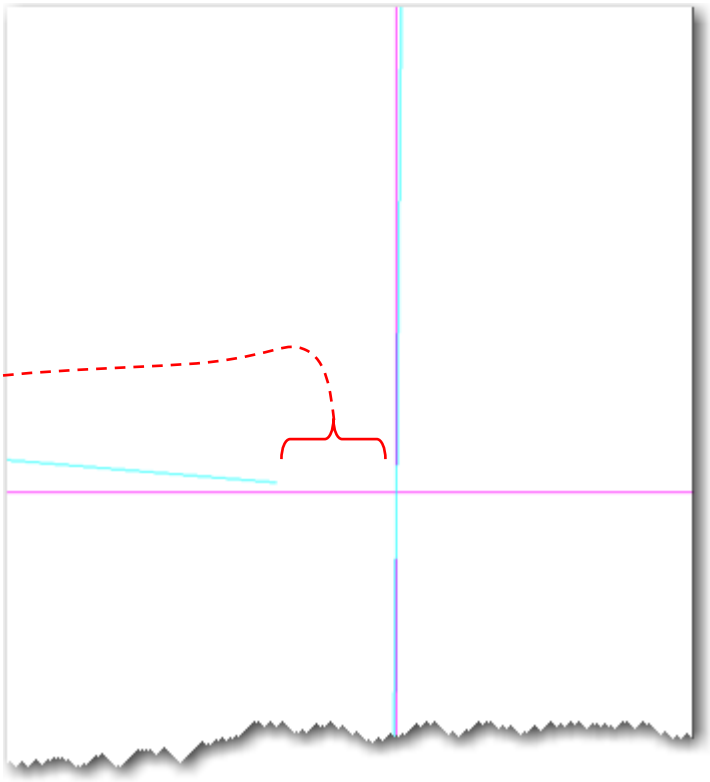
Tolerance is set to 0.5 by default; this defines the radius distance at which the cleanup tool will look for Clustered Nodes.

The endpoints of lines that aren't snapped to an ARG Attribute will show up as errors.

EX:

Line that appears to snap at the correct point.





Once zoomed in it is clear the endpoint of line is not snapped to the ARG Attribute.

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Section 19.0

Record As-Built Drawings

Table of Contents: Section 19.0

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Overview - Section 19.0

Internal Use: Full compliance where applicable
Contractor Use: Full compliance where applicable

At DW there are two types of as-built drawings: one for historical record with the Records and Documents Administration (RDA), and one for posting to GIS with the Asset Recording Group (ARG). Typically Design Drafting and Distribution are the groups to create these drawings. Every project is submitted to RDA but not every project is posted to DW's GIS system, which should be determined by ARG at the onset of a project.

Use the steps in the following subsections to successfully create the **Record As-built Drawings**. The content of these Sections will only contain information as it applies to CAD practices and tools. Other applications used in collaboration with these CAD functions may be captured in some documentation.

- See *Section 5.0 – Example Sheets*, and it's subsections for specific information related to plan creation
- See Section *18.0 – CAD to GIS ARG As-Built Drawings*, and its subsections, for related As-built information

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Section 19.1

Record As-Built Drawings for Capital Projects

Overview - Section 19.1

Internal Use: Full compliance where applicable
Contractor Use: Full compliance where applicable

The intention of this section is to streamline the Workflows and As-Built process within Design Drafting, by documenting CAD related steps and review the As-Built Record Form that tracks each project. All steps comply with Denver Water's CAD Standards and shall be followed as closely as possible, with the understanding that every project is unique and may require special circumstances.

Many of the processes listed in this document are not exclusive to the As-Built process and can be utilized on other projects.

Supporting documents

Throughout this document several other documents will be referenced, and can be found in the following Dashboard locations:

Engineering – Project Procedures

Capital Projects Procedures Manual (CPPM)

- *Workflows*
- *As-Built workflow*
- *As-Built to ARG workflow*

Project Management/Design Drafting

- *As-Built Record Form*
- *ARG Minimum Requirements List (for Legacy Projects)*

Asset Recording Group

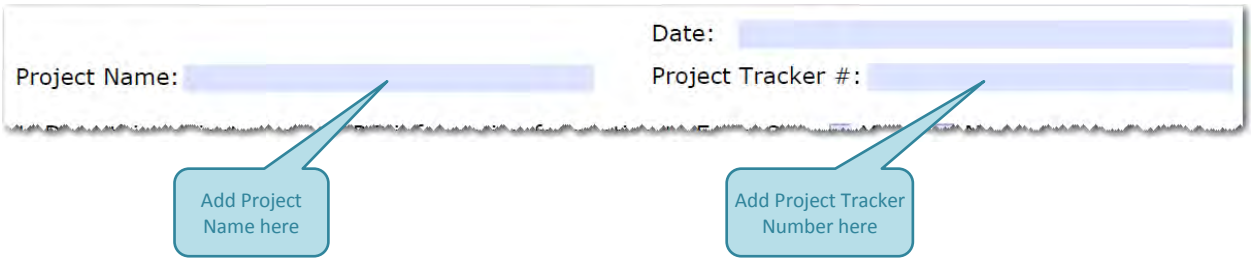
- *Domain List*
- *Pipe Rules*

Survey

- *Grid Coverages*

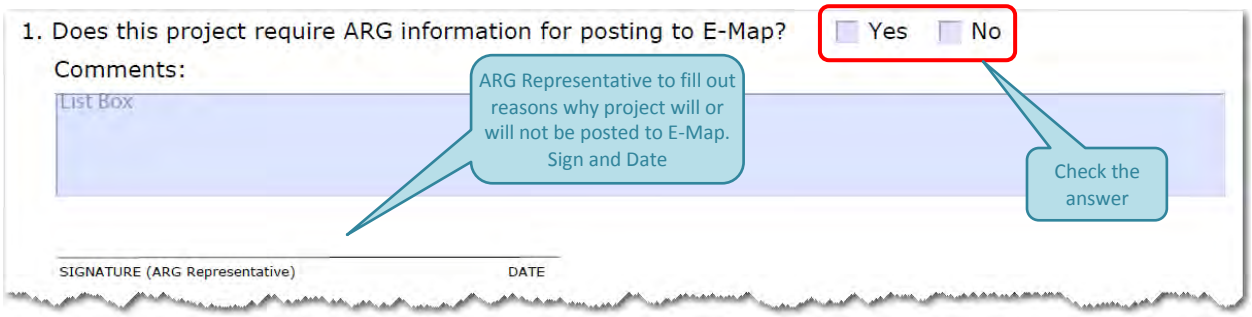
As-Built Record Form

The *As-Built Record Form* is a new document procedure to help track where any project is at any given time. The form is based off lessons learned from issues with "closing out" As-Built records. This form will remain as a physical copy and is to be maintained by the As-Built Supervisor until the project has been completed and then scanned to the respective Project folder.



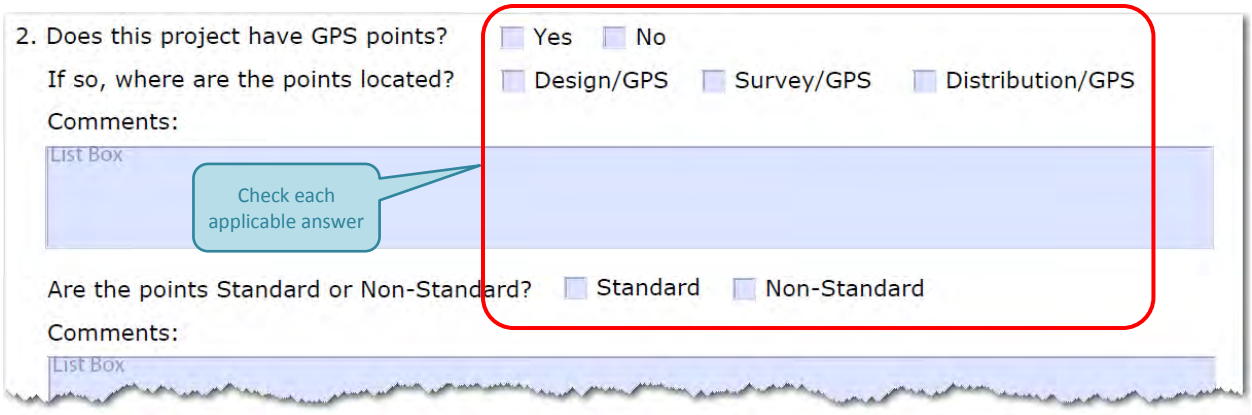
Step 1:

The As-Built Supervisor will meet with the Asset Recording Group to determine whether the project will need to be posted to E-Map:



Step 2:

Some projects already have GPS Points associated with them. Typically the GPS points will be located in the GPS folder within Dsgn or Srvy. **If there is not GPS associated with the project then a request can be sent to Survey.**

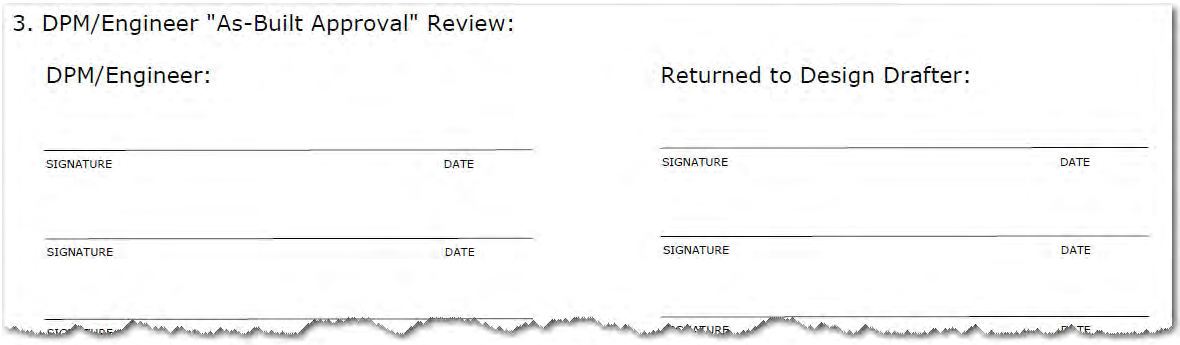


Standard: any GPS point collected to the current standard - where the values will translate directly into the ARG Attributes

Non-Standard: any GPS point not collected to the current standard - values will not translate directly into the ARG Attributes. Minimal information, and used primarily for location only.

Step 3:

This section is to be filled out each time the physical plans exchange hands between the Engineers and Drafters:


3. DPM/Engineer "As-Built Approval" Review:

DPM/Engineer:

SIGNATURE DATE

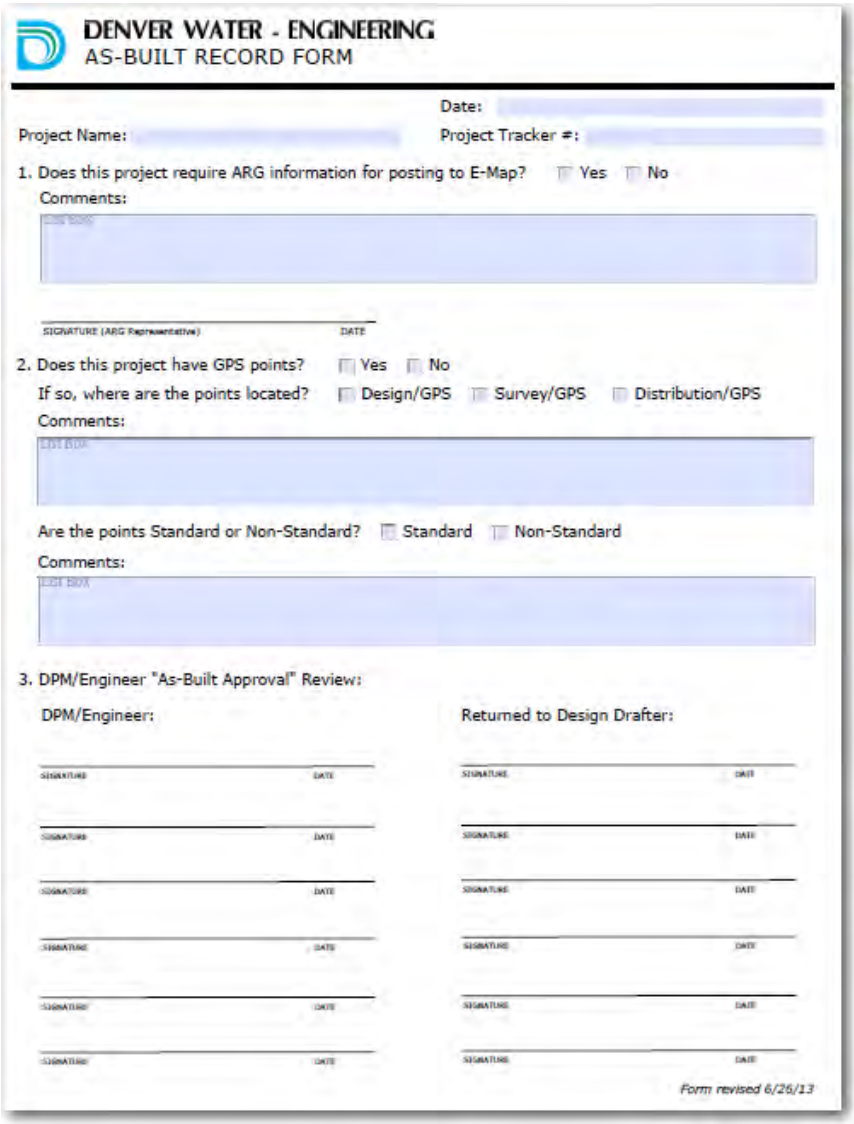
SIGNATURE DATE

Returned to Design Drafter:

SIGNATURE DATE

SIGNATURE DATE

See the *Engineering SharePoint* Site – Project Management/Design Drafting – to find the most up-to-date As-Built Record Form.


DENVER WATER - ENGINEERING
AS-BUILT RECORD FORM

Date:

Project Name: Project Tracker #:

1. Does this project require ARG information for posting to E-Map? Yes No

Comments:

SIGNATURE (ARG Representative) DATE

2. Does this project have GPS points? Yes No

If so, where are the points located? Design/GPS Survey/GPS Distribution/GPS

Comments:

Are the points Standard or Non-Standard? Standard Non-Standard

Comments:

3. DPM/Engineer "As-Built Approval" Review:

DPM/Engineer:

Returned to Design Drafter:

Form revised 6/26/13

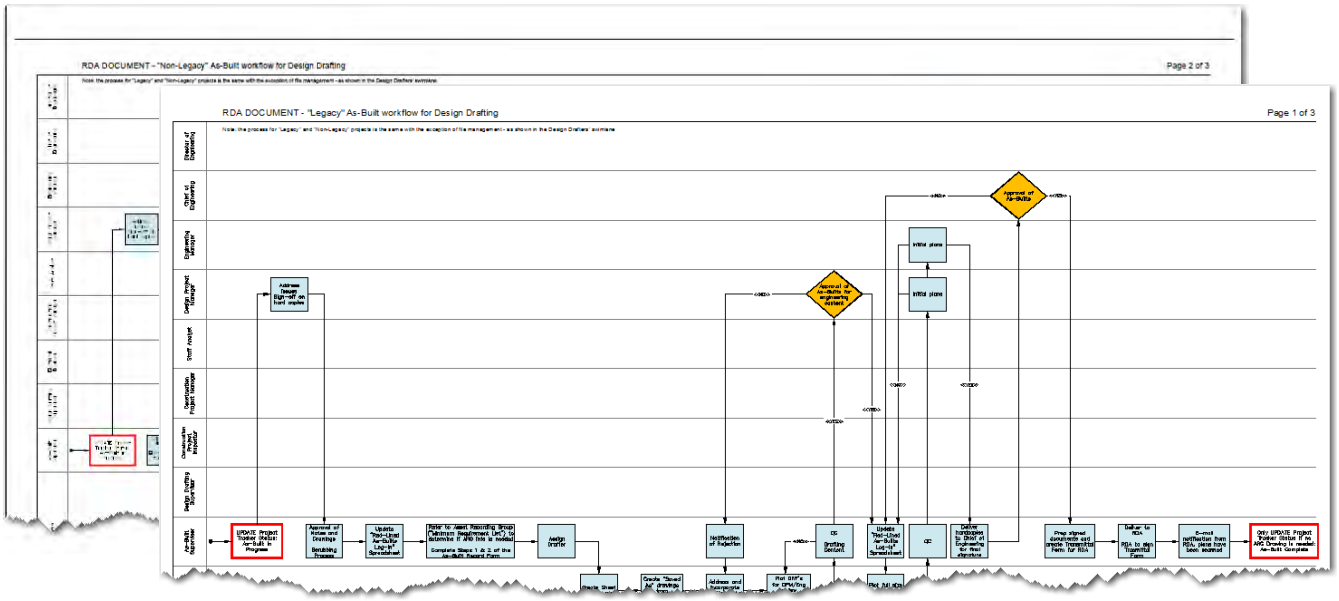
Record Drawing Projects Overview

Record Drawing refers to any project designed using the current CAD Standard. Since these projects were completed with the "new" way of thinking Non-Legacy projects have their own workflow and file management system.

As stated previously, Legacy refers to any project designed before the 2011 CAD Standards. Since these projects were completed with an "old" way of thinking Legacy projects have their own workflow and file management system.

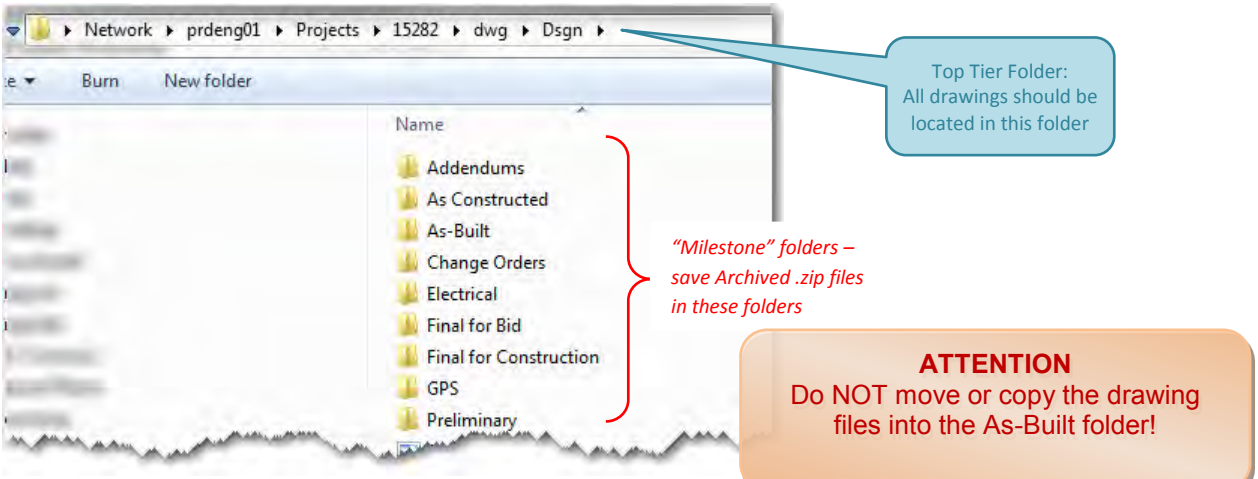
Workflow

See the *Engineering SharePoint* site – Capital Projects Procedures Manual – to find the most up-to-date Workflows:



File Management

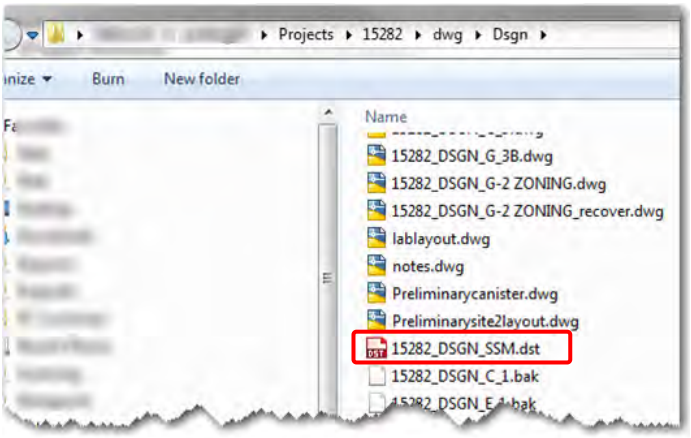
The drawings (.dwg) and Sheet Sets (.dst) should reside in the ***Dsgn*** folder and will be modified from this location. The archived files, which will be .zip files, will be placed in the folders that correspond with each milestone (Final for Bid, Final for Construction, etc.). Archives should have been performed at the end of each milestone – see *Section 7.1 – Archiving with Sheet Set Manager*.



NOTE: Electronic plots (PDFs and DWFs) should be saved into the Milestone folders as well, see *Section 6.1 – File Management*.

Sheet Set Manager

Most projects should already have a Sheet Set created that should be stored in the ***Dsgn*** folder. For the remaining duration of the project the Sheet Set Properties will be modified to reflect the As-Built revisions:



ATTENTION
Do NOT move, copy or create a new Sheet Set (.dst) – unless the files is corrupt always maintain the existing one.

Project Drawings

It is important to maintain the integrity of the electronic drawings as they stood at the time of the design. In order to do this the files that reside in the ***Dsgn*** folder will be modified.

Drawing Standards

Project drawings' CAD Standards are to remain "as-is" from the time of the design. Since these projects were designed to the current CAD Standard it should not be necessary to update layer names, colors, linetypes, etc.

If the project was broken out into several drawings DO NOT combine them into one drawing, maintain each drawing independently. By combining drawings the margin of error is greater since each drawing has individual settings that may not transfer or combine well.

DO NOT rename .DWGs – this will break the link to the Sheet Set.

Delete unused layout tabs if they are not used as part of the final as-built plan set.

For example, this plan set only has 7 sheets and the ***15746_DSGN_C1.0.dwg*** has a C18 layout which is not part of the final set, therefore it can be deleted from the drawing:

New Drawings/Sheets

On occasion new drawings (.DWGs) or sheets (layouts) may need to be added to an As-Built plan set. **DO NOT use the current template to create these sheets!**

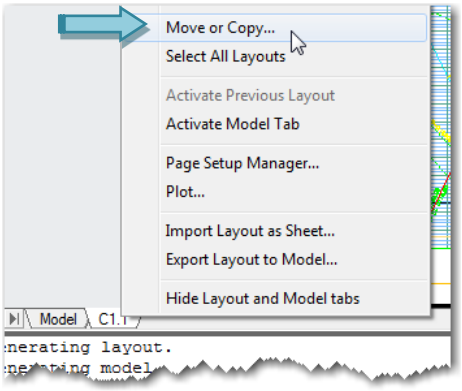
In both cases remember to add the new sheets to the Sheet Set.

Drawings:

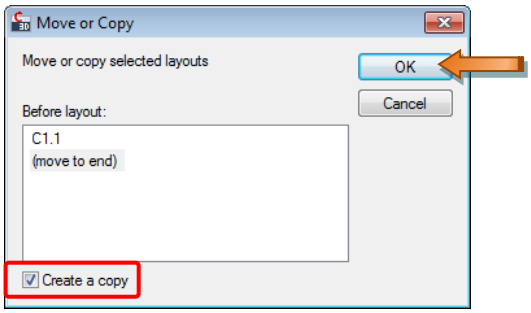
- Open an existing drawing from the same plan set
- Perform a "Save As"
  - Name the drawing accordingly
- Erase all unneeded data
  - Leave the Title Block
- Add pertinent data to the newly created drawing
  - Create or adjust Viewports as needed

Sheets (preferred method):

In an existing drawing, copy an existing layout tab – right-click the layout tab, select *Move or Copy*…:



In the *Move or Copy* pop-up window check *Create a copy*, then click <OK>:



- Erase all unneeded data
  - Leave the Title Block
- Add pertinent data to the newly created drawing
  - Create or adjust Viewports as needed

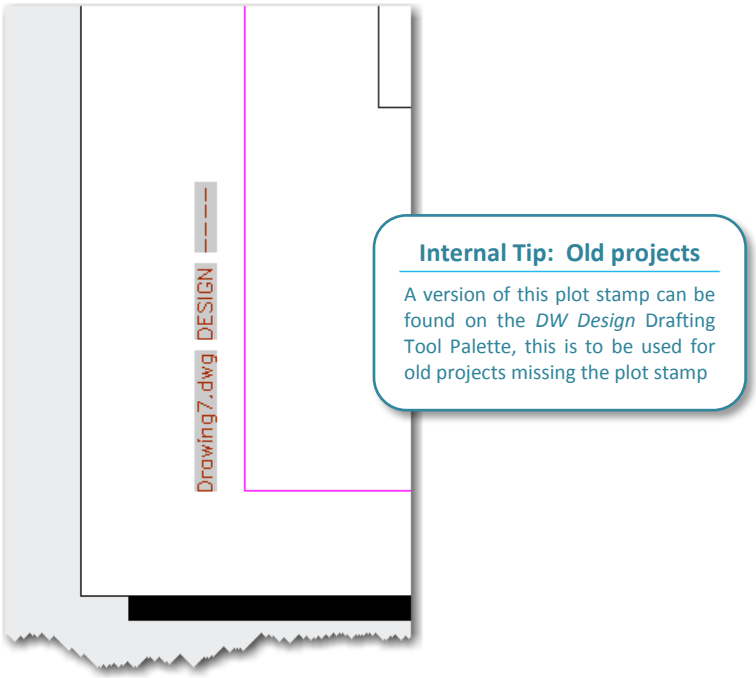
NOTE: Do NOT use the Sheet Set Manager to create new drawings in the As-built phase unless the template has been updated in the Sheet Set Properties.

PLOTTING

Project drawings may be set to old plotters, in these cases the Named Page Setups will need to be adjusted to ensure Publishing from the Sheet Set works properly, see *Sections 16.0 – Plotting & Publishing* for more information on Plotting and Publishing.

Plot Stamp

On DW drawings the plot stamp is part of the Title Block and shall remain on all projects:



NOTE: Do not use the Plot Stamp option in the Plot Dialog box.

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Section 19.2

Record As-Built Drawings for Distribution Engineering

Overview - Section 19.2

Internal Use: Full compliance where applicable
Contractor Use: Reference only

Distribution Record Drawings are the final plan sets created to document a historical record of constructed site conditions upon the completion of a project – **Record As-Built Drawings**.

Supporting external documents

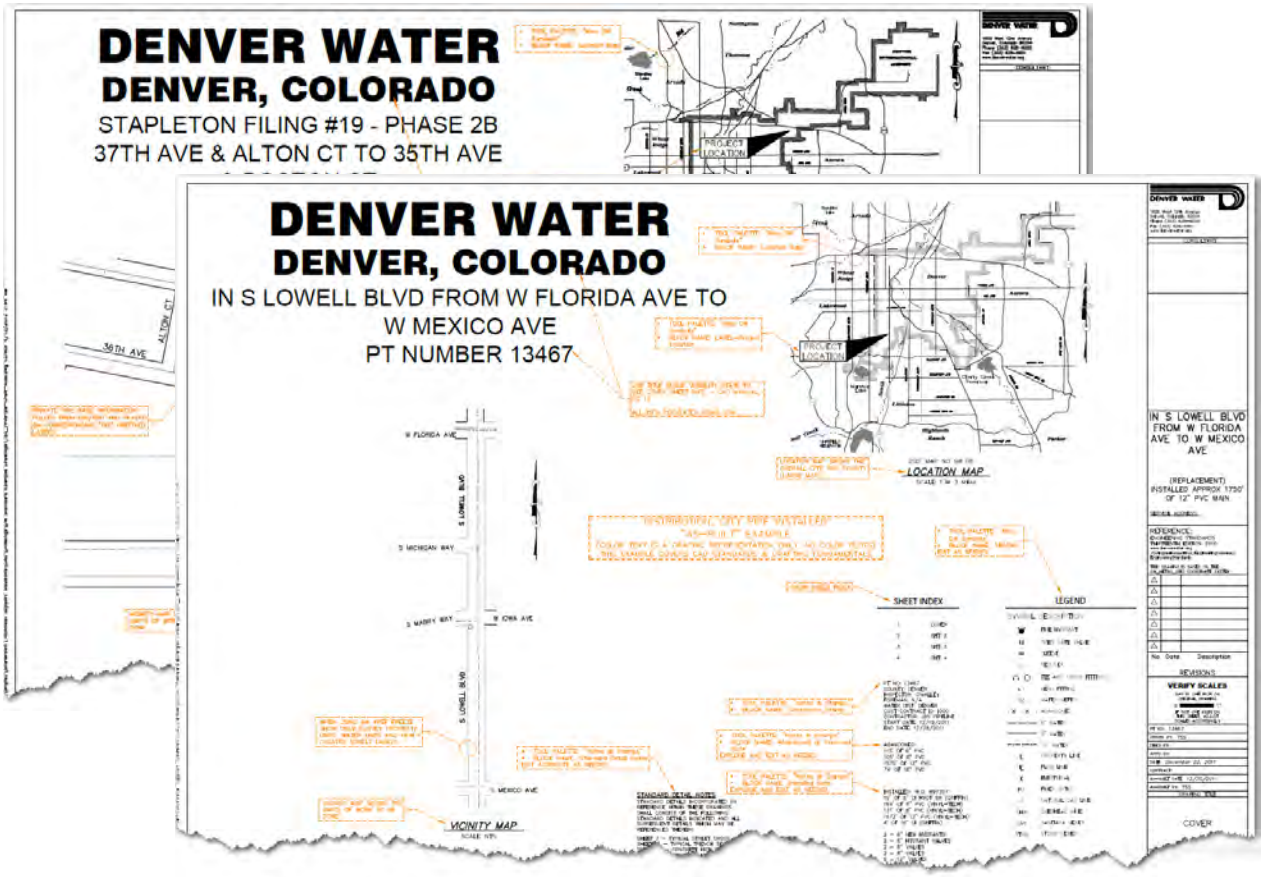
Throughout this document, other documents are referenced and can be found in the following locations:

- *Domain List* (Asset Recording Dashboard) Domain_list Excel file
- *Pipe Rules* (Asset Recording Dashboard) Pipe_Rules PDF file
- *Project Tracker-Distribution As-builts* (User guide)
- *SOP: Distribution As-Builts* (User guide)

Sheet Setup

It is the CAD Technician's choice to determine when the COVER and/or WATER PLAN sheets are created. In some cases, it is easier to set them up on the front end of a project and work through the locked viewports, and in other cases it's easier to set the sheets up after the work has all been completed in Model Space. For documentation purposes the set-up of sheets is being shown at the end of the project.

See *Section 5.3.1 – Distribution Engineering Example* for this section for the different job types indicate where most components can be found and the "how to's" of using them:

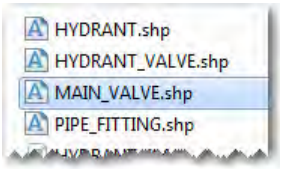


The following may be useful when setting up sheets:

- Use *Sheet Set Manager* to modify the Title Block and Cover information – do not double click, or use the *Properties* palette to edit the title block unless specified on the Example Sheets
    - It is suggested to fill out as many Sheet Set properties as possible before any sheets are added to lessen edit time and keystrokes by the End-User
- Viewports on the Cover sheet are for guidance only, they can be removed and/or manipulated as needed
- On the Cover Sheet and Title Block, additional grips (shown as triangles) have been added to allow more space for Project Title and Project Descriptions
- Viewports go on layer _VPORT and should always be locked
    - The maximum scale of a drawing is 1" = 40'

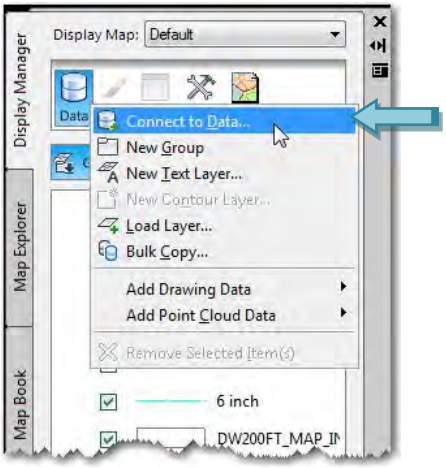
SHP References

Before proceeding to the "Query Data" step [see *Section 8.0 – Utilizing GIS Data via FDO Connection, page 8.0-7*], the inspector's GPS points (SHP files) can be loaded to help determine the actual project area, geospatially, within the drawing:

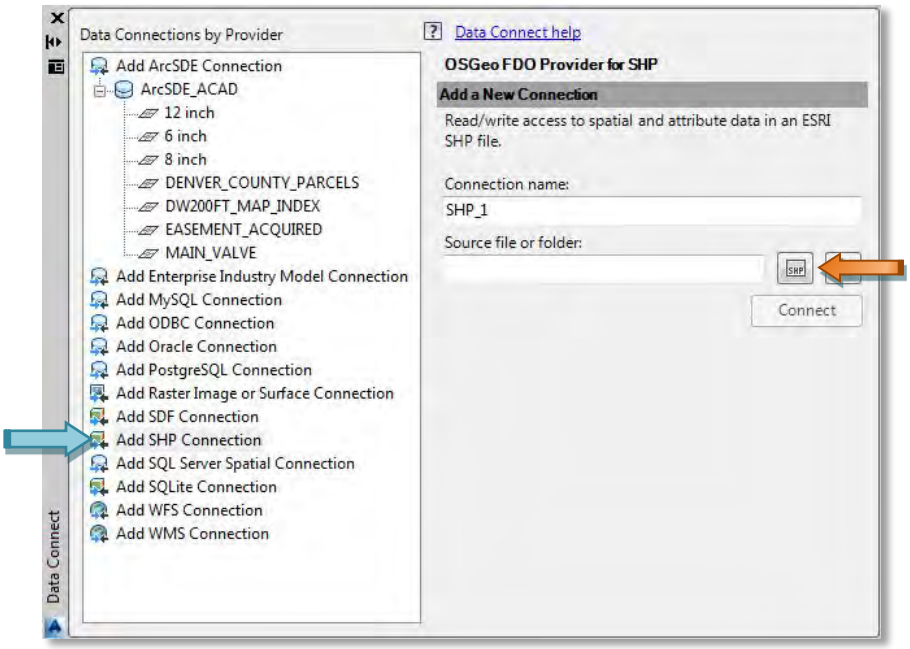


NOTE: This is optional to help verify the project location and should be done in AutoCAD Map 3D 2016.

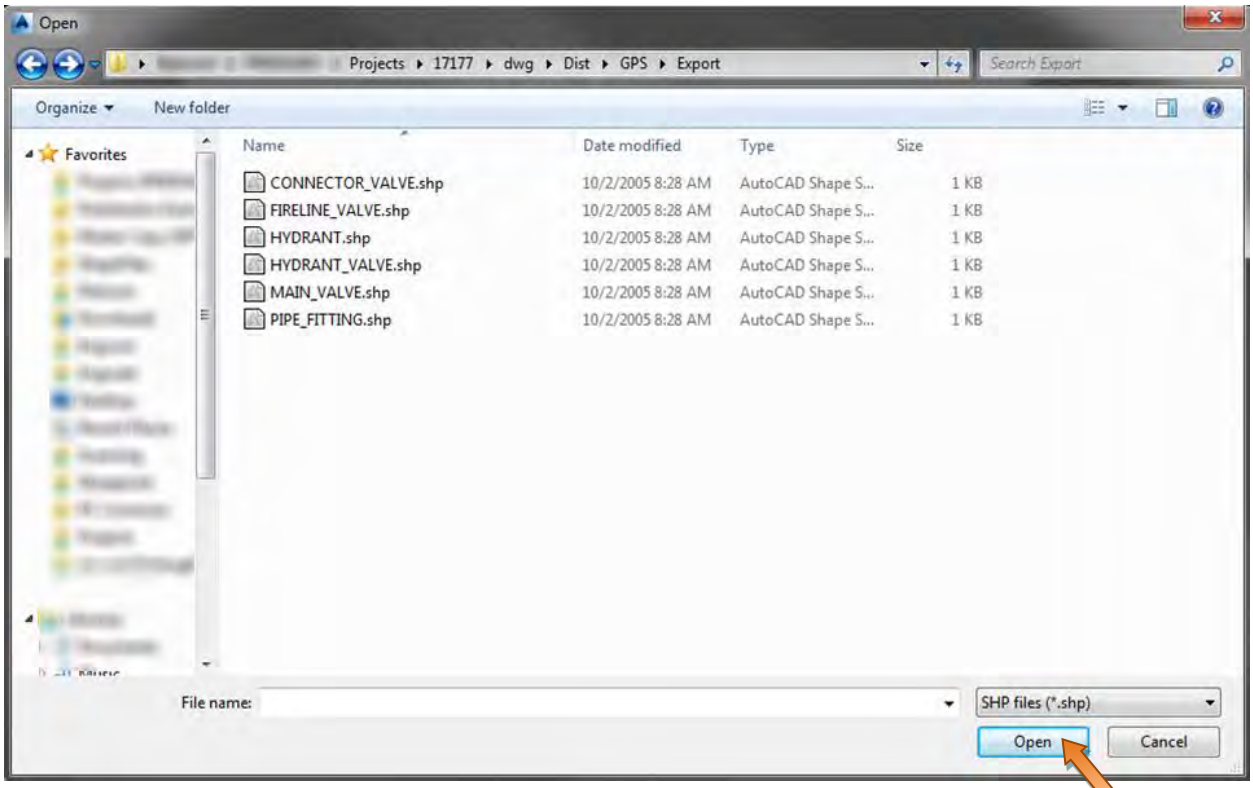
In the *Task Pane*, on the *Display Manager* tab, click the *Data* icon and select *Connect to Data…*:



The *Data Connect* fly-out palette will appear. Choose *Add SHP Connection* from the list on the left and click the <**SHP**> (unmarked) icon:

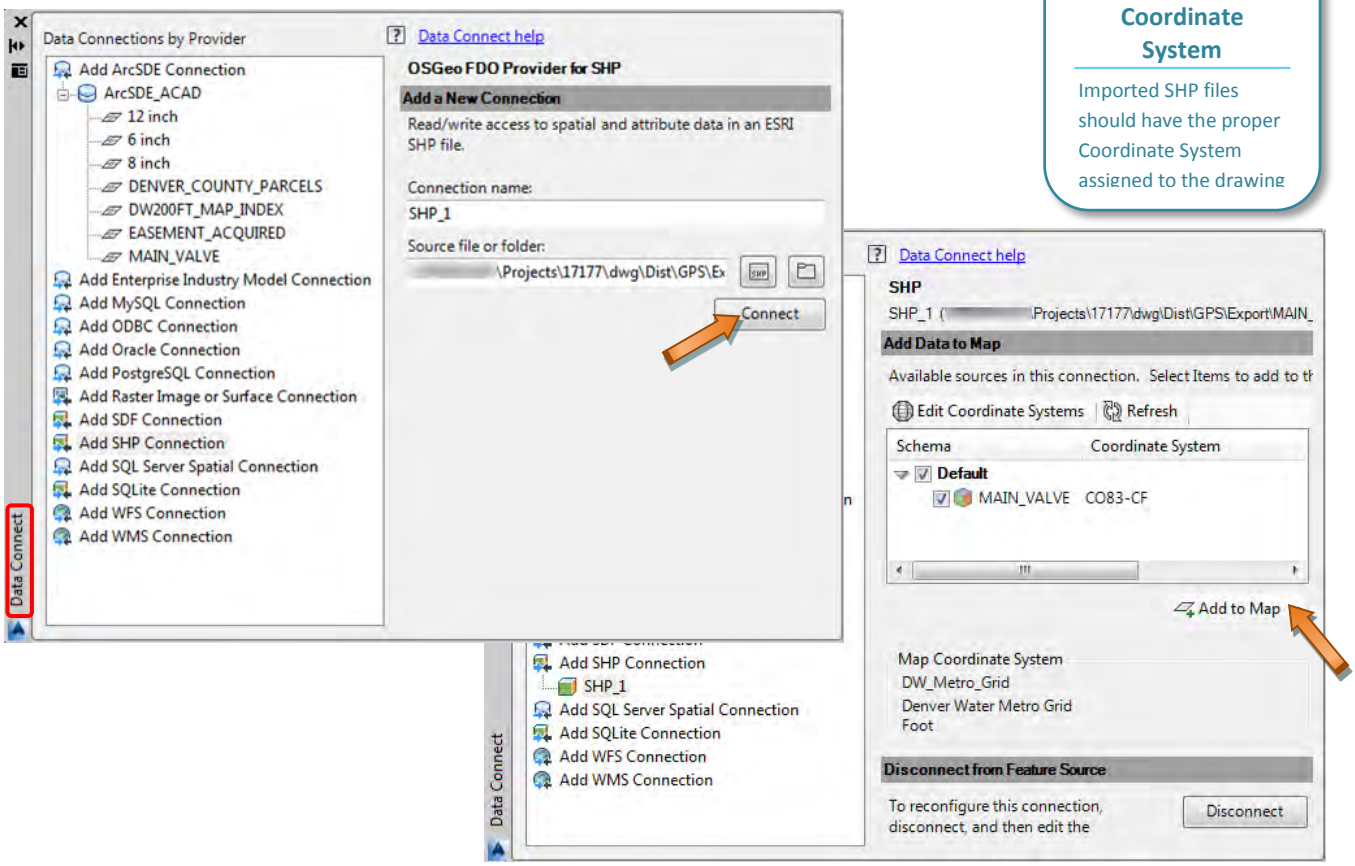


The Open pop-up window will appear. Navigate to the project folder's GPS location (**PTNO/dwg/DIST/GPS/Export**). Select **ONE** of the SHP files (preferably MAIN_VALVE) and click <Open>:



NOTE: The intent of this step is to locate the project area on the screen as a precursor to Querying Data.

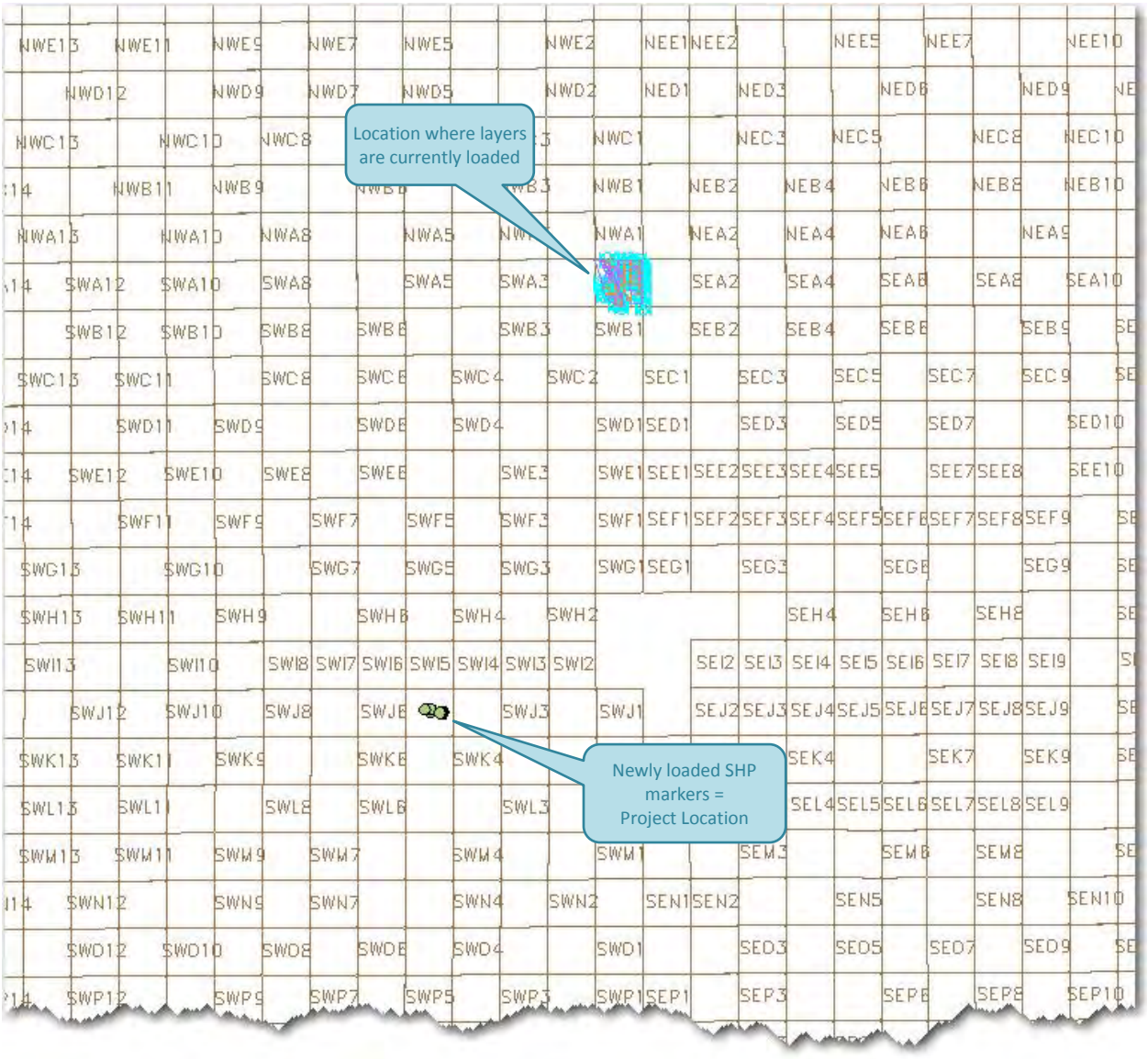
In the *Data Connect* fly-out palette, click <Connect>; then <Add to Map>:



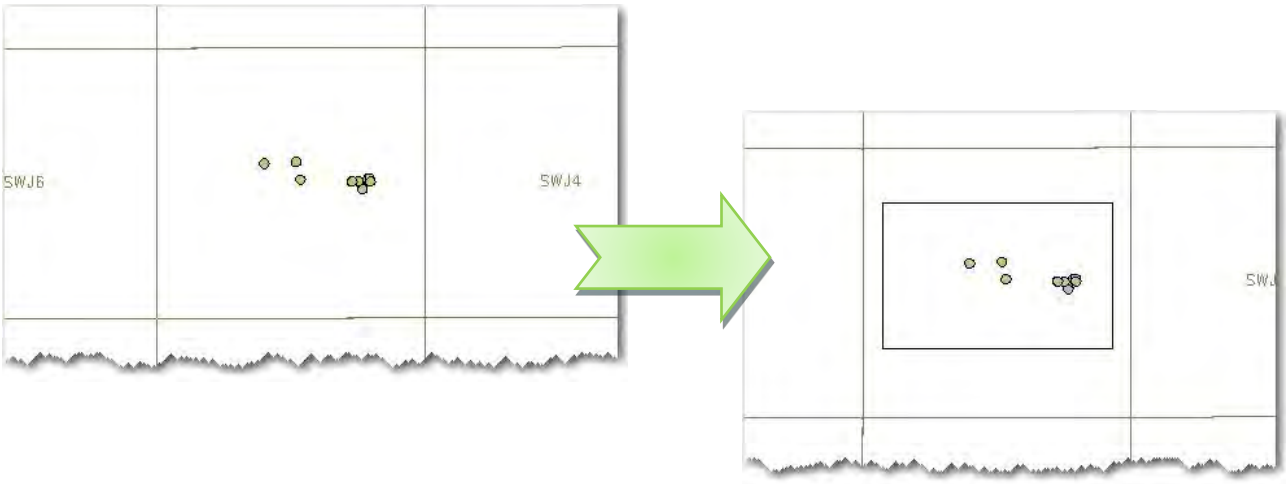
Internal Tip: Coordinate System

Imported SHP files should have the proper Coordinate System assigned to the drawing

In Model Space, zoom extents. The newly loaded SHP files should appear as markers elsewhere in the drawing (from where layers are currently loaded):

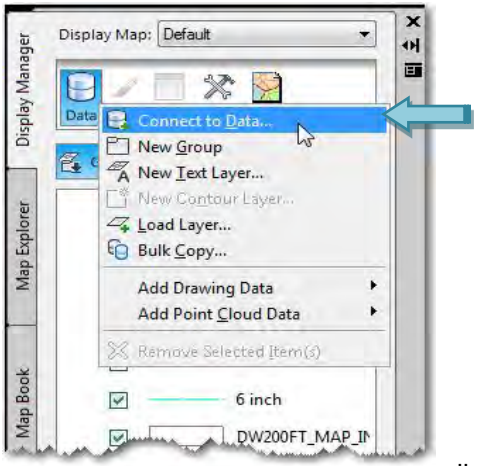


Using the ZOOM/Window command, zoom in on the markers, and then draw a rectangle around the SHP files, this is will be used as a Query reference:

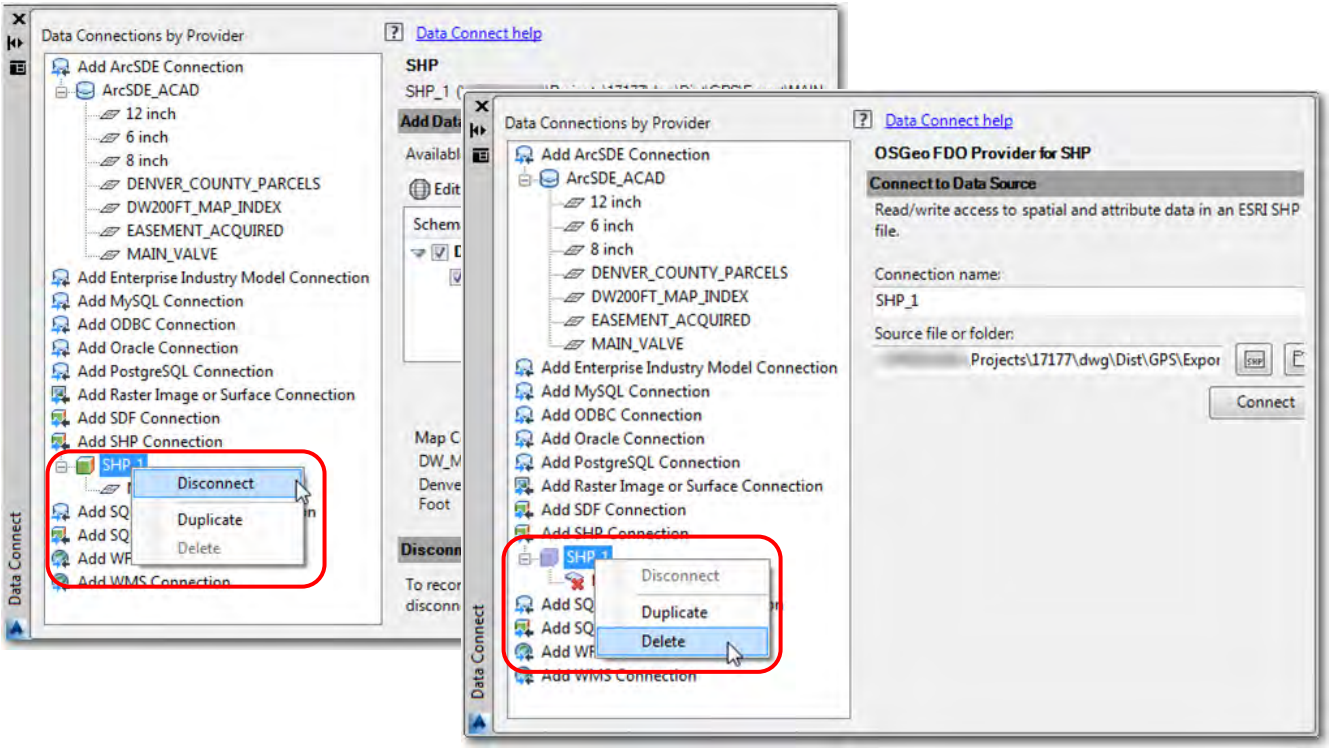


Remove SHP References

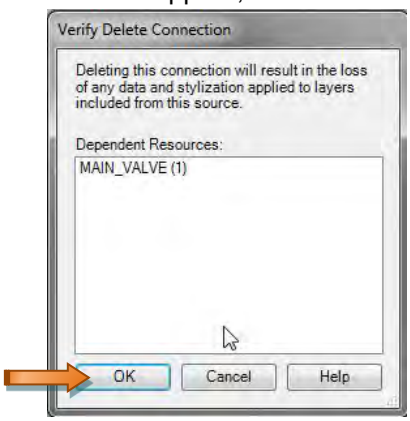
The SHP files must be disconnected and removed from the drawing. In the *Task Pane*, click the *Data* icon and select *Connect to Data…*:



In the *Data Connect* fly-out palette, right-click on the SHP connection (typically SHP_1) and select **Disconnect**. Repeat the right-click process and select **Delete**:



The *Verify Delete Connection* pop-up window will appear, click <OK>:

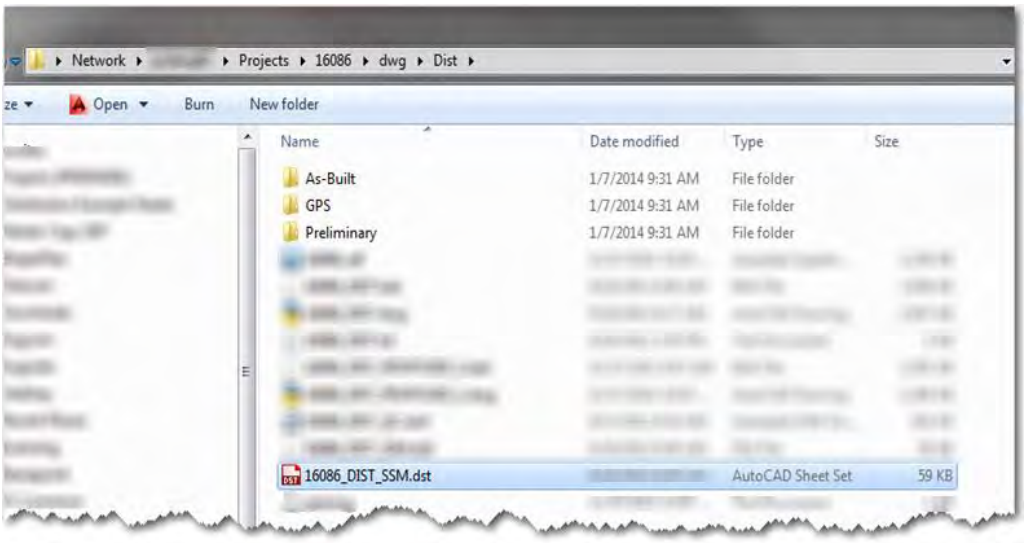


PROJECT DRAWING USING SHEET SET MANAGER

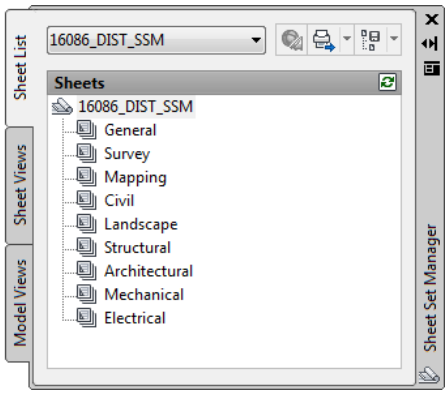
The Project Drawing must now be created, if CAD is not already open, re-launch it using the Desktop Icon, or another preferred method. The Sheet Set must be created first and then the drawing, for this process see *Section 7.0 - Sheet Set Manager*.

Sheet Set Tips

Sheet Sets shall be named with the PT NO, discipline followed by "SSM" (i.e. 12345_DIST_SSM), and saved in the DIST folder of the appropriate project:

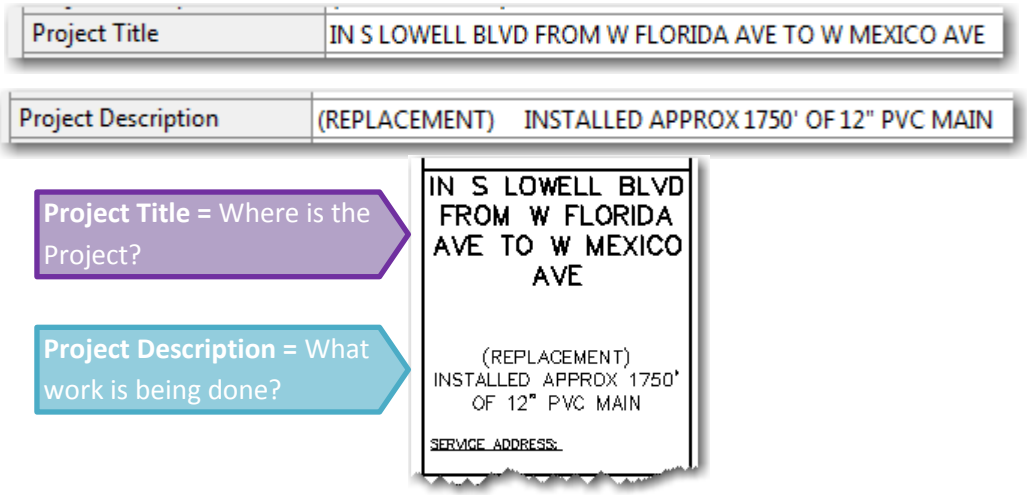


It is important to remember creating the Sheet Set does not create a drawing; they exist independently of each other. The image below shows only the newly created Sheet Set, without any "sheets" added:

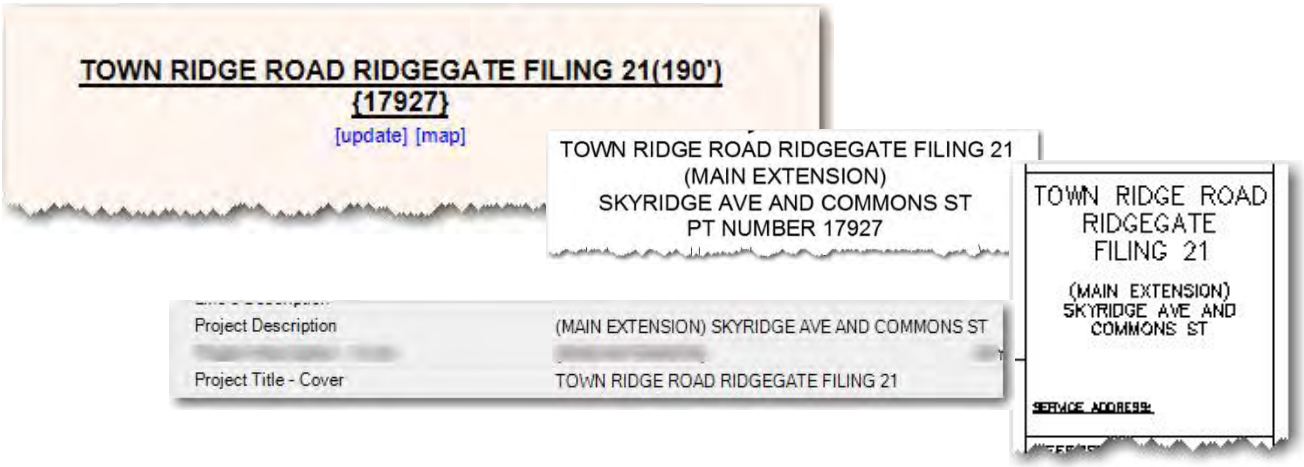


The **Project Title** and **Project Description** (edited within the Sheet Set properties) will vary depending on the job type. The Project Title stays the same on every sheet (Sheet Set Property) and the Project Description may vary from sheet to sheet, but is not typical. T&D jobs and Contractor jobs receive this information from slightly different locations.

The **City Pipe Cover Page and Title block** information shall match the proposed set of plans, it is helpful to think about what Project Title and Project Description mean:



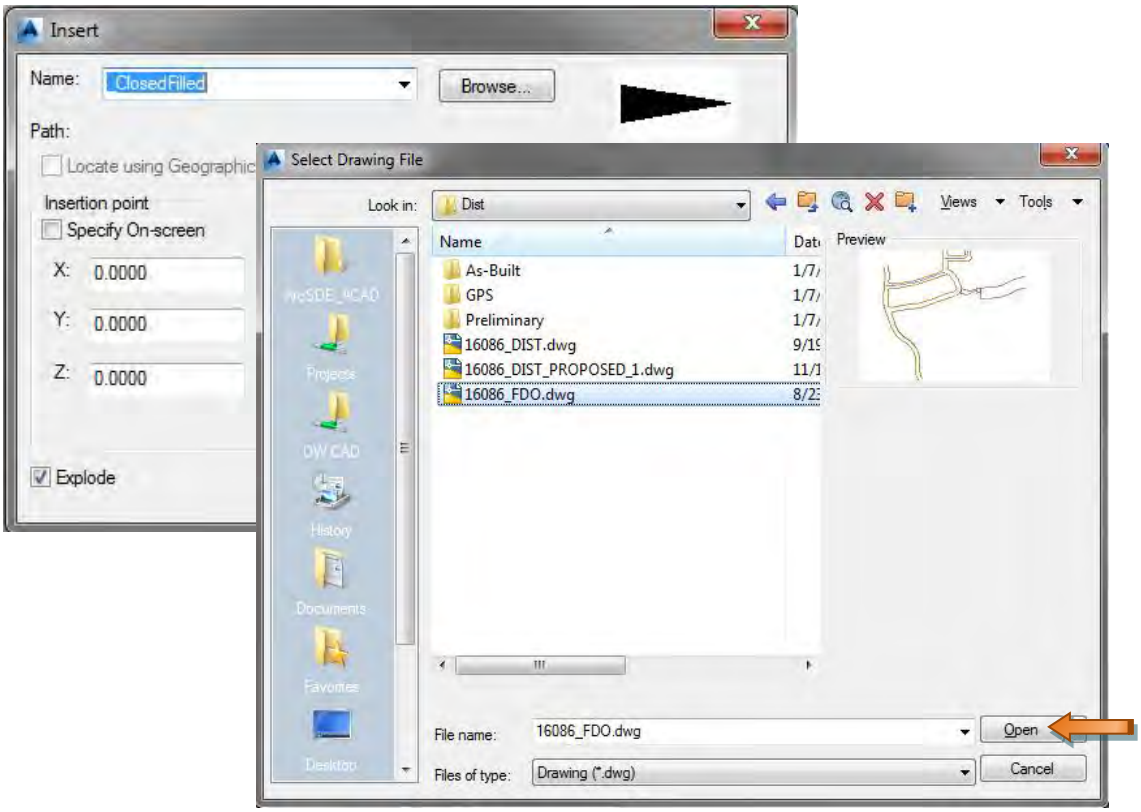
For **Contractor Installed** (Private Pipe) the information shall match the approved set of plans/Project Tracker:



Always REGEN the drawing after Sheet Set properties have been modified, save changes.

FDO Base Information

While in Model Space type INSERT at the command line. Browse to the project location and select the desired drawing, click <Open>; see *Section 8.0 –Utilizing GIS Data via FDO Connections* for specifics on inserting the FDO drawing:

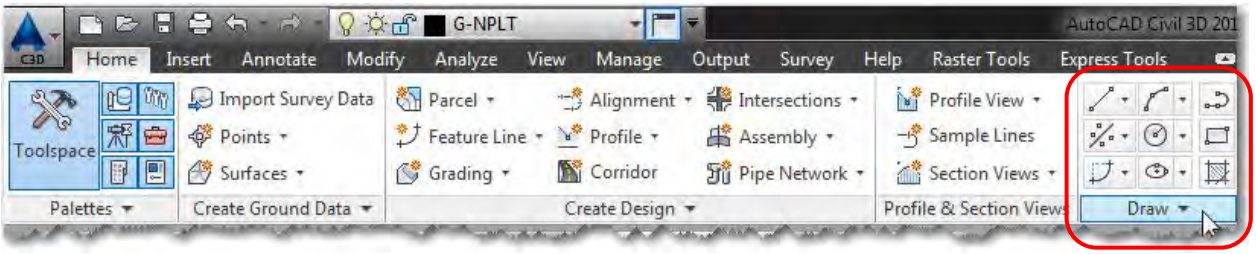


NOTE: If Survey data is needed, an XREF should be used instead, see *Section 9.2 – XREFs*.

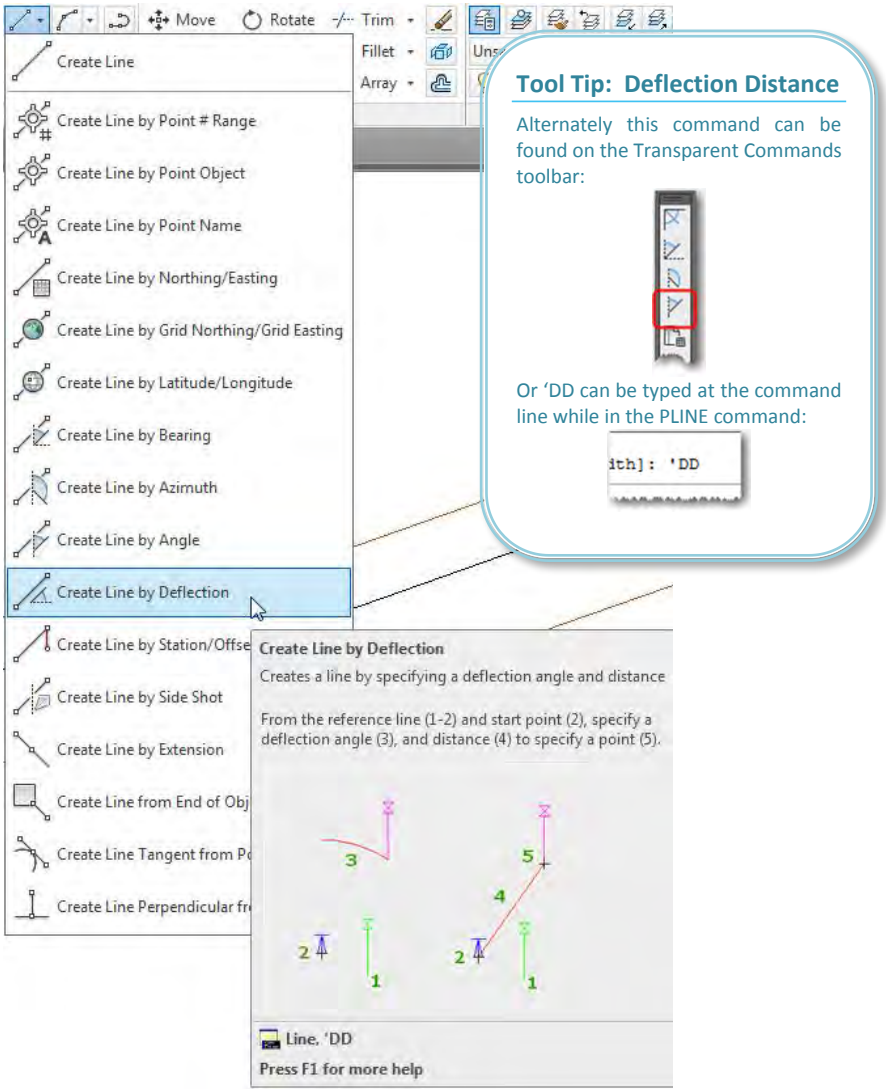
Sketch Waterline

Using a "junk" layer, such as G-NPLT set current, sketch in the waterline using the inspection notes, GPS points, Engineering Standards, E-Map, and any other supporting applications or documents. *This is a difficult process to fully document and may vary slightly on a project-by-project basis.*

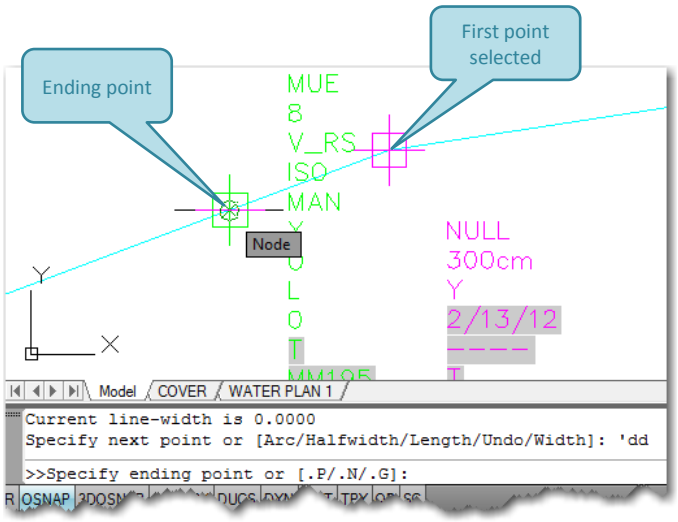
When drawing pipe deflection the **Distance Deflection** command may be very useful. To use this command another command must be active, such as PLINE. Once the first point is selected while in the PLINE command, navigate to the *Home* tabs' *Draw* panel:



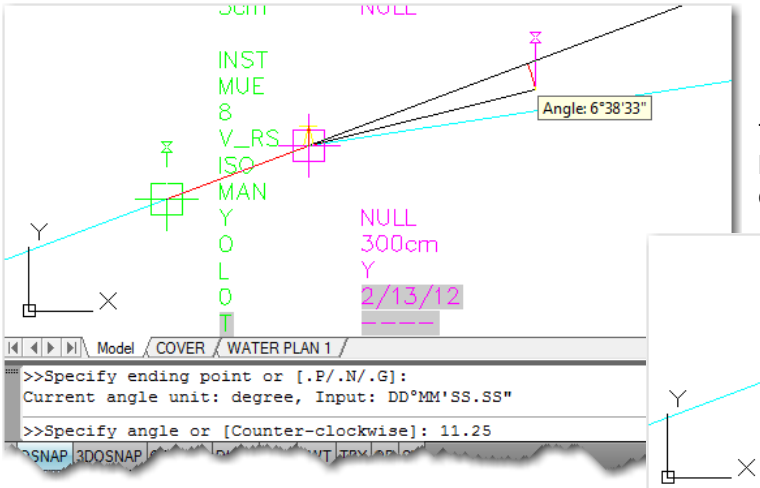
On the Draw panel pick the line pull down and select *Create Line by Deflection*:



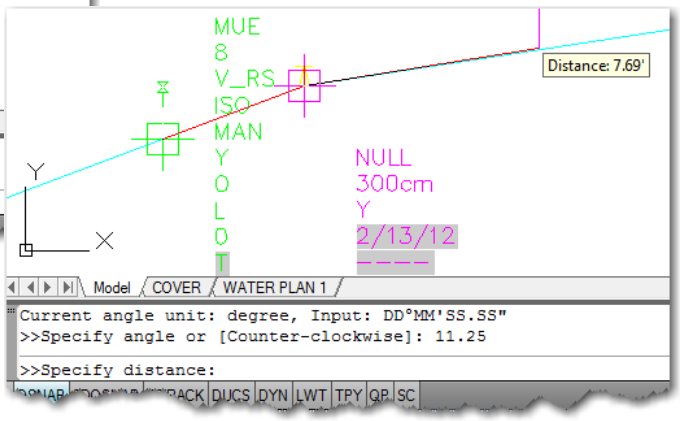
Follow the command prompt to utilize the Deflection Distance command; the first point selected should be the closest point to the desired angle, and then work backwards toward the ending point:



Once the ending point is selected the command line will prompt the user to specify an angle, type in the desired angle and press Enter:

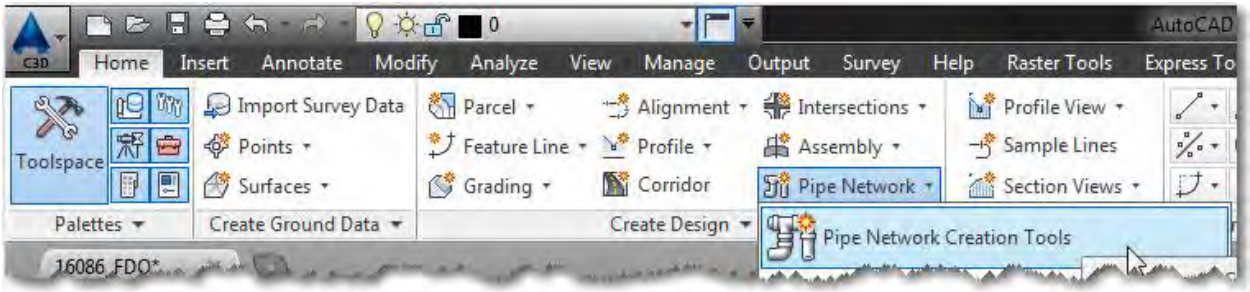


The line will now reflect the desire angle, the line distance can be typed in or just pick a point on the screen:



Adding a Pipe Network

For projects without an alignment, use the following process (typically Private Pipe and Contractor installed jobs). On the *Home* tab, *Create Design* panel (of the Ribbon), click the *Pipe Network* pull-down and choose ***Pipe Network Creation Tools***:

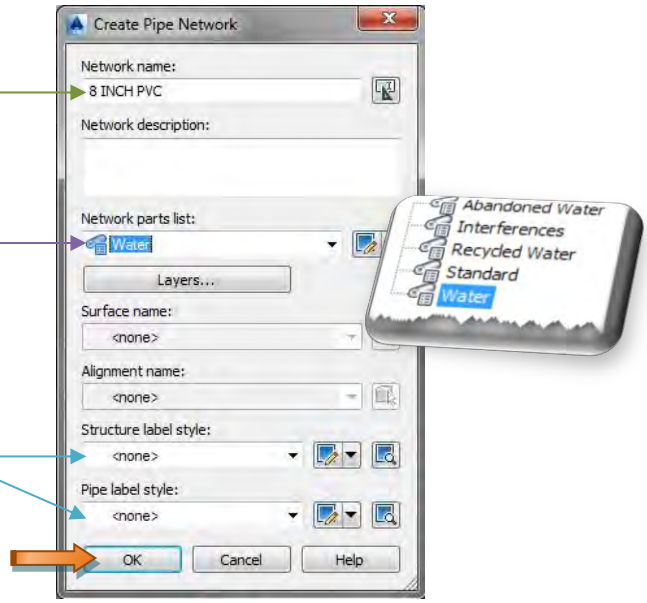


The *Create Pipe Network* pop-up will appear, match the options as close to the example below as possible, and click <OK>:

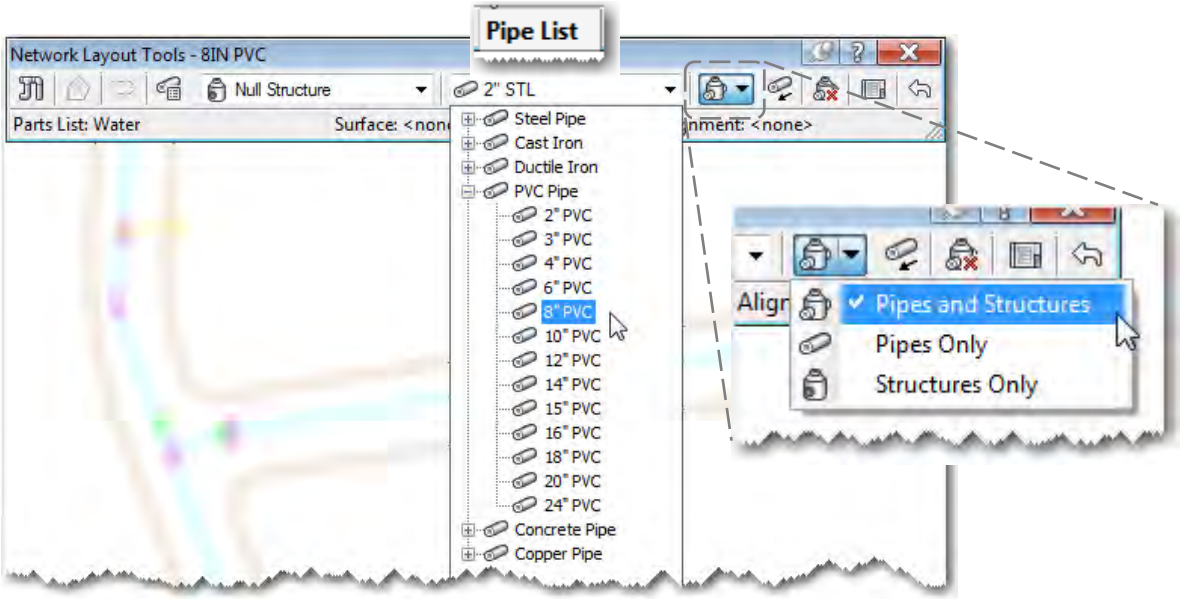
Network name: Choose a name that is reflective of the work being done. Special characters cannot be used.

Network parts list: Most of the time Water will be main choice, unless a network is being created for Abandoned or Recycled Water.

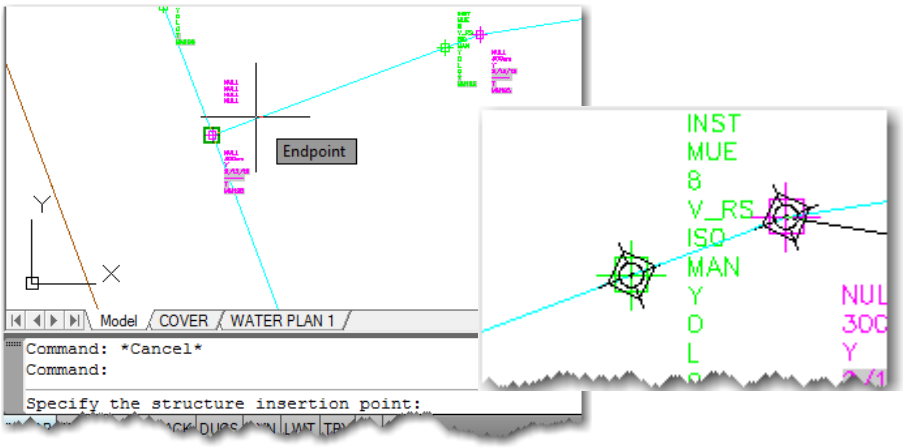
Label styles: At this time the labels styles can be left as <none>.



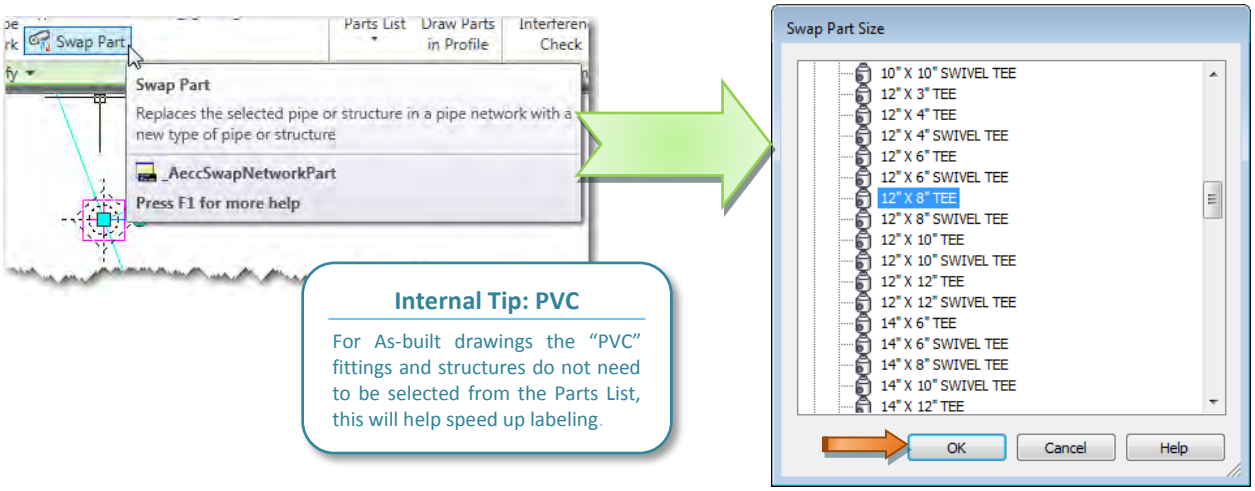
A floating toolbar will appear. Leave the structures as Null; select the correct pipe material and size from the Pipe List pull down; choose how to draw the network using the proper button (see example below):



The command line will prompt Specify the structure insertion point; utilize OSNAP to pick the correct insertion points, trace along the previously created ARG information – notice Null Structures are being added at each node; hit Enter once finished:



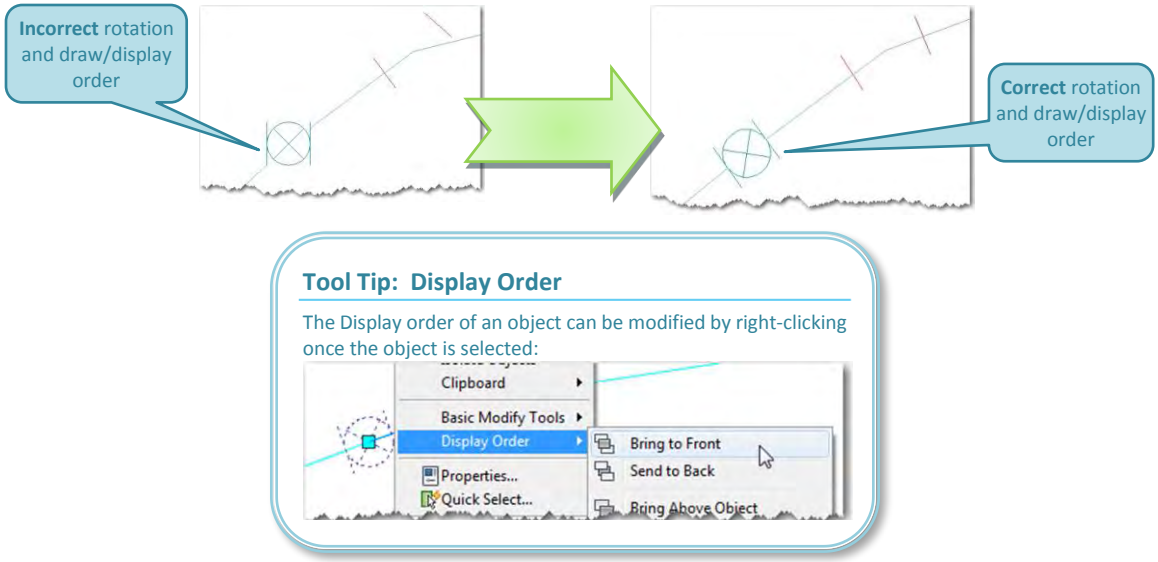
The Null Structures can now be replaced by swapping parts (found on the contextual ribbon or by right-clicking) and choosing the appropriate appurtenance, click <OK>:



Internal Tip: PVC

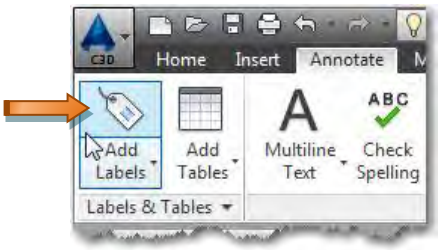
For As-built drawings the "PVC" fittings and structures do not need to be selected from the Parts List, this will help speed up labeling.

Each symbol will need to be reviewed as it is placed, to make sure the rotation and draw/display order is correct:

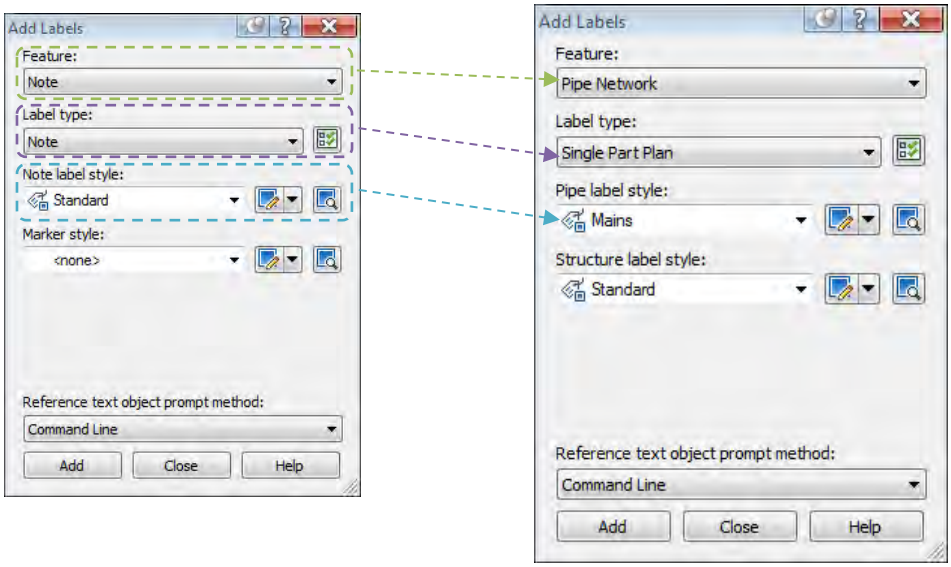


Annotate Pipe Network

Once the entire pipe network is finished the plan is ready to be annotated and labeled. On the *Annotate* tab, of the ribbon, click the *Add Labels* button [see *Section 13.0 - Labeling & Annotation Tools*]:



The Add Labels pop-up will appear. Choose **Pipe Network**, under Feature, and **Single Part Plan**, under Label type and **Mains** under Pipe label style:

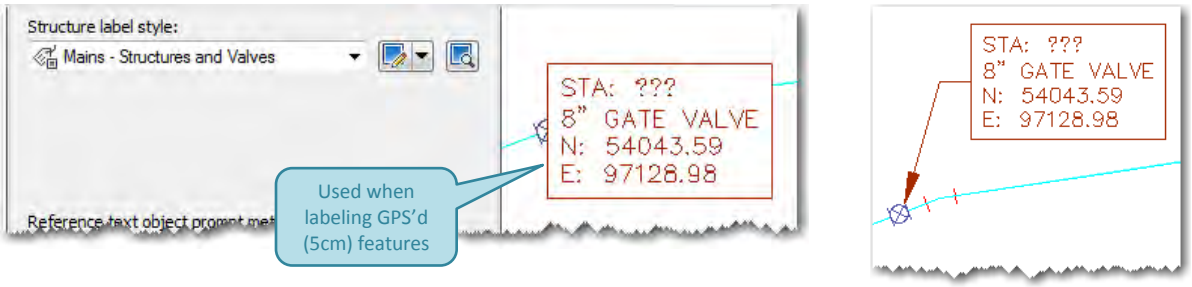


Structure Label Styles

The Structure label style consists of five different label types; the following examples show what each usable label style looks like.

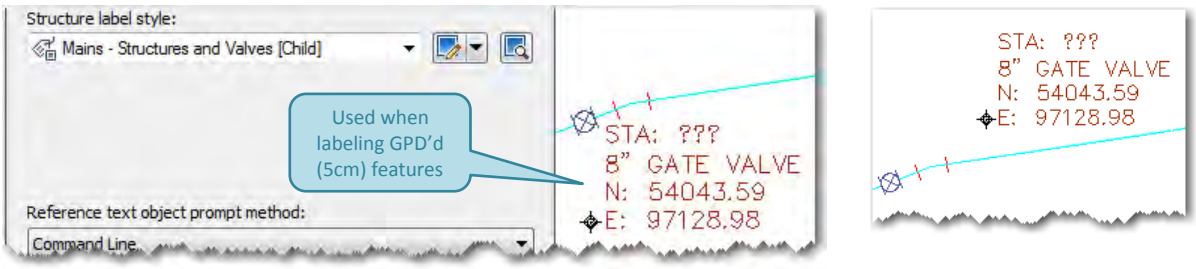
Mains – Structures & Valves

Automatically draws a masked text box around the text, and includes a leader when moved:



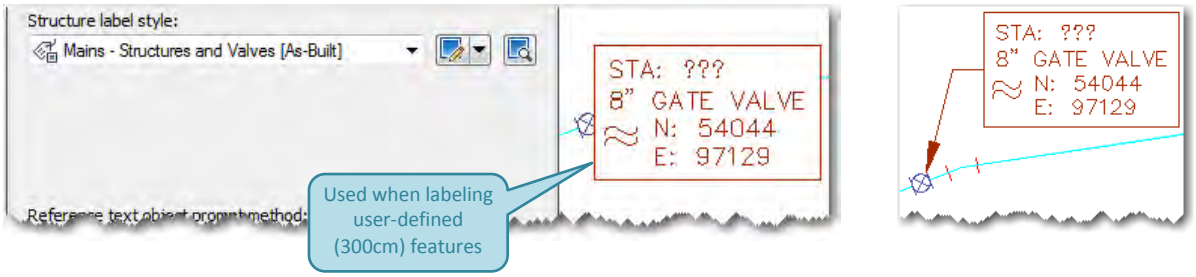
Mains – Structures and Valves [Child]

Does not include a text box or leader when placed or moved, includes marker for label placement:



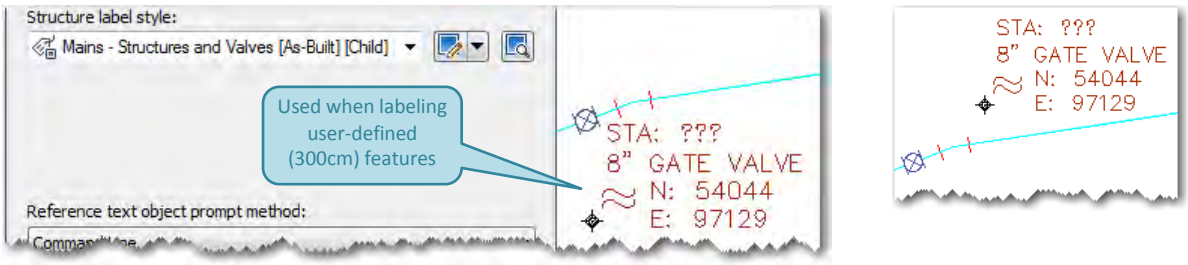
Mains – Structures & Valves [As-Built]

Automatically draws a masked text box around the text, and includes a leader when moved. Also includes an approximate sign as a separate text component:

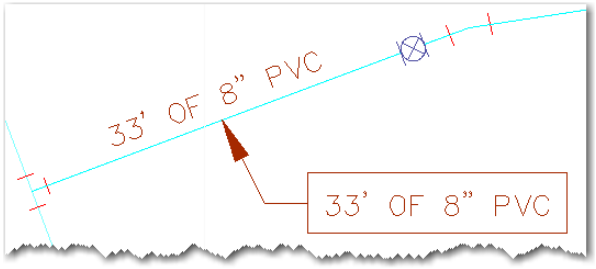


Mains – Structures & Valves [As-Built] [Child]

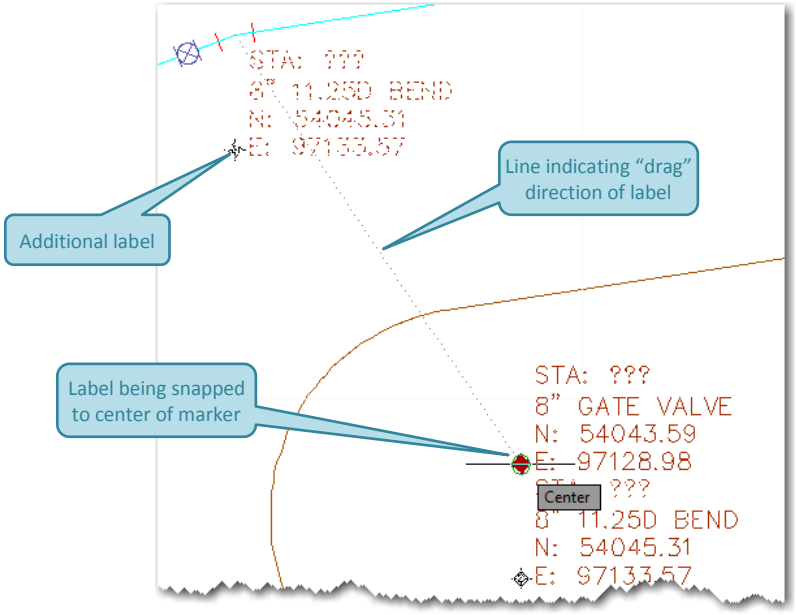
Does **not** include a text box or leader when placed or moved. Also includes an approximate sign as a separate text component, and a marker for label placement:



Each of the four previously listed label styles will include a masked text box and leader when the label is moved off of the pipe:

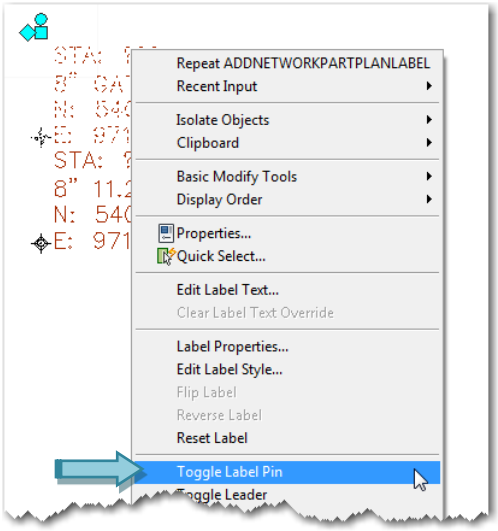


The "Child" label styles include a symbol that is useful when stacking notes in the same text box. Use the cyan colored grips to move the annotation to the desired location. When placing an additional label, snap to the center of the marker to line up the labels:



Note: OSNAP "nearest" when lining up with a text box.

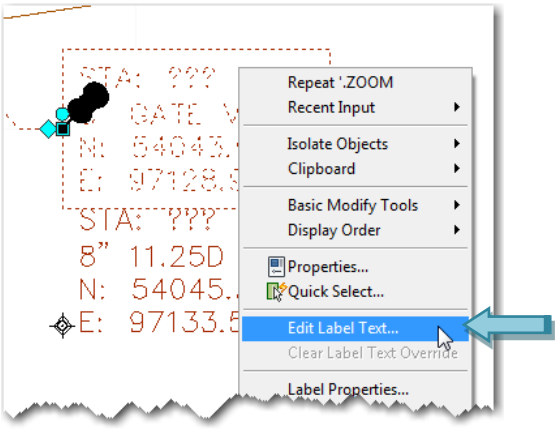
Civil 3D labels tend to "jump", to avoid this pin each label once it is placed. Select the desired label, right-click and choose Toggle Label Pin; the label will now show a pushpin:



Edit Label Text

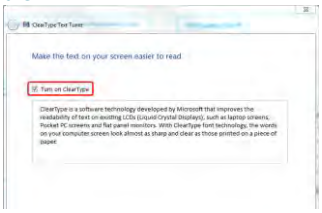
Each label may need to be modified, either to remove stationing, adding pipe lengths, and/or expanding text boxes, among various other reasons.

Select the label to be modified, right-click and choose *Edit Label Text…*:



Tool Tip: ClearType Text Tuner

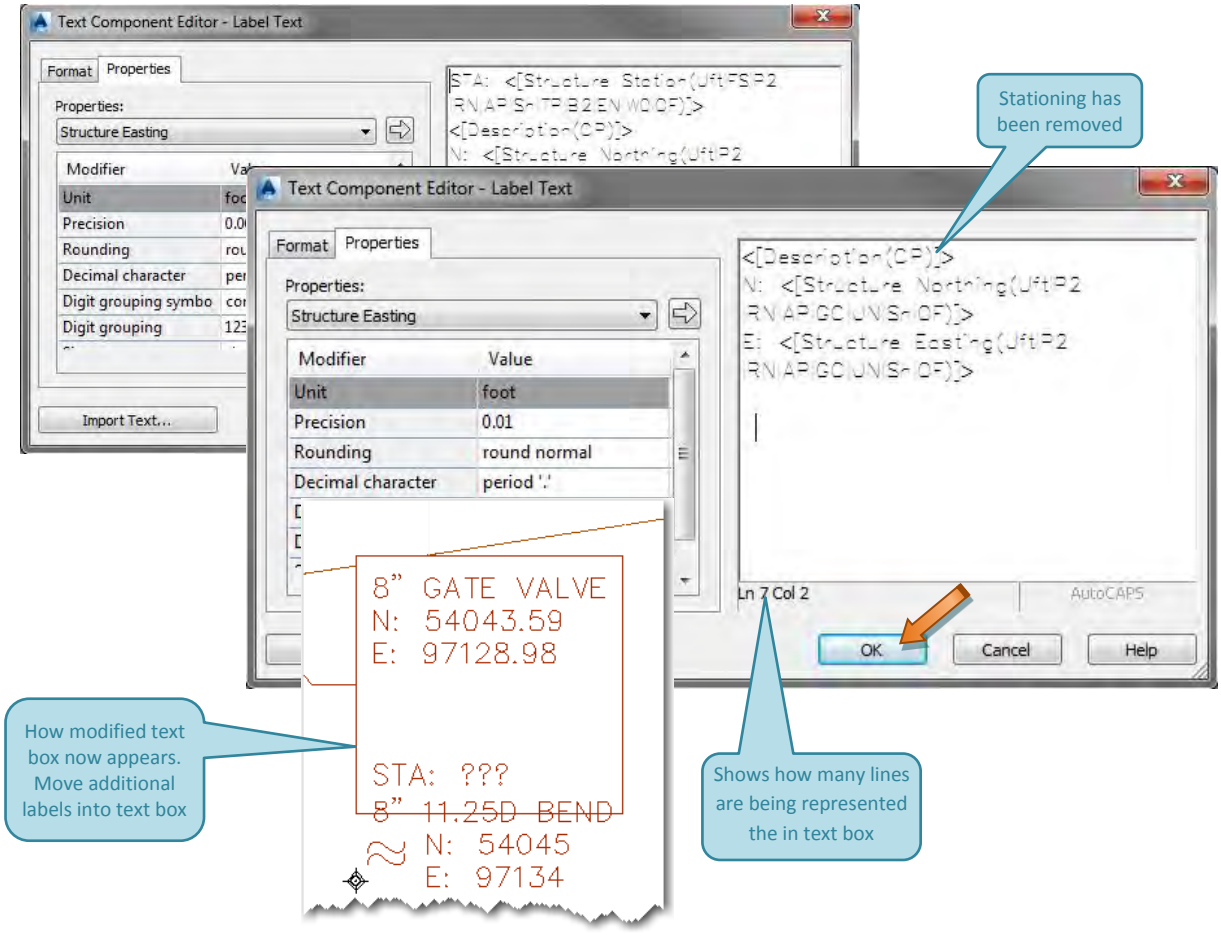
If you have trouble seeing text you can adjust your settings by typing cttune.exe at the Windows command line and running through the prompts.



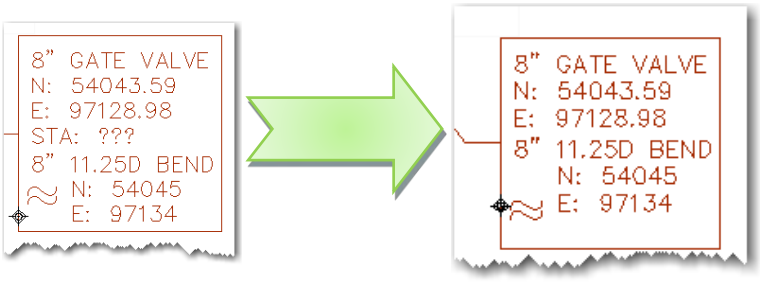
The *Text Component Editor – Label Text* pop-up window will appear. The window on the right of the pop-up is where the text can be modified.

Begin by removing any text not needed in the label, such as stationing.

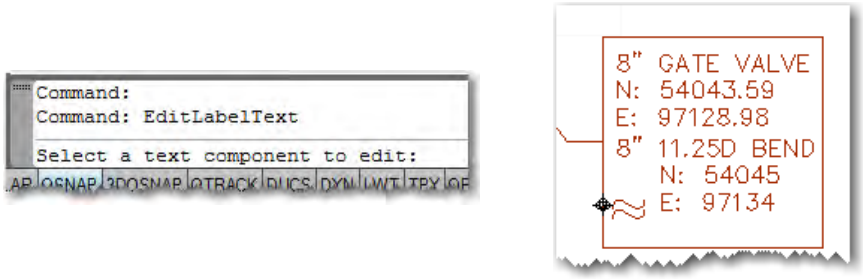
To expand text boxes, place the cursor after the last line of text and hit Enter as many times as needed, be sure to include a space upon the last Enter. Click <OK> when finished (alternately, the text box can be created after the label (that does not include a text box) is completed):



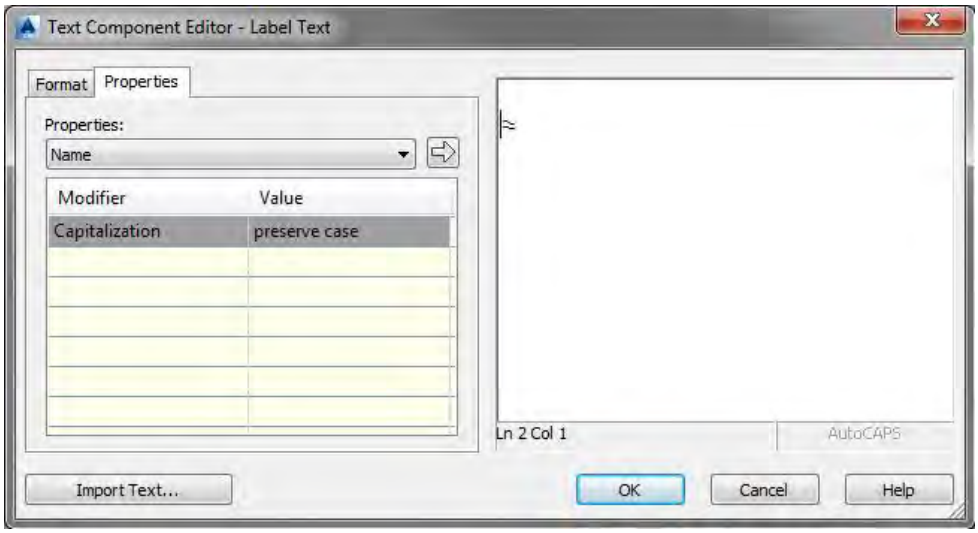
The ”approximate” (≈) sign is a separate component of each applicable label style and must be edited separately. After a label is edited the ≈ sign may appear to be out of alignment:

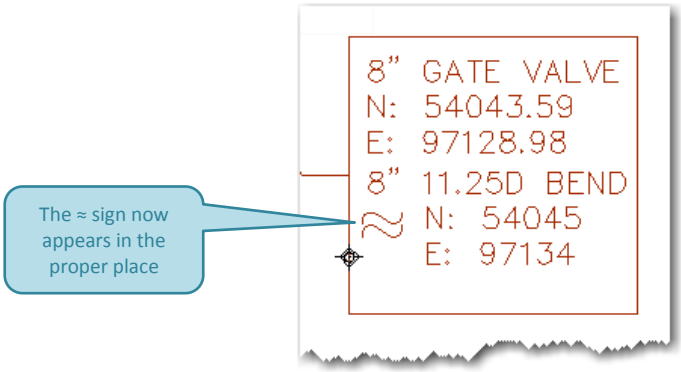


Select the label, right-click and choose *Edit Label text*, the command line will prompt the user to *Select a text component to edit*, pick the ≈ symbol in the label:



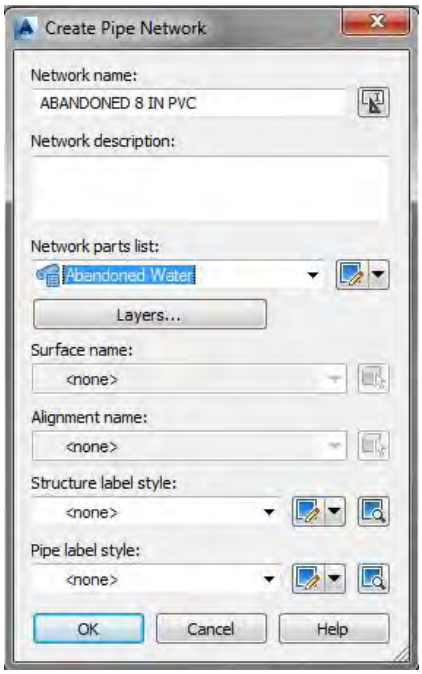
The *Text Component Editor – Label* Text pop-up window will appear, showing only the ≈ sign. To move the ≈ sign up, click above it and hit Backspace on the keyboard. Alternately to move it down hit Enter. Click <OK> when finished:



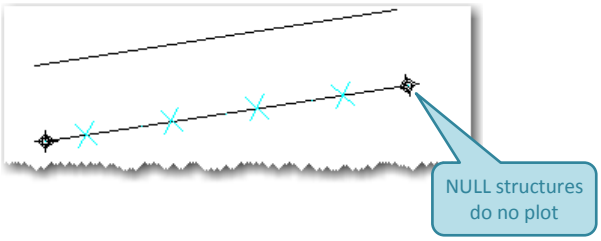


Add an Abandoned Pipe Network

Follow the same steps for *Adding a Pipe Network*, [*Page 19.2-13, this section*], except choose **Abandoned Water**, for the Network parts list; name the network appropriately:



Leaving the line work in place, draw on top of it. The nodes at any intersections will not plot:

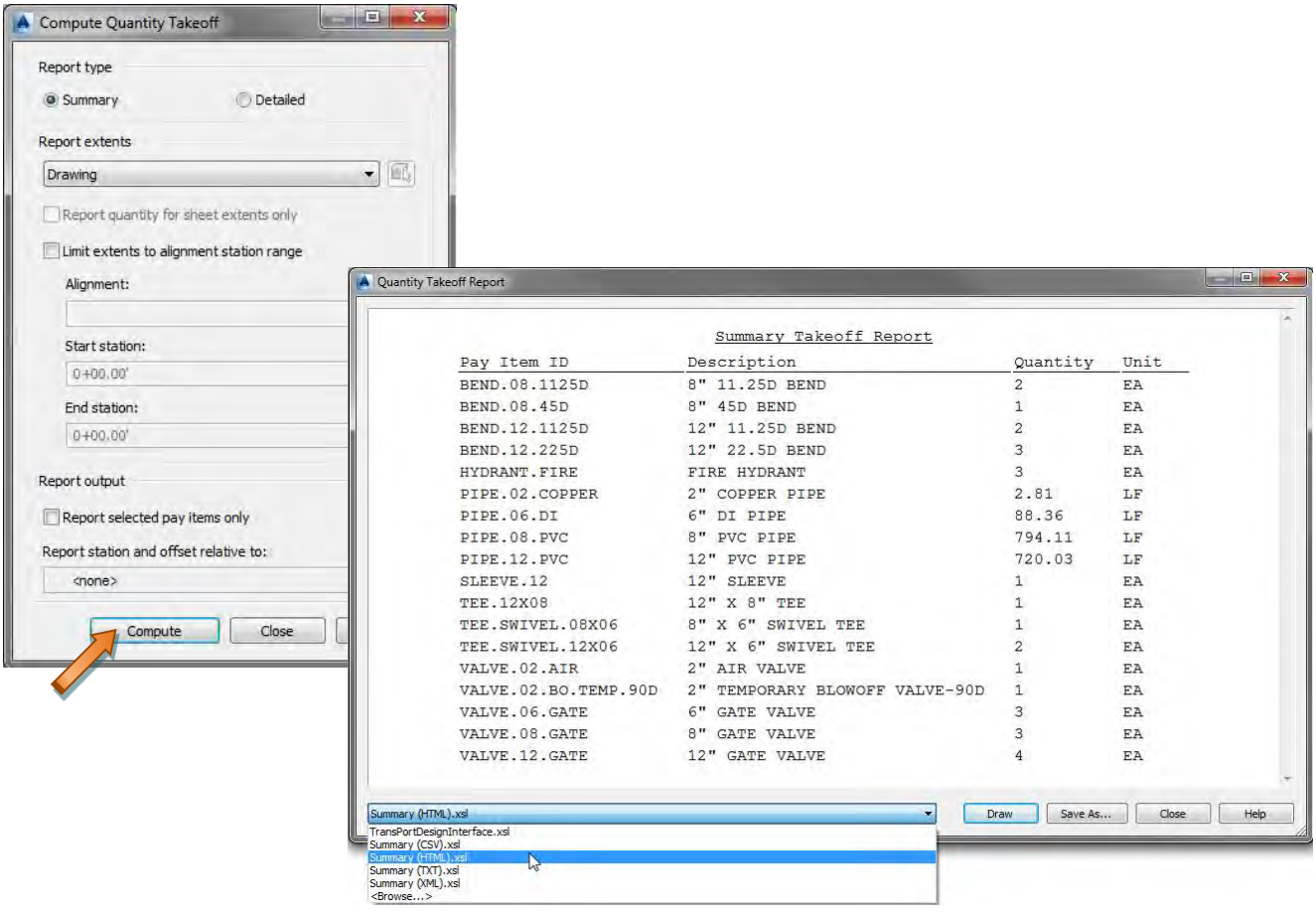


Quantity Takeoff

The Cover sheet requires a count for all pipe, valves, hydrants, etc. Civil 3D comes with a tool that can help automate this process.

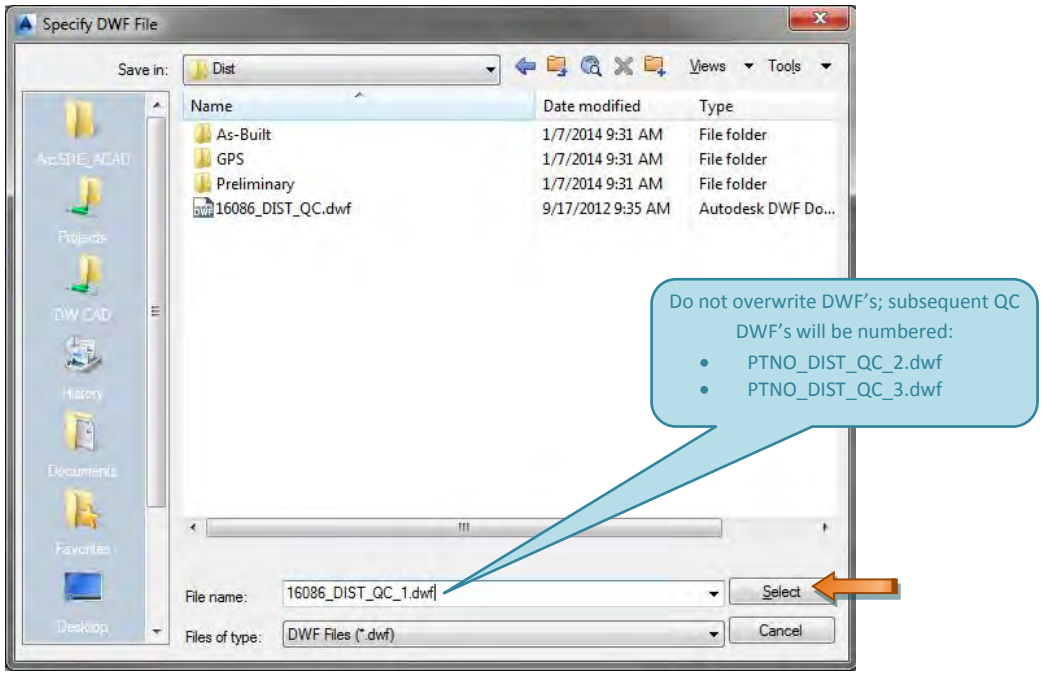
On the Analyze tab, QTO panel, of the ribbon (while in the project drawing), click **Takeoff**:

The *Compute Quantity Takeoff* pop-up will appear, use the settings shown below, and click <Compute>. The *Quantity Takeoff Report* window will appear, select the desired Summary type:



This tool builds a list of all the pipe network objects in the drawing and creates a report. This report can be used to help with the "inventory" of a project.

The *Specify DWF* File pop-up will appear, navigate to the project's DIST folder. Name the DWF accordingly (***PTNO_DIST_QC_1.dwf***), click <Select>:

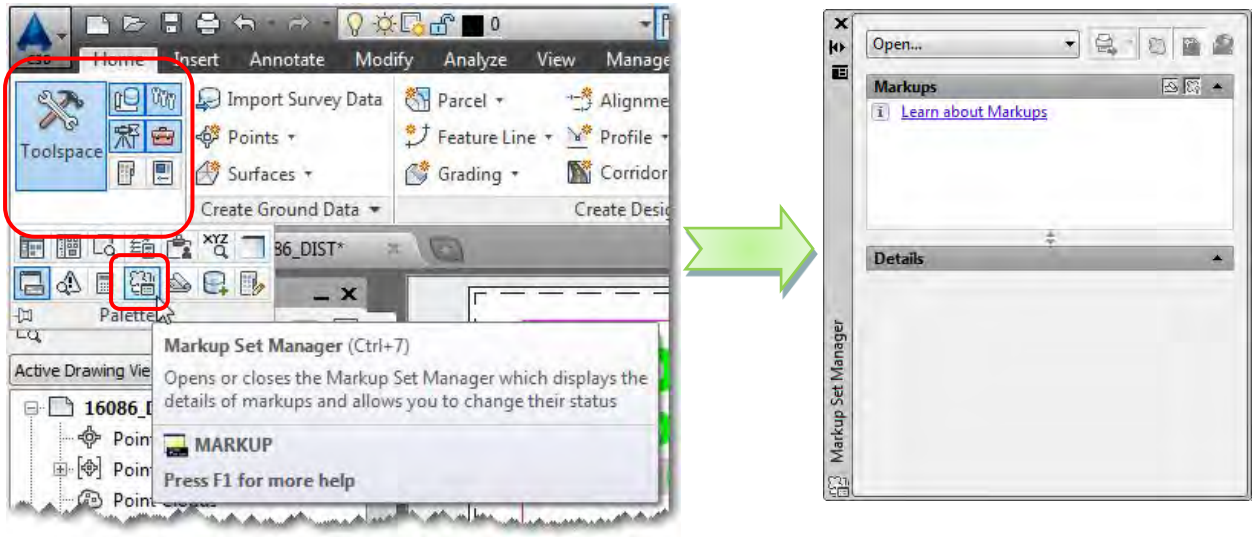


DWF Markups in CAD

Open the Project Drawing using the Sheet Set.

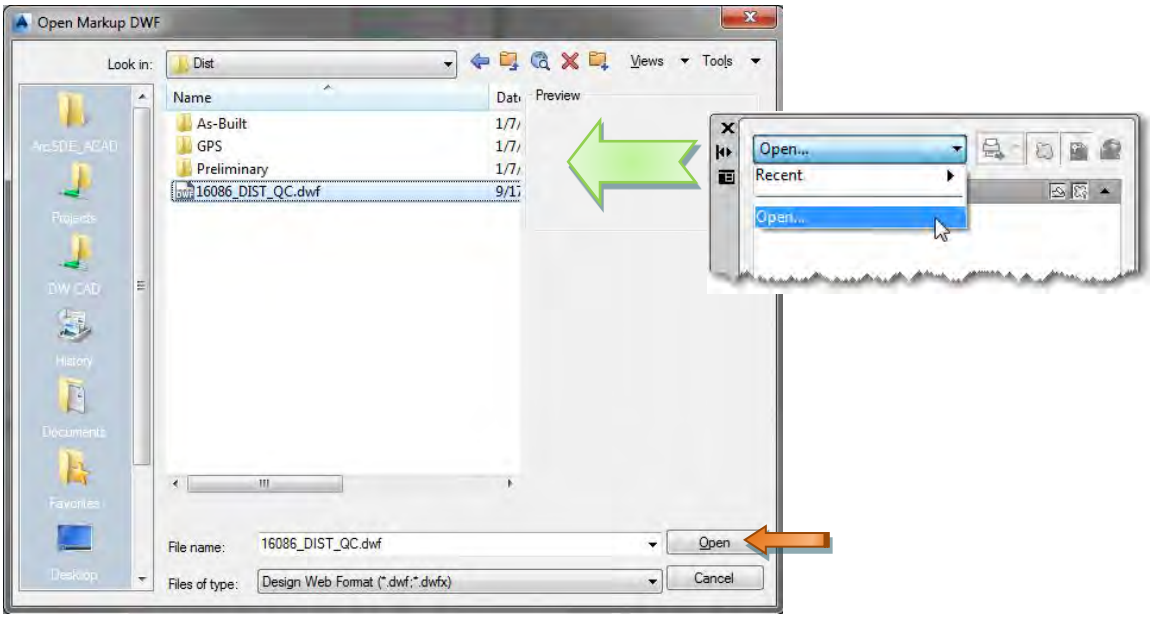
See *Section 16.4 – Electronic Plots (PDFs & DWFs)* for DWF creation, follow the naming convention mentioned below.

Once the drawing is open, navigate to the Home tab on the ribbon, click the Palettes pull-down and click the *Markup Set Manager* icon. The *Markup Set Manager* palette will appear:

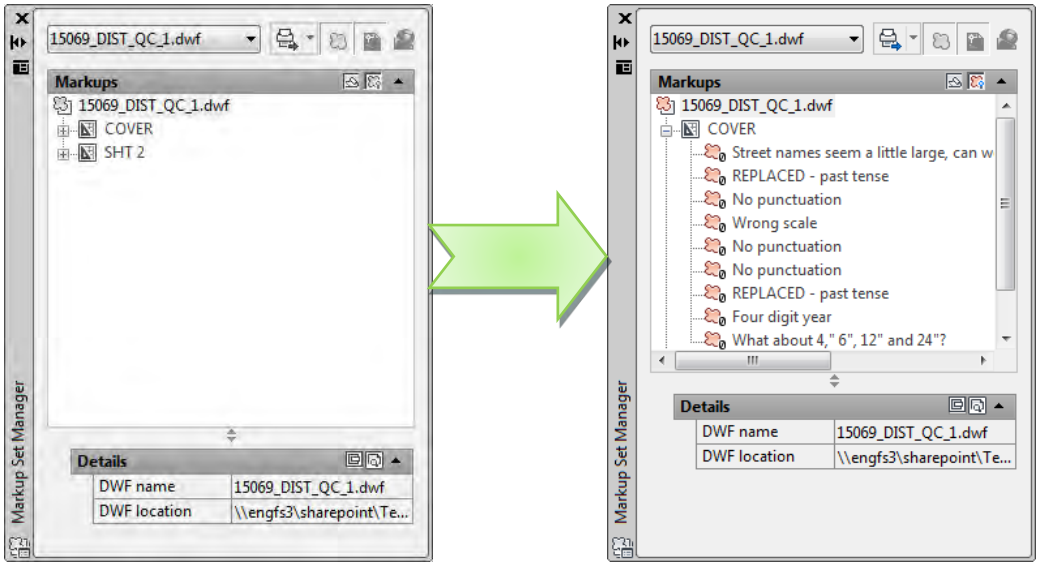


Alternately, type **_markup** at the command line.

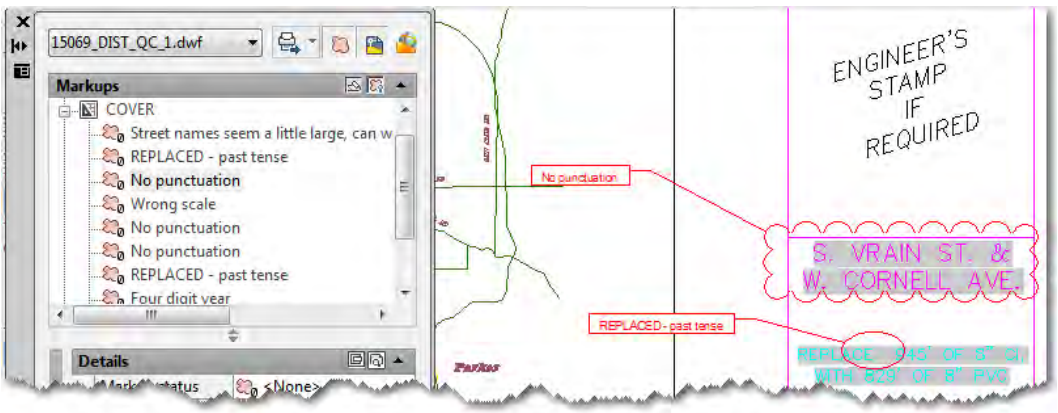
In the *Markup Set Manager* palette, select the down arrow next to *Open…* and choose *Open…*. The *Open Markup DWF* dialog window will appear, navigate to the previously saved DWF file (now marked up) and click <Open>:



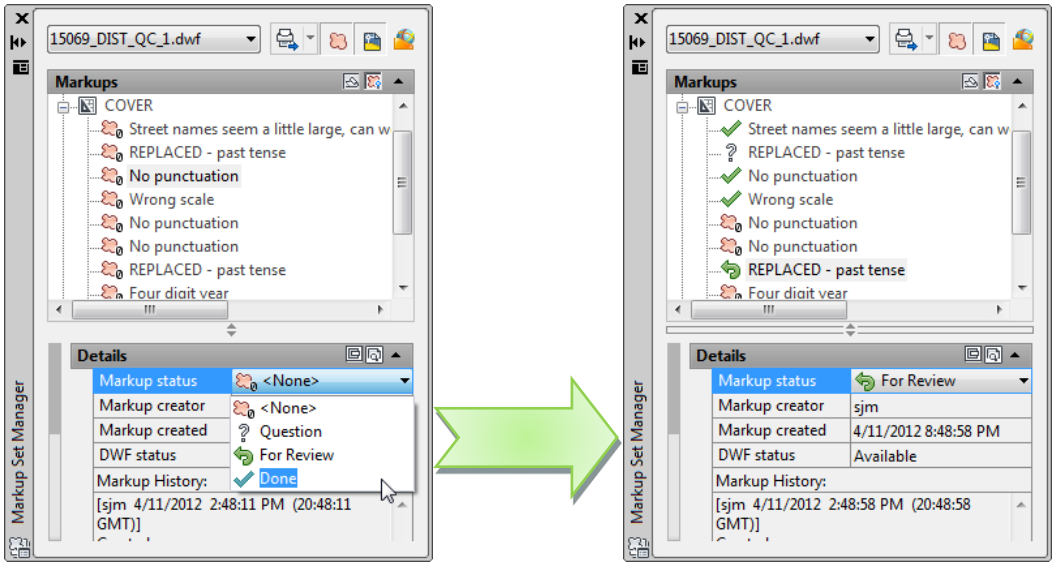
The *Markup Set Manager* palette will show the selected DWF, listing all sheets in the file. Use the plus sign to expand the sheets to see any markups:



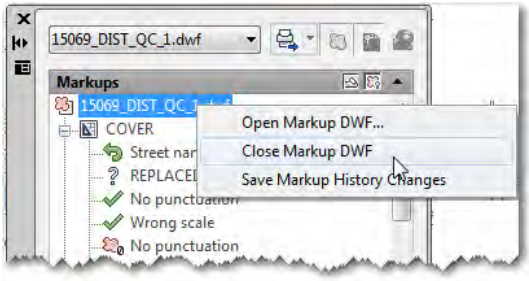
Double-click on one of the markups to show them in Paper Space within the Project Drawing (or alternately view them in Autodesk Design Review):



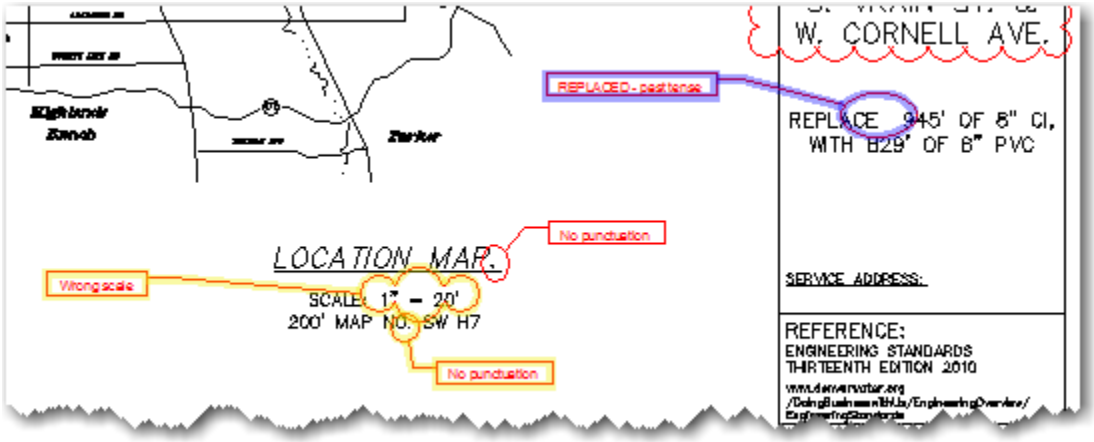
As each markup is corrected in the drawing, change the *Markup status* (under Details) accordingly:



Once all markups have been addressed, right-click on the DWF name and select *Close Markup DWF*:



Once opened, the DWF file will reflect the markup changes with highlights:

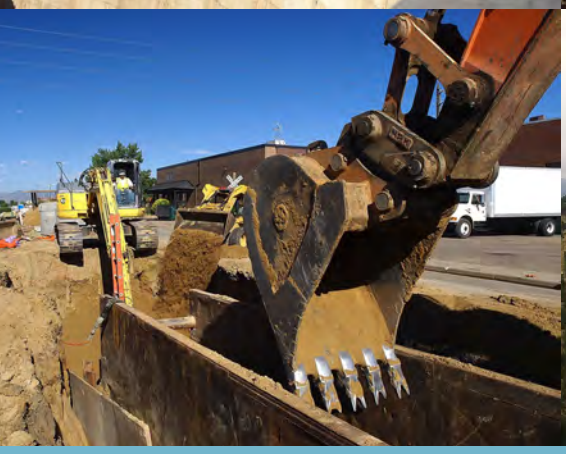
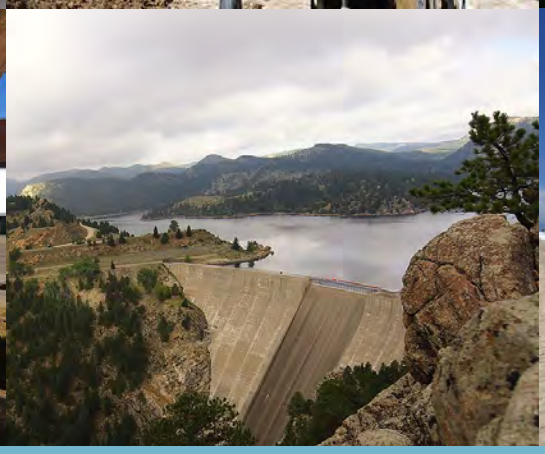


Following the steps on page *19.2-20 – DWF Markups in CAD*, this document, create a new DWF, name accordingly.

CAD Standards Manual

Consultant Needs




3rd Edition
2016

PLEASE REFER to denverwater.org for Standards updates.

DENVER WATER

Section 20.0

Consultant Needs

Table of Contents: Section 20.0

Revision History

Revision	Date	Page(s)	Changes

Overview - Section 20.0

Internal Use: Full compliance where applicable
Contractor Use: Full compliance

- Plan Reviews

Introduction

Denver Water has developed CAD standards for internal and external use. Internally, the CAD Standards will be used as an office standard; externally, the CAD Standards shall be issued to consultants for use. In both instances, these standards shall be used to ensure uniformity in plan output, allowing the users to follow routine procedures and thereby increase efficiency. Standards are based on the current version of the United States National CAD Standard® (NCS).

Consultants' efforts to follow these standards will result in a more efficient project design and approval process. To simplify this process the CAD Standards have been broken into four sections based on General information and submittal type:

- SECTION ONE: General Information – applicable to *all* submittals
- SECTION TWO: Main Extensions – applicable to Main Extension submittals only
- SECTION THREE: Easements and Licenses – applicable to Easements and Licenses submittals only

The CAD Standards are a supplemental guide to the current Denver Water Engineering Standards. The Engineering Standards 14th Edition, Errata 7 will be released on November 1st in coordination with the CAD Standards 3rd Edition. The Engineering Standards 15th Edition is currently scheduled for release in 2017. These are working documents, they are revised often, and it is your responsibility to make sure you have the most current edition. Both are available on Denver Water's website under Engineering Overview.

Software Applications

What version and format of AutoCAD files Denver Water will accept
Denver Water will accept an **AutoCAD® 2013 .dwg file (or earlier)**. The .dwg file shall be free from any intelligent (proxy) objects and must conform to other specifications as stated in the Denver Water CAD Standards and Denver Water's current Engineering Standards. A .dwf file of the final plot must accompany this .dwg file, as applicable.

While Denver Water is on Subscription with Autodesk software, we may not be using the current version of Autodesk software. When Denver Water implements a new version of Autodesk software the documents posted on the Denver Water website and the CAD and the current Engineering Standards will be changed to reflect any changes due to this new version (where applicable).

If the submittal was created using a program other than AutoCAD® or AutoCAD LT® then the submitting organization is responsible for converting the files to a plain (no proxy) **AutoCAD® 2013 .dwg file**.

The software that Denver Water currently uses is **AutoCAD® 2016 Civil 3D** and **Map 3D**.

Denver Water reserves the right to decline **any** submittal due to incompatibility issues, including but not limited to, corrupt files.

Denver Water's Engineering Division Sections

- **Distribution Engineering** is responsible for the design of proposed projects and the as-built drawings required for all main installations by Denver Water that are 20-inches and smaller.

  Work done within Distribution Engineering is comparable to the Main Extensions - Page 20.0-23 submittals, current Engineering Standards, Chapter 2.

- **Property Management** is responsible for easement acquisitions, plan reviews, land sales and exchanges, and license agreements on Denver Water's operating properties and non-operating properties. They also oversee recreation activities for operating and non-operating property, including leases, agreements, and studies.

  Work done within Property Management is comparable to the Easements and Licenses - Page 20.0-65 submittals, current Engineering Standards, Chapter 4.

List of Acronyms

CAD - Computer-Aided Design or Drafting

.CHX - AutoCAD Standards Check File

.CTB - AutoCAD Color-Based Plot Style File

.DGN – Microstation Design File

DW – Denver Water

.DWF – Design Web Format File

.DWFx – Design Web Format XPS File

.DWG – AutoCAD Drawing Database File

.DWS – AutoCAD Drawing Standards File

ENG – Engineering

FAQ – Frequently Asked Questions

.LIN – AutoCAD Linetype File

NCS – National CAD Standards

PDF – Portable Document Format File

SID – Seamless Image Database

XREF – External Reference File

.ZIP – Zipped File (compressed file)

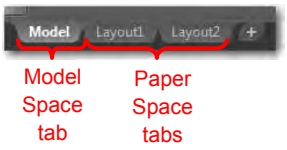
Drawing Tools and Practices

All templates/drawings provided by Denver Water are based on the internal CAD Standards. The following practices have been included in this document to help sync the external drawings with the way the provided drawings were created and are intended to be used.

Expected Use of Model Space and Paper Space

All drafting shall be done in Model Space, in decimal units, with the proper annotation and drawing scales set. Drawings shall use Paper Space (Layout) views to accomplish plans required.

Every drawing has a Model Space tab and at least one Paper Space tab:

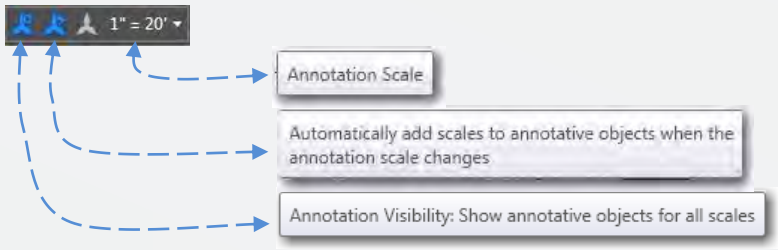


Annotation Scales

The Annotation Scale, also known as drawing scale, must be set for Model Space and for each viewport in Paper Space. Acceptable Denver Water scales, as defined by the current Engineering Standards, have been predefined within the provided Template drawings:

Tip: Annotation Scale Overview

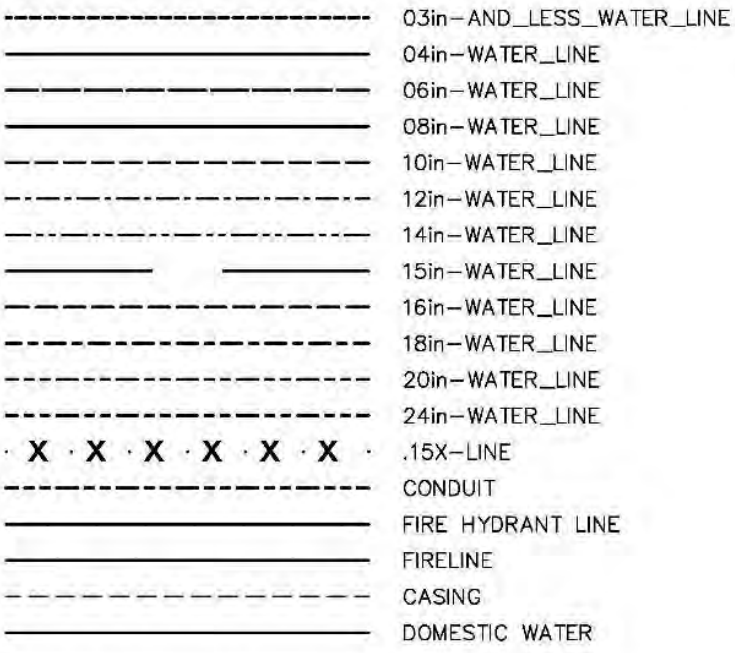
The Annotation Scale settings can be controlled using the buttons on the drawing status bar:



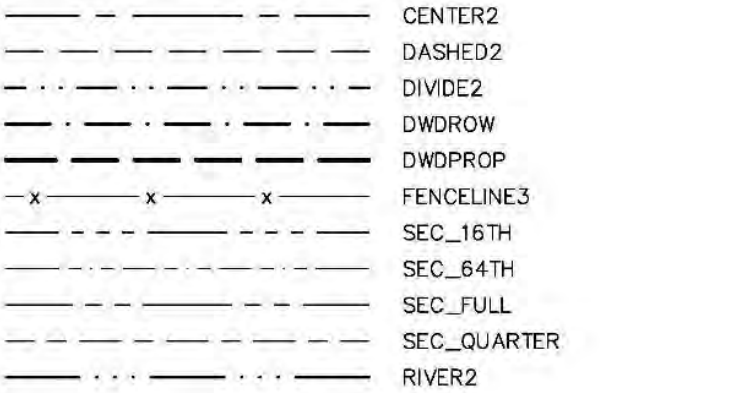
Note: It is important to keep both on at all times, it can adversely affect the scales within the drawings.

Denver Water - Linetypes

MAIN EXTENSIONS LINETYPES

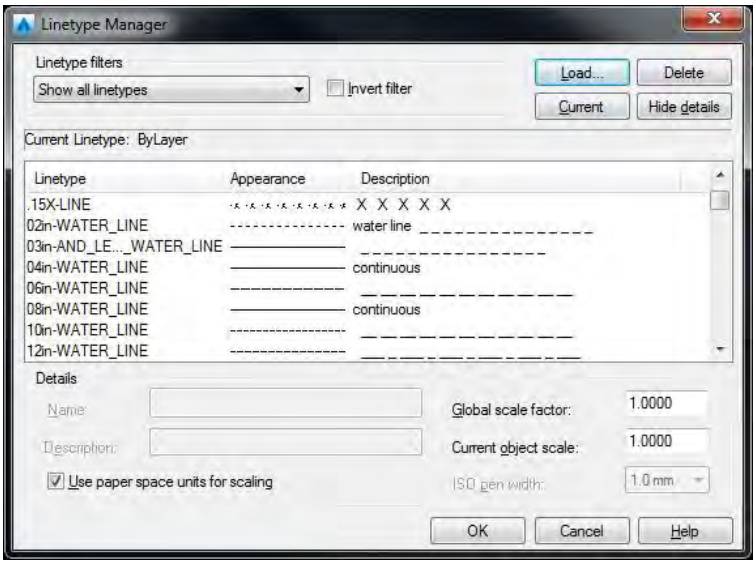


EASEMENTS AND LICENSES LINETYPES



Linetypes

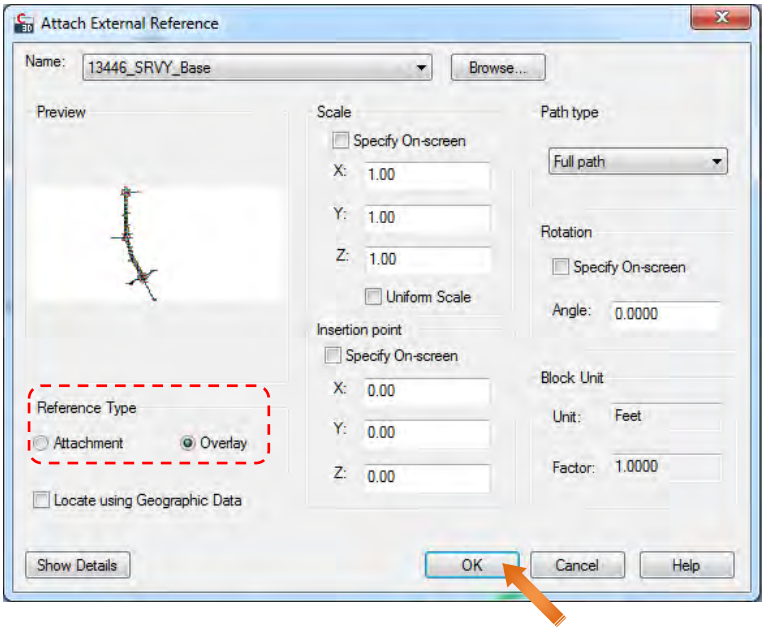
Within the provided Template drawing, all layers have been assigned specific linetypes. These linetypes are to remain as is. Denver Water provides a .lin file (see *Support Files - Page 20.0-22*):



XREF's

If *External References (XREFs)* are acceptable in the submittal process (see *Main Extensions - Page 20.0-23* or *Easements and Licenses - Page 20.0-65*) the following options are required. AutoCAD® allows XREFs of DWG, DWF, DWFx, PDF, or DGN underlays, and raster images.

The **Reference Type** shall be set to Overlay and **Path type** to Relative Path (**not shown**):



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Pen Line Weights

Use this table in correspondence with the Layer Color Chart, next page. The table represents how each pen assignment in the CTB file plots:

PLOTTED LINE WEIGHTS			
Pen Assignment	Line Width (in)	Plotted Line Width	50% Screened Line
Color 1	0.0050		
Color 2	0.0110		
Color 3	0.0177		
Color 4	0.0236		
Color 5	0.0290		
Color 6	0.0354		
Color 7	0.0417		
Color 8	0.0472		
Color 9	0.0530		

Layer Color Chart

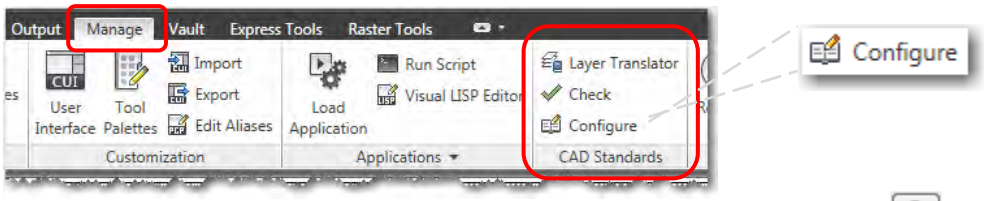
All colors are assigned a Pen number based the ending number of the color. Colors ending in 0 plot in true color and are assigned a Pen 4 width. If the color is in a "screened" row, it will plot gray with the corresponding Pen width. The following chart mimics the provided **DW Engineering.ctb** (not used with Licenses and Easements, see *Support Files - Page 20.0-22*). The table represents how each color in the CTB file plots:

	Pen 1	Pen 2	Pen 3	Pen 4	Pen 5	Pen 6	Pen 7	Pen 8	Pen 9	COLOR PENS
LnWt. (in)	0.005	0.0110	0.0177	0.0236	0.0290	0.0354	0.0417	0.0472	0.0530	0.014
	1	2	3	4	5	6	7	8	9	10
	11	12	13	14	15	16	17	18	19	20
	21	22	23	24	25	26	27	28	29	30
	31	32	33	34	35	36	37	38	39	40
SCREENED	41	42	43	44	45	46	47	48	49	50
	51	52	53	54	55	56	57	58	59	60
	61	62	63	64	65	66	67	68	69	70
SCREENED	71	72	73	74	75	76	77	78	79	80
	81	82	83	84	85	86	87	88	89	90
	91	92	93	94	95	96	97	98	99	100
	101	102	103	104	105	106	107	108	109	110
	111	112	113	114	115	116	117	118	119	120
	121	122	123	124	125	126	127	128	129	130
	131	132	133	134	135	136	137	138	139	140
	141	142	143	144	145	146	147	148	149	150
SCREENED	151	152	153	154	155	156	157	158	159	160
	161	162	163	164	165	166	167	168	169	170
	171	172	173	174	175	176	177	178	179	180
SCREENED	181	182	183	184	185	186	187	188	189	190
	191	192	193	194	195	196	197	198	199	200
	201	202	203	204	205	206	207	208	209	210
	211	212	213	214	215	216	217	218	219	220
	221	222	223	224	225	226	227	228	229	230
SCREENED	231	232	233	234	235	236	237	238	239	240
	241	242	243	244	245	246	247	248	249	250
SCREENED	251	252	253	254	255					

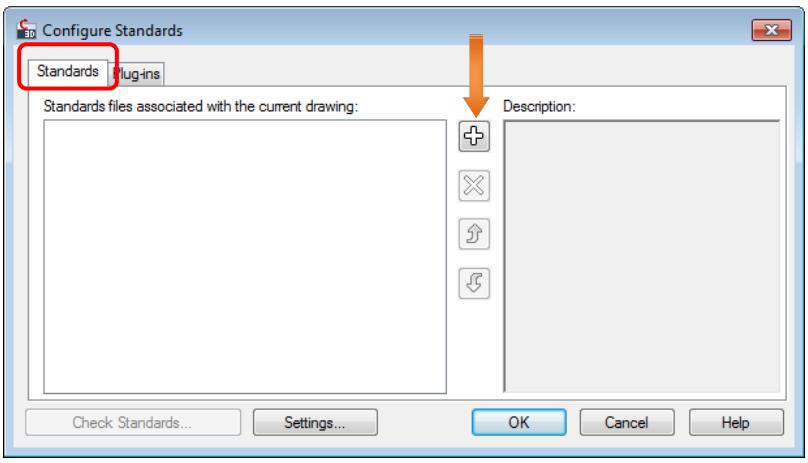
Batch Standards Checker – IN CAD

Each Template drawings provided by DW has a .dws file with the same name used to help ensure the standards have been properly utilized. These files audit and analyze drawings for DW text styles, heights, scales, and proper layer use and compare what they have found to the predefined standards. (See *Support Files - Page 20.0-22*).

Click the *Configure* button, located on the *Manage* tab of the ribbon on the CAD Standards panel (alternately type **_standards** at the command line):

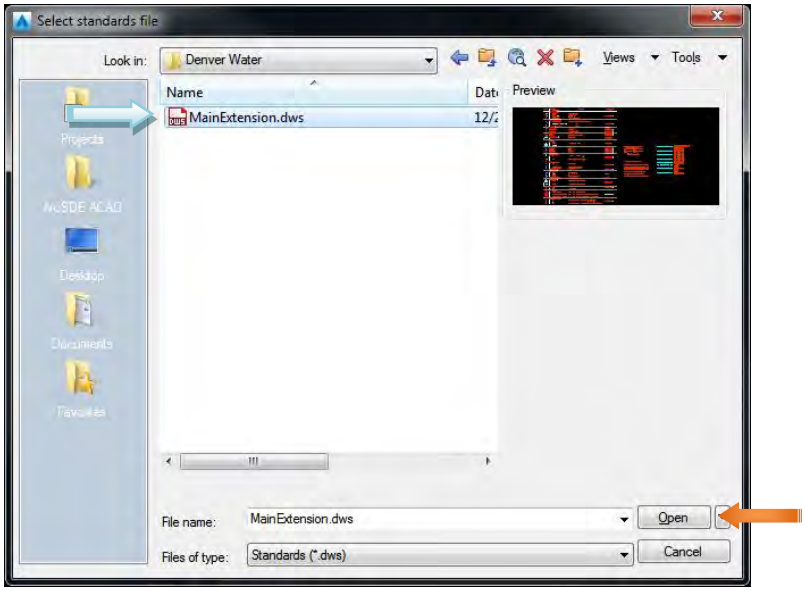


The *Configure Standards* pop-up window will appear; on the *Standards* tab, click the button: 

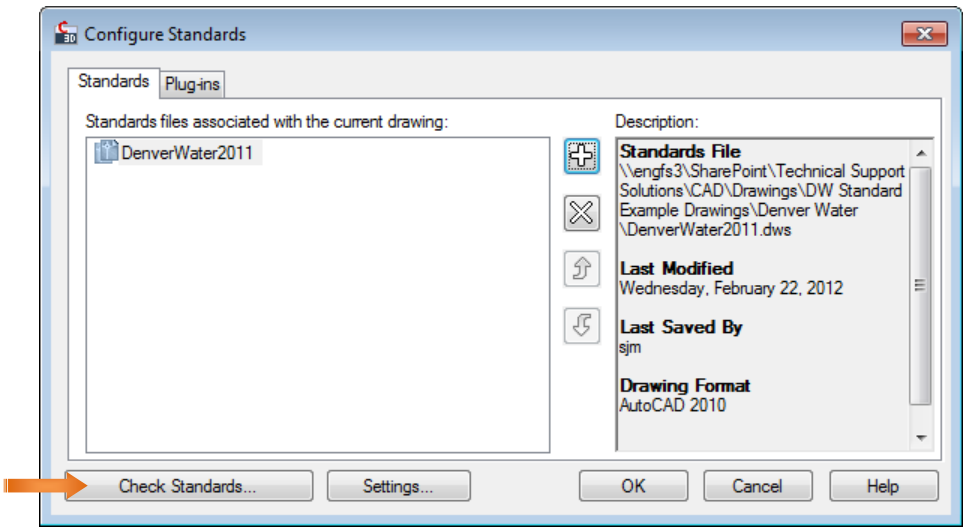


Navigate to the desired .dws file (see *Support Files - Page 20.0-22*), click Open :

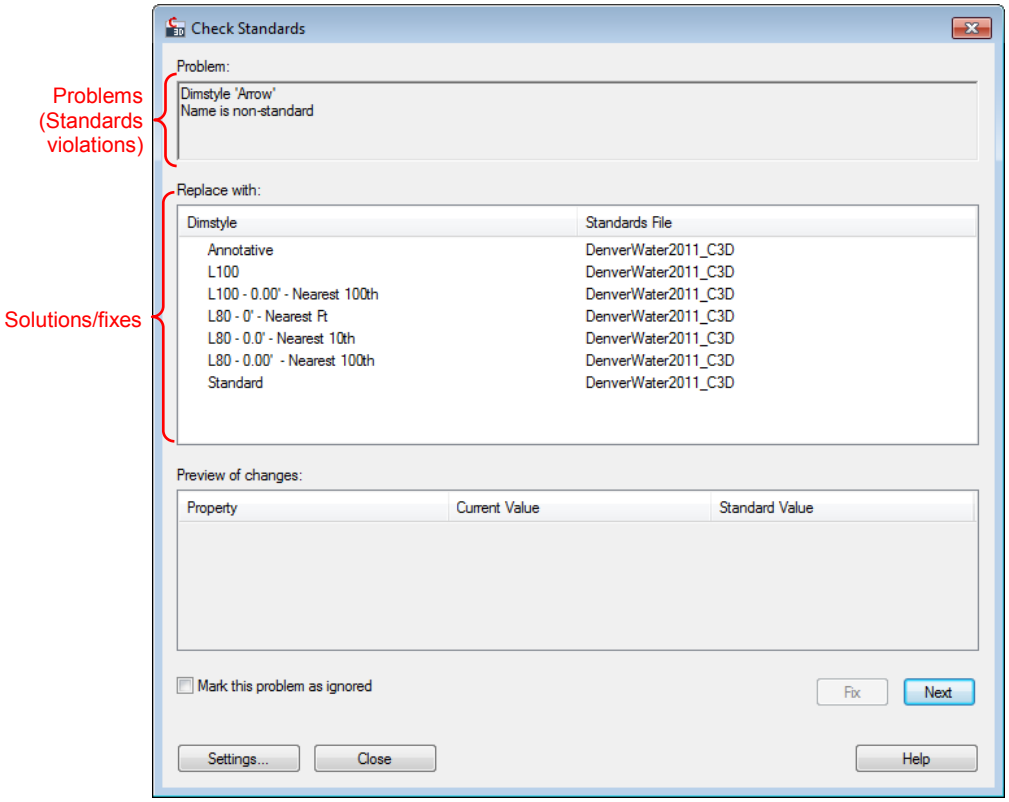
Tip: DWS
Use the correct DWS from the corresponding zip file based on submittal type.



In the *Configure Standards* pop-up window click Check Standards... :



The *Check Standards* window will appear listing "problems" and possible "solutions/fixes" in the "Replace with" section to standards violations:



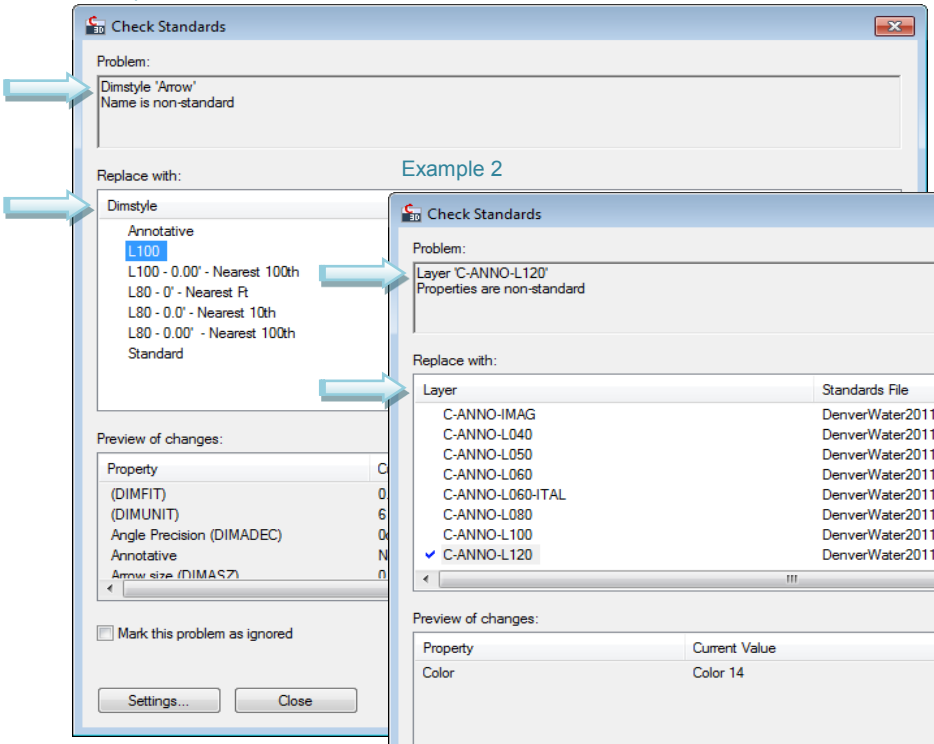
Tip: Layers

The DWS files only contain the layers as provided in the templates drawings, it is suggested to run the checker against Denver Water specific layers to help minimize the amount of errors.

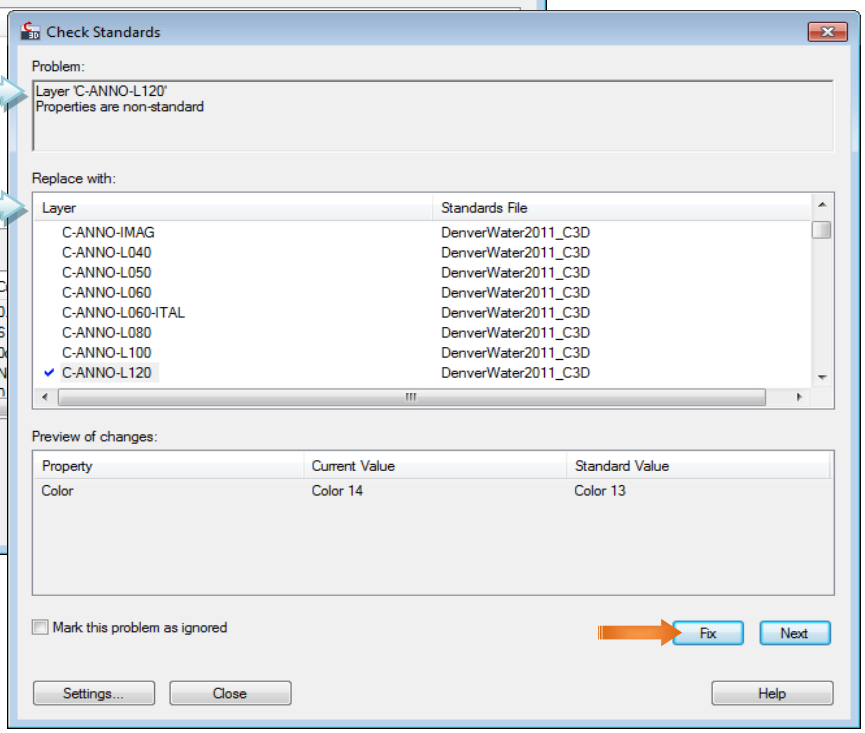
Also be advised that any newly added layers will not be in the Standards Checker.

Review the “Problem” and analyze how it may be fixed with the “Replace with” options. If applicable, choose an option from the “Replace with” list and click Fix

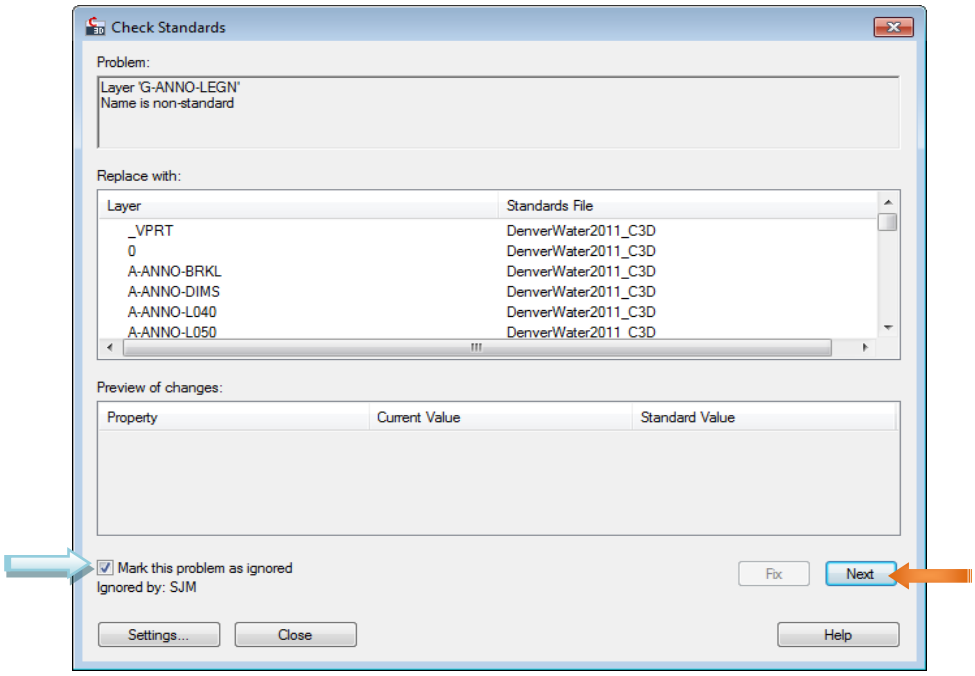
Example 1



Example 2

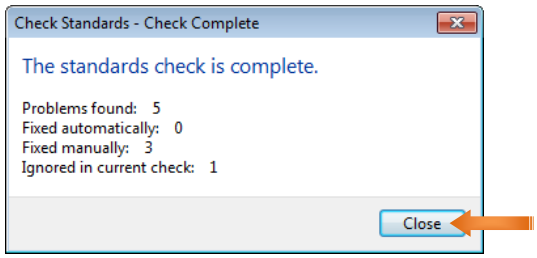


If the “Problem” is an acceptable exception to the Standards, check the *“Mark this problem as ignored”* box and click Next :

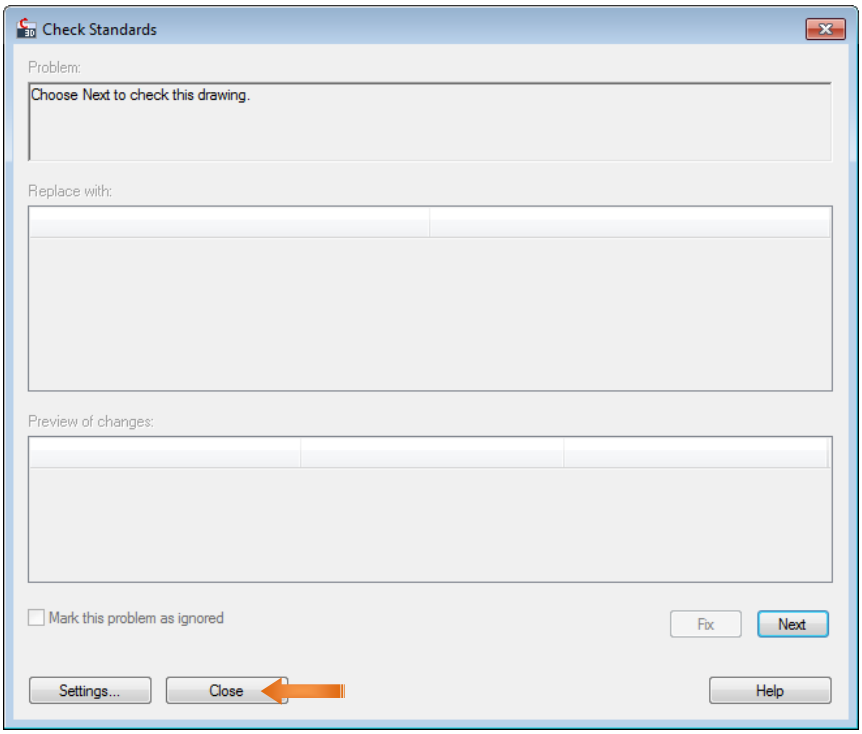


Tip: Errors
The Standards Checker will almost always show errors; this will not be used against the submitter in any way; Denver Water is using these to assess what is working well within the standards.

Once all problems have been "fixed" or "ignored" the *Check Standards – Check Complete* pop-up window will appear with a brief explanation, click Close :



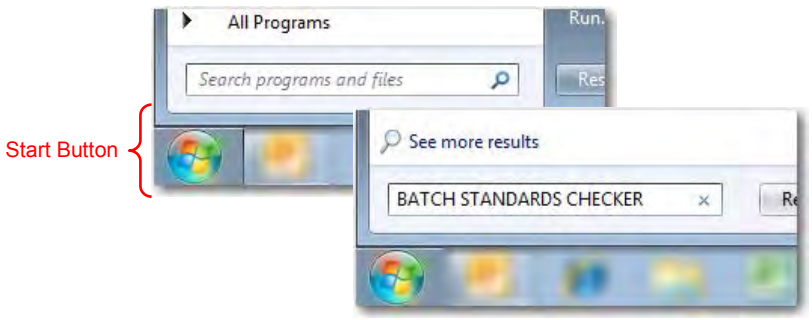
Click Close on the *Check Standards* window:



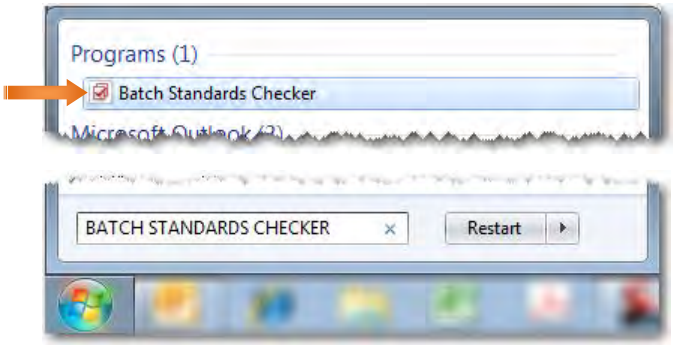
Printing Standards Audit Report

The following images are from a Windows PC, although they should work similarly for all Window's based PC's.

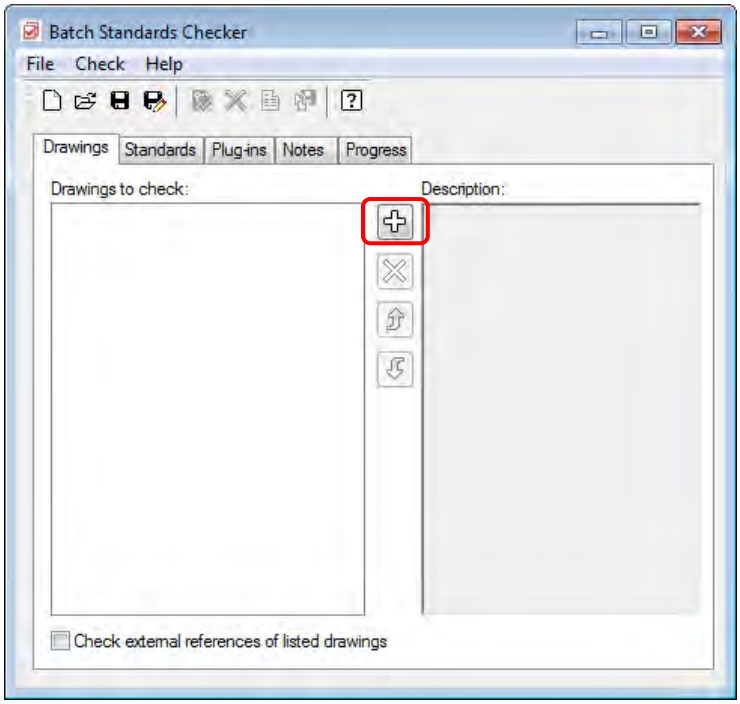
Click the Start button on the Taskbar. In the *Search programs and files* field, type BATCH STANDARDS CHECKER:

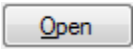


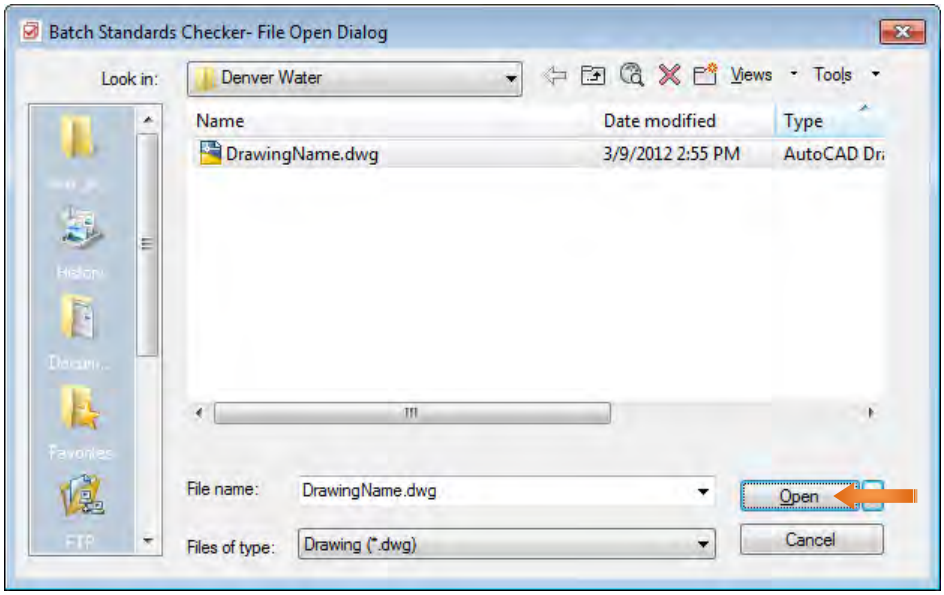
Click the *Batch Standards Checker;* it should appear at the top of the start menu:



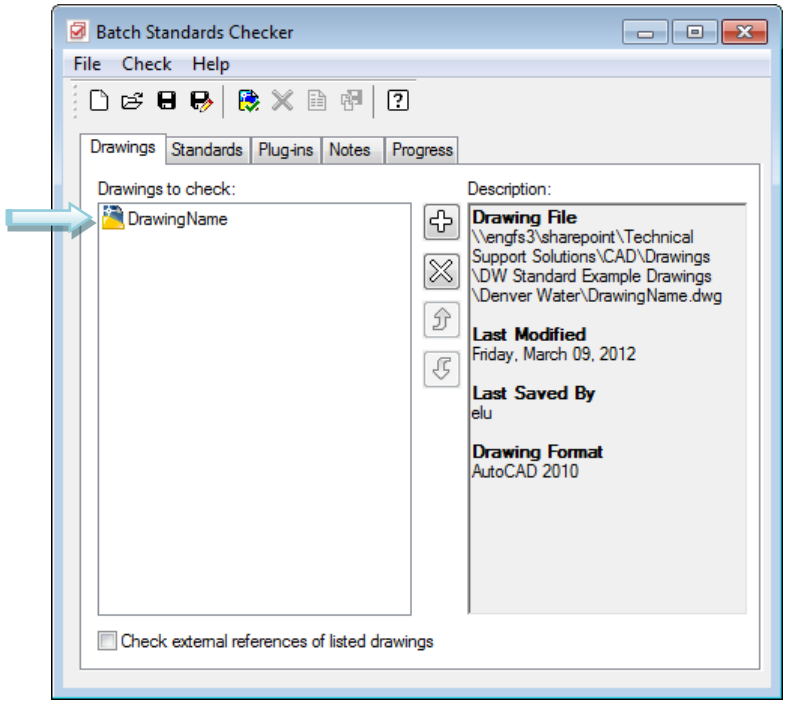
The *Batch Standards Checker* pop-up window should appear on the Drawings tab add applicable drawings by clicking the  button:



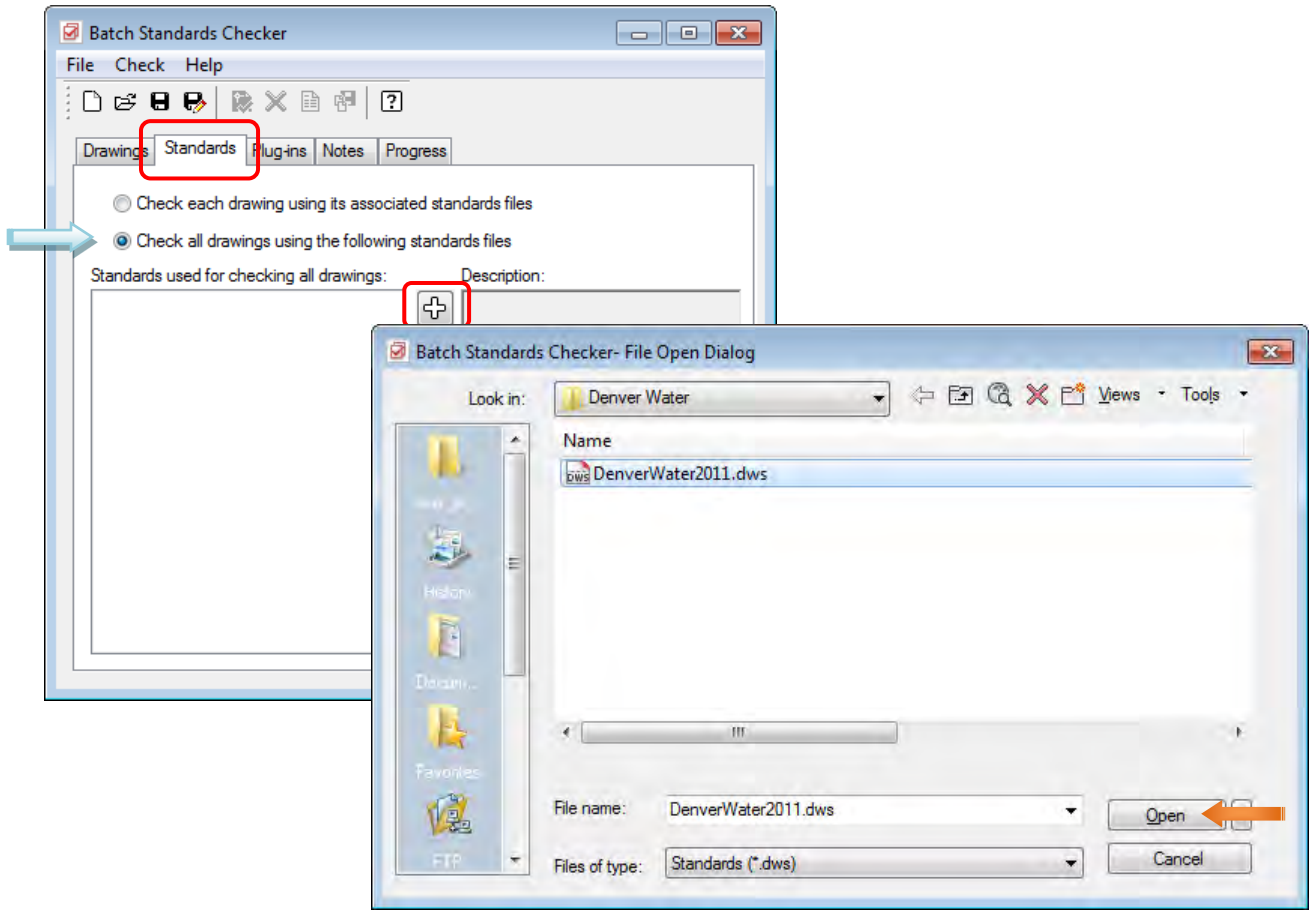
The *Batch Standards Checker – File Open Dialog* window will appear; browse to find the applicable drawings; click  :



The *Drawings to check* column will show the selected drawing, with the drawing specifics shown in the *Description* column:

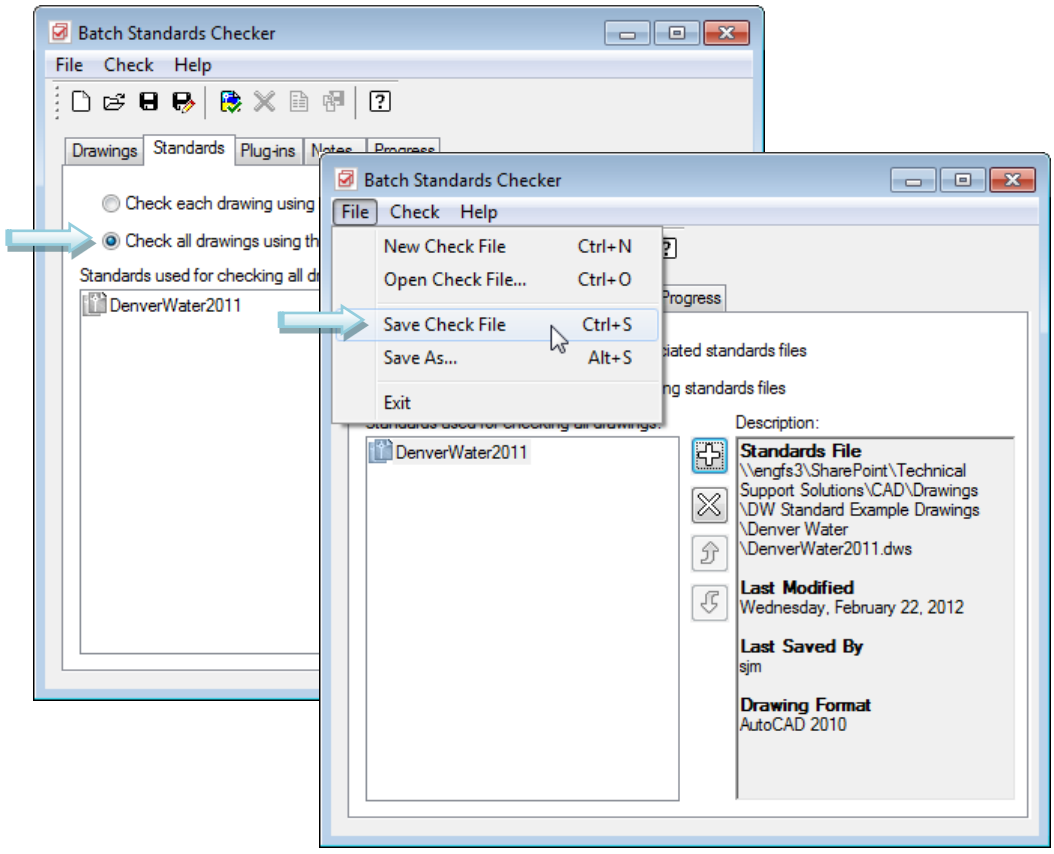


On the *Standards tab*, pick the *Check all drawings using the following standards file* option. Click the button to select the provided .dws file, click Open :

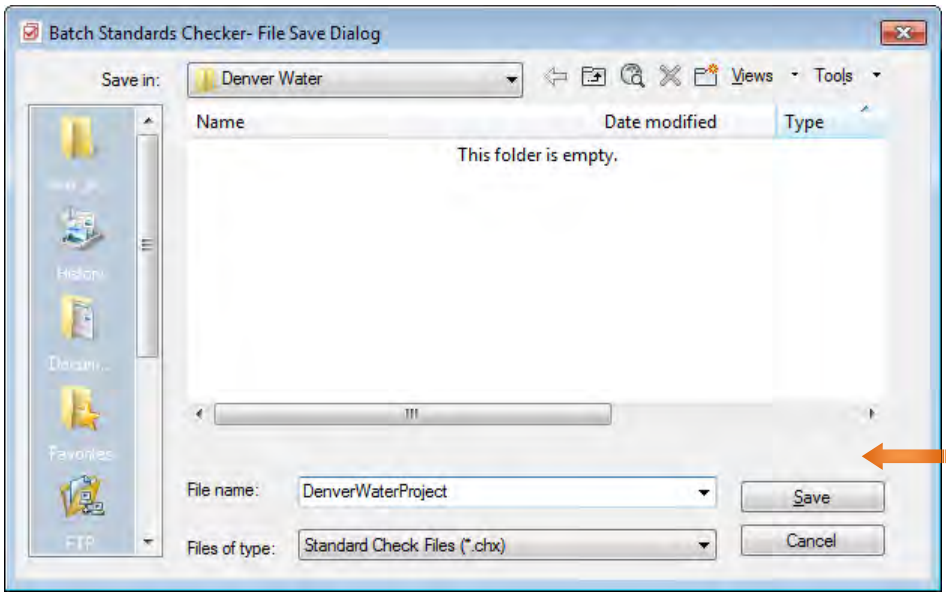


Saving a Check File

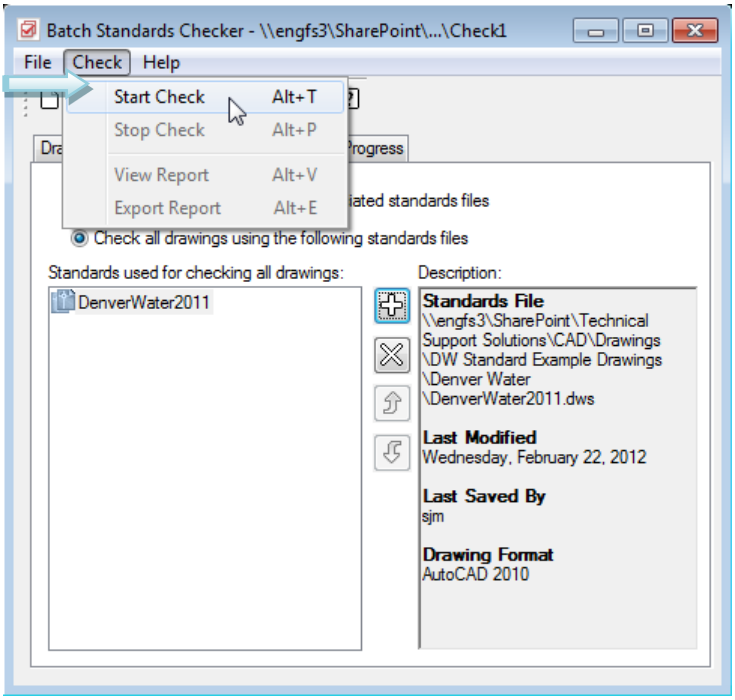
The *Standards used for checking all drawings* column will show the selected .dws file, with the file specifics shown in the *Description* column. On the menu bar click *File* and choose *Save Check File*:



Save the .chx file in desired location, name appropriately:

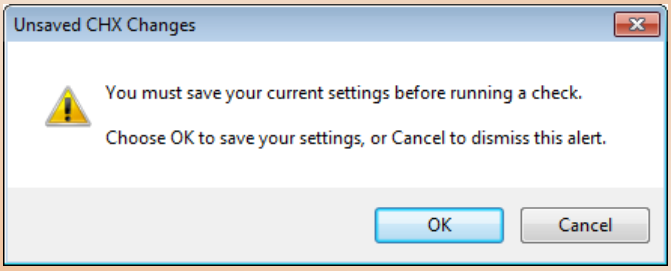


On the menu bar, click *Check* and choose *Start Check*:

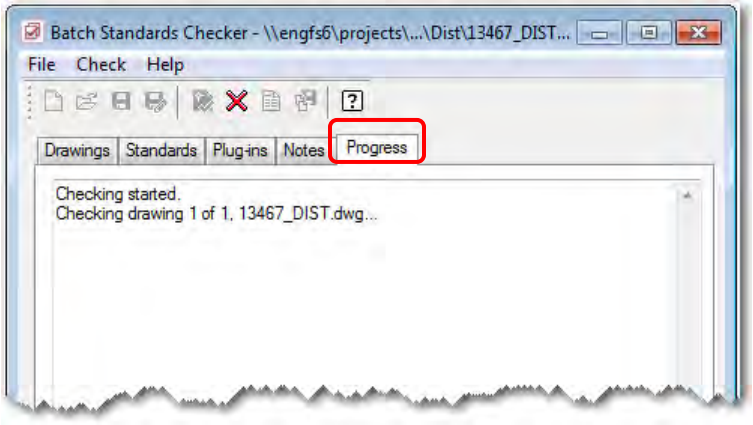


ATTENTION

If the check file was not saved the following error may occur, see the previous step.

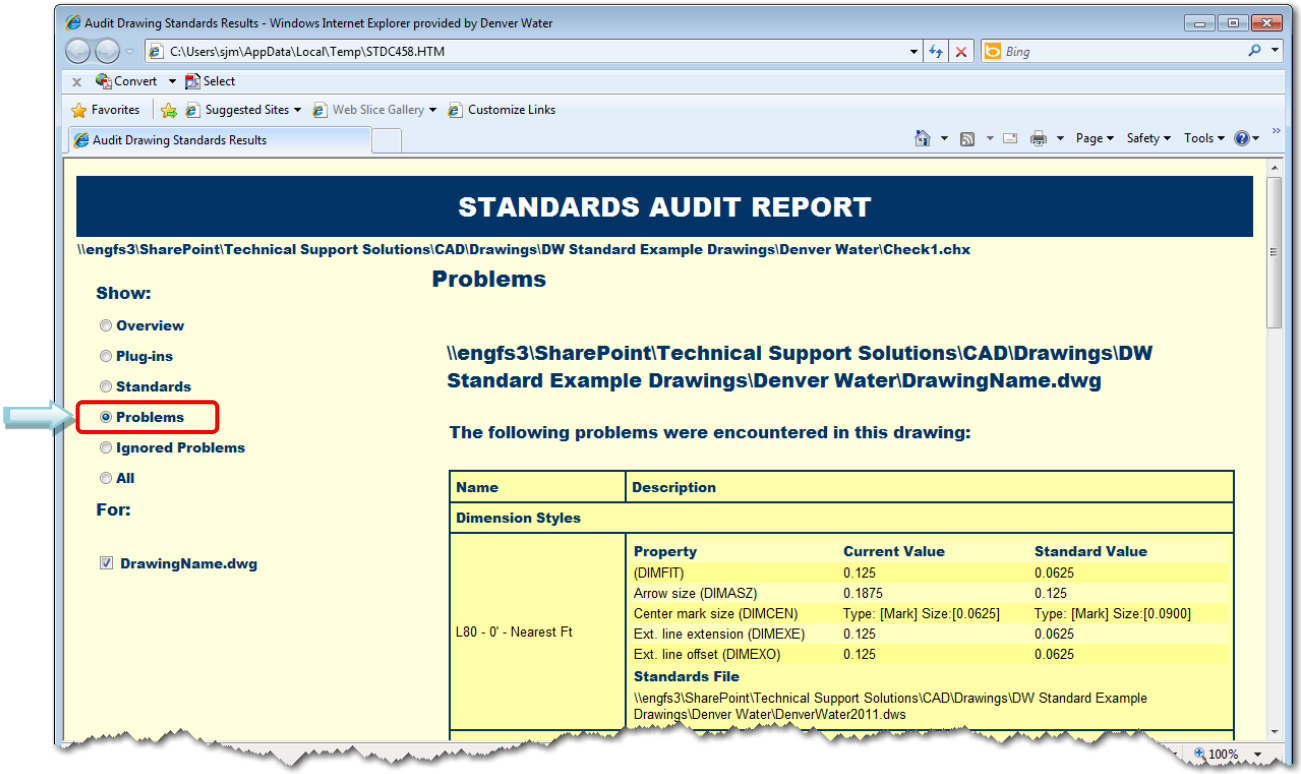


The Progress tab will display similar to the example below:



The internet browser will automatically launch, displaying the STANDARDS AUDIT REPORT; Overview will be selected by default:

To review the Standards Violations, previously reviewed in CAD, pick the “Problems” option in the list:



Print this report as a PDF; to be included in submittal process, see *Main Extensions - Page 20.0-23* and *Easements and Licenses - Page 20.0-65* for specifics.

Support Files

To download support files, visit our website:

http://www.denverwater.org/DoingBusinesswithUs/EngineeringOverview/CADStandards/

For questions or concerns please contact Denver Water's CAD Management team at: CADStandards@denverwater.org

For any questions or concerns for Denver Water's current Engineering Standards please email Ms. Katie Ross at: EngineeringStandards@denverwater.org

Attention: We periodically update this web page with the latest templates, documentation and support files, please check often to be sure you have the latest versions.

Overview – Main Extensions

Introduction

System extensions within the City and County of Denver or Total Service Contract Areas are referred to as Main Extensions. System extensions in other Distributor Contract Areas are referred to as Private Pipe Extensions. *Work done within Denver Water's Distribution Engineering section is comparable.*

Plan sets and CAD files shall be submitted and shall meet requirements and specifications as detailed in current Denver Water's Engineering Standards, Chapter 2, as well as all requirements listed within these CAD Standards.

Basic Drawing Guidelines

In order for projects to be shared easily it is important that the method of drafting and structure of the drawing set be standardized; use the following as a guideline for standardization. These standards will be applicable to the majority of projects submitted through plan review; however, there may be instances where a variance from these standards will provide more flexibility. CAD variances are granted by Denver Water's CAD Manager only.

General Checklist

- ☐ Plans are at a minimum, in compliance with the Denver Water's current Engineering Standards
- ☐ Defined drawing scales – Model Space and Paper Space viewports
  - See *Annotation Scales - Page 20.0-7*
- ☐ XREF's attached as overlays using a relative path
  - See *XREF's - Page 20.0-9*
- ☐ Use of DW standard layers and linetypes
  - See *Layering - Page 20.0-25*, in Main Extensions section
- ☐ Use of DW standard blocks and symbols
  - See *Symbols - Page 20.0-34*, in Main Extensions section
  - Drawings shall bear the Denver Water Approval Stamp (provided in *MainExtension.dwg*)
  - Fire Prevention Bureau signature block (provided in *MainExtension.dwg*)
- ☐ Each sheet is a separate layout – layouts may be contained in one drawing file or separated into individual drawings files at the engineering firm's discretion
  - See *Expected Use of Model Space and Paper Space - Page 20.0-7*
- ☐ Refer to the Denver Water's current Engineering Standards for abbreviation usage on plans
- ☐ Standards check has been preformed
  - See *Batch Standards Checker – In CAD - Page 20.0-13*
- ☐ Plot using DW_Engineering.ctb or other grayscale CTB - hardcopies and DWF's match
  - See *Layer Color Chart - Page 20.0-11*
- ☐ Submittal package is complete
  - See *Final Product - Main Extensions - Page 20.0-64*

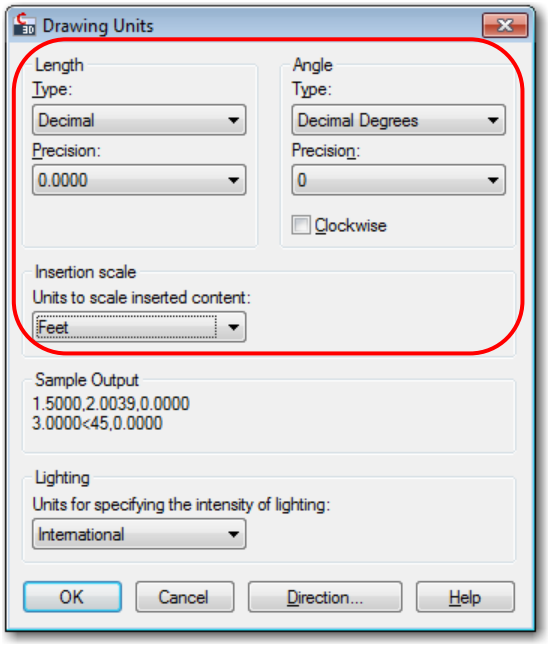
Template Overview (MainExtensions.dwg)

The provided Template drawing is intended to aid in the compliance of the Denver Water CAD Standards. Located within the template (provided as AutoCAD® drawing *MainExtensions.dwg*) are preferred layers, linetypes and symbols. All information is basic AutoCAD® features with no intelligence, such as Civil 3D styles. If variance from these standards is necessary or something needs to be added or revised in the template, please contact Denver Water's CAD Manager.

The following Template drawing, *MainExtensions.dwg, has been created with the following specifications:*

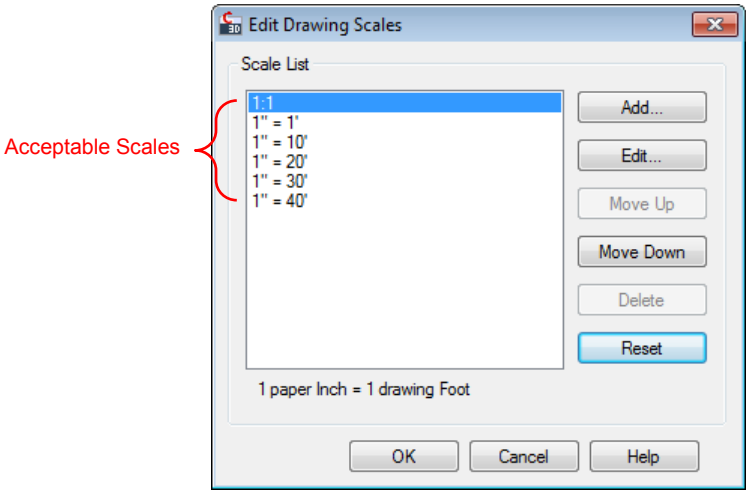
Drawing units

Drawing Units are Decimal – Feet:



Drawing Scales

Only the acceptable drawings scales (See *Annotation Scales - Page 20.0-7*) have been added to the template drawing; refer to Denver Water's current Engineering Standards, Section 2.05.A:



Layering

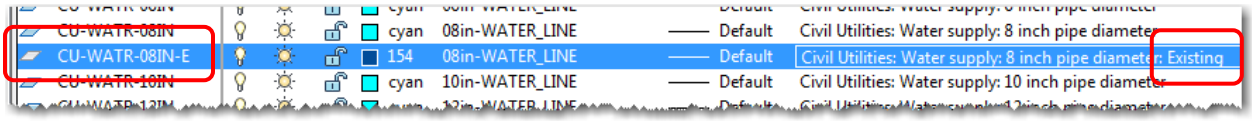
Layer names are based on the NCS and consist of distinct data fields separated from one another by dashes. These fields are: *Discipline Designator, Major Group, Minor Groups* (up to two), and *Status*.

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

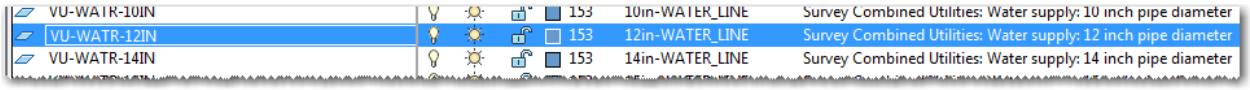
A	I	-	W	A	L	L	-	F	U	L	L	-	D	I	M	S	-	N

The "CU" prefix has been adopted for all water facilities. Each layer's linetype and color have been predefined, based on the provided .lin and .ctb files (see *Support Files - Page 20.0-22*); linetypes shall not include text - use labeling to indicate size of water lines on plans:

When creating layers for existing features ***(not surveyed)***: maintain the original layer name, include a status of "E" at the end of the layer, update the descriptions, and make the layer screened/gray:



Survey base layers, for existing water utilities, with the NCS prefix (Discipline Designator) of "VU" have been added to the template drawing. Any form of the "V" prefix from the NCS is acceptable on submittals for existing features; however, pipe sizes must be shown with specified linetypes per size.



In instances where the provided layers are not sufficient please refer to the NCS first and Denver Water's CAD Manager second.

Layer Fields

The following are lists of common layer fields that may be encountered when working with the template drawing:

Discipline Designators

Designator	Description
C	Civil
CU	Civil Utilities (adopted by DW for all new water features)
VU	Survey Combined Utilities

Status

Status	Description
E	Existing
F	Future
1	Phase number 1 (only with written CAD Manager approval)
2	Phase number 2 (only with written CAD Manager approval)
3	Phase number 3 (only with written CAD Manager approval)
4	Phase number 4 (only with written CAD Manager approval)

Template Layers – Main Extensions

The provided template drawing comes preloaded with standard layers. The following table shows the layers with the layer *Name, Color, Linetype*, and *Description*. Colors are subject to change.

Common layers: these layers will exist in almost every drawing

Layer name	Color	Linetype	Description
0	**7**	Continuous	DO NOT USE THIS LAYER
Defpoints	**7**	Continuous	DO NOT USE THIS LAYER

CU - Civil Utilities: use these layers for all water features

Layer Name	Color	Linetype	Description
C-NPLT	**white**	Continuous	Civil: Non-plotting graphic information
CU-CSWK	**132**	HIDDEN2	Civil Utilities: Casework (casing)
CU-CSWK-PROF	**132**	Continuous	Civil Utilities: Casework (casing): Profile
CU-FIRE-HYDT	**131**	Continuous	Civil Utilities: Fire protection: Hydrants and connections
CU-FIRE-HYDT-LINE	**133**	Continuous	Civil Utilities: Fire protection: Hydrants and connections: Lines
CU-FIRE-HYDT-VALV	**131**	Continuous	Civil Utilities: Fire protection: Hydrants and connections: Valves
CU-FIRE-LINE	**143**	Continuous	Civil Utilities: Fire protection: Lines
CU-FIRE-LINE-VALV	**131**	Continuous	Civil Utilities: Fire protection: Lines: Valves
CU-WATR	**133**	Continuous	Civil Utilities: Water supply
CU-WATR-03IN	**133**	03in-AND_LESS_WATER_LINE	Civil Utilities: Water supply: 3 inch or smaller pipe diameter Mains ONLY
CU-WATR-04IN	**133**	04in-WATER_LINE	Civil Utilities: Water supply: 4 inch pipe diameter
CU-WATR-06IN	**133**	06in-WATER_LINE	Civil Utilities: Water supply: 6 inch pipe diameter
CU-WATR-08IN	**133**	08in-WATER_LINE	Civil Utilities: Water supply: 8 inch pipe diameter
CU-WATR-10IN	**133**	10in-WATER_LINE	Civil Utilities: Water supply: 10 inch pipe diameter
CU-WATR-12IN	**133**	12in-WATER_LINE	Civil Utilities: Water supply: 12 inch pipe diameter
CU-WATR-14IN	**133**	14in-WATER_LINE	Civil Utilities: Water supply: 14 inch pipe diameter

Layer Name	Color	Linetype	Description
CU-WATR-15IN	**133**	15in-WATER_LINE	Civil Utilities: Water supply: 15 inch pipe diameter
CU-WATR-16IN	**133**	16in-WATER_LINE	Civil Utilities: Water supply: 16 inch pipe diameter
CU-WATR-18IN	**133**	18in-WATER_LINE	Civil Utilities: Water supply: 18 inch pipe diameter
CU-WATR-20IN	**133**	20in-WATER_LINE	Civil Utilities: Water supply: 20 inch pipe diameter
CU-WATR-24IN	**133**	24in-WATER_LINE	Civil Utilities: Water supply: 24 inch pipe diameter
CU-WATR-ABAN	**132**	.15X-LINE	Civil Utilities: Water supply: Abandoned/Removed/Relocated
CU-WATR-CNTR	**16**	CENTER	Civil Utilities: Water supply (Conduits): Center (Centerline)
CU-WATR-CNTR-NPLT	**white**	CENTER	Civil Utilities: Water supply: Center (Centerline): Non-plotting graphic information
CU-WATR-COND	**135**	CONDUIT	Civil Utilities: Water supply: Conduits
CU-WATR-DOMW	**cyan**	Continuous	Civil Utilities: Water supply: Domestic water systems ONLY
CU-WATR-INST	**131**	Continuous	Civil Utilities: Water supply: Instrumentation (meters, valves, etc.)
CU-WATR-IRRG	**183**	03in-AND_LESS_WATER_LINE	Civil Utilities: Water supply: Irrigation water systems ONLY
CU-WATR-NPW~-03IN	**203**	03in-AND_LESS_WATER_LINE	Civil Utilities: Water supply: Non-potable water - system: 3 inch or smaller pipe diameter
CU-WATR-NPW~-04IN	**203**	04in-WATER_LINE	Civil Utilities: Water supply: Non-potable water - system: 4 inch pipe diameter
CU-WATR-NPW~-06IN	**203**	06in-WATER_LINE	Civil Utilities: Water supply: Non-potable water - system: 6 inch pipe diameter
CU-WATR-NPW~-08IN	**203**	08in-WATER_LINE	Civil Utilities: Water supply: Non-potable water - system: 8 inch pipe diameter
CU-WATR-NPW~-10IN	**203**	10in-WATER_LINE	Civil Utilities: Water supply: Non-potable water - system: 10 inch pipe diameter
CU-WATR-NPW~-12IN	**203**	12in-WATER_LINE	Civil Utilities: Water supply: Non-potable water - system: 12 inch pipe diameter
CU-WATR-NPW~-14IN	**203**	14in-WATER_LINE	Civil Utilities: Water supply: Non-potable water - system: 14 inch pipe diameter
CU-WATR-NPW~-15IN	**203**	15in-WATER_LINE	Civil Utilities: Water supply: Non-potable water - system: 15 inch pipe diameter
CU-WATR-NPW~-16IN	**203**	16in-WATER_LINE	Civil Utilities: Water supply: Non-potable water - system: 16 inch pipe diameter
CU-WATR-NPW~-18IN	**203**	18in-WATER_LINE	Civil Utilities: Water supply: Non-potable water - system: 18 inch pipe diameter
CU-WATR-NPW~-20IN	**203**	20in-WATER_LINE	Civil Utilities: Water supply: Non-potable water - system: 20 inch pipe diameter

Layer Name	Color	Linetype	Description
CU-WATR-NPW~-24IN	**203**	24in-WATER_LINE	Civil Utilities: Water supply: Non-potable water - system: 24 inch pipe diameter
CU-WATR-NPW~-COND	**205**	CONDUIT	Civil Utilities: Water supply: Non-potable water - system: Conduits
CU-WATR-NPW~-STRC	**142**	Continuous	Civil Utilities: Water supply: Non-potable water - system: Structures
CU-WATR-NPW~-VALV	**142**	Continuous	Civil Utilities: Water Supply: Non-potable water – system: Valves
CU-WATR-PATT	**141**	Continuous	Civil Utilities: Water supply (Conduits): Texture or hatch patterns
CU-WATR-PROF	**84**	Continuous	Civil Utilities: Water supply: Profile
CU-WATR-PROF-GEOM	**252**	Continuous	Civil Utilities: Water supply: Profile: Geometry points
CU-WATR-PROF-GRID	**143**	Continuous	Civil Utilities: Water supply: Profile: Grid
CU-WATR-PROF-GRID-GEOM	**252**	Continuous	Civil Utilities: Water supply: Profile: Grid: Geometry points
CU-WATR-PROF-GRID-MAJR	**153**	Continuous	Civil Utilities: Water supply: Profile: Grid: Major
CU-WATR-PROF-GRID-MINR	**181**	Continuous	Civil Utilities: Water supply: Profile: Grid: Minor
CU-WATR-PROF-PATT	**141**	Continuous	Civil Utilities: Water supply: Profile: Texture or hatch patterns
CU-WATR-PROF-STAN-MAJR	**93**	Continuous	Civil Utilities: Water supply: Profile: Stationing: Major
CU-WATR-PROF-STAN-MINR	**82**	Continuous	Civil Utilities: Water supply: Profile: Stationing: Minor
CU-WATR-PROF-STRC	**112**	Continuous	Civil Utilities: Water supply: Profile: Structures
CU-WATR-PROF-TEXT	**22**	Continuous	Civil Utilities: Water supply: Profile: Text
CU-WATR-PROF-TICK	**123**	Continuous	Civil Utilities: Water supply: Profile: Tick marks
CU-WATR-PROF-TITL	**cyan**	Continuous	Civil Utilities: Water supply: Profile: Drawing or detail titles
CU-WATR-PROF-TTLB	**164**	Continuous	Civil Utilities: Water supply: Profile: Border and titleblock
CU-WATR-SECT	**green**	Continuous	Civil Utilities: Water supply: Section
CU-WATR-SECT-TEXT	**93**	Continuous	Civil Utilities: Water supply: Section: Text
CU-WATR-STAN	**53**	Continuous	Civil Utilities: Water supply: Stationing
CU-WATR-STAN-EQST	**53**	Continuous	Civil Utilities: Water supply: Stationing: Equation Station
CU-WATR-STAN-GEOM	**53**	Continuous	Civil Utilities: Water supply: Stationing: Geometry points
CU-WATR-STAN-MAJR	**53**	Continuous	Civil Utilities: Water supply: Stationing: Major
CU-WATR-STAN-MAJR-E	**72**	Continuous	Civil Utilities: Water supply: Stationing: Major: Existing
CU-WATR-STAN-MINR	**53**	Continuous	Civil Utilities: Water supply: Stationing: Minor
CU-WATR-STAN-MINR-E	**73**	Continuous	Civil Utilities: Water supply: Stationing: Minor: Existing
CU-WATR-STRC	**red**	Continuous	Civil Utilities: Water supply (Conduits): Structures (vaults, manholes, etc.)

Layer Name	Color	Linetype	Description
CU-WATR-STRC-NPLT	**white**	Continuous	Civil Utilities: Water supply (Conduits): Structures: Non-plotting graphic information
CU-WATR-TEXT	**22**	Continuous	Civil Utilities: Water supply: Text
CU-WATR-VALV	**142**	Continuous	Civil Utilities: Water supply: Valves
CU-WATR-VALV-PROF	**142**	Continuous	Civil Utilities: Water supply: Valves: Profile
CU-WATR-WELL	**163**	Continuous	Civil Utilities: Water supply: Well

VU – Survey Combined Utilities: use these layers for all surveyed water features

Layer Name	Color	Linetype	Description
VU-CATV	183	Continuous	Survey / Mapping Combined Utilities: Cable television system
VU-CATV-INST	183	Continuous	Survey / Mapping Combined Utilities: Cable television system: Instrumentation
VU-CATV-OVHD	183	Continuous	Survey / Mapping Combined Utilities: Cable television system: Overhead
VU-CATV-TEXT	43	Continuous	Survey / Mapping Combined Utilities: Cable television system: Text
VU-CATV-UGND	183	Continuous	Survey / Mapping Combined Utilities: Cable television system: Underground
VU-CHEM	233	Continuous	Survey / Mapping Combined Utilities: Chemical
VU-CHEM-TEXT	43	Continuous	Survey / Mapping Combined Utilities: Chemical: Text
VU-COMM	43	Continuous	Survey / Mapping Combined Utilities: Communications
VU-COMM-INST	43	Continuous	Survey / Mapping Combined Utilities: Communications: Instrumentation
VU-COMM-OVHD	43	Continuous	Survey / Mapping Combined Utilities: Communications: Overhead
VU-COMM-TELM	43	Continuous	Survey / Mapping Combined Utilities: Communications: Telemetry
VU-COMM-TEXT	43	Continuous	Survey / Mapping Combined Utilities: Communications: Text
VU-COMM-UGND	43	Continuous	Survey / Mapping Combined Utilities: Communications: Underground
VU-COMM-VLTS	43	Continuous	Survey / Mapping Combined Utilities: Communications: Vaults
VU-CSWK	153	Continuous	Survey / Mapping Combined Utilities: Casework (casing)
VU-FIRE-HYDT	183	Continuous	Survey / Mapping Combined Utilities: Fire protection: Hydrants and connections

VU-FIRE-HYDT-LINE	183	Continuous	Survey / Mapping Combined Utilities: Fire protection: Hydrants and connections: Lines
VU-FIRE-HYDT-VALV	183	Continuous	Survey / Mapping Combined Utilities: Fire protection: Hydrants and connections: Valves
VU-FIRE-LINE	183	Continuous	Survey / Mapping Combined Utilities: Fire protection: Lines
VU-FIRE-LINE-VALV	183	Continuous	Survey / Mapping Combined Utilities: Fire protection: Lines: Valves
VU-NGAS	43	Continuous	Survey / Mapping Combined Utilities: Natural gas
VU-NGAS-INST	43	Continuous	Survey / Mapping Combined Utilities: Natural gas: Instrumentation
VU-NGAS-PIPE	43	Continuous	Survey / Mapping Combined Utilities: Natural gas: Piping
VU-NGAS-STRC	43	Continuous	Survey / Mapping Combined Utilities: Natural gas: Structures
VU-NGAS-TANK	43	Continuous	Survey / Mapping Combined Utilities: Natural gas: Storage tanks
VU-NGAS-TEXT	43	Continuous	Survey / Mapping Combined Utilities: Natural gas: Text
VU-NGAS-UGND	43	Continuous	Survey / Mapping Combined Utilities: Natural gas: Underground
VU-POWR	233	Continuous	Survey / Mapping Combined Utilities: Power
VU-POWR-INST	233	Continuous	Survey / Mapping Combined Utilities: Power: Instrumentation (meters, transformers, etc.)
VU-POWR-OVHD	233	Continuous	Survey / Mapping Combined Utilities: Power: Overhead
VU-POWR-STRC	233	Continuous	Survey / Mapping Combined Utilities: Structures
VU-POWR-TEXT	233	Continuous	Survey / Mapping Combined Utilities: Power: Text
VU-POWR-UGND	233	Continuous	Survey / Mapping Combined Utilities: Underground
VU-POWR-XRMR	233	Continuous	Survey / Mapping Combined Utilities: Power: Transformer
VU-SSWR	73	Continuous	Survey / Mapping Combined Utilities: Sanitary sewer
VU-SSWR-FORC	73	Continuous	Survey / Mapping Combined Utilities: Sanitary sewer: Force main
VU-SSWR-LCHF	73	Continuous	Survey / Mapping Combined Utilities: Sanitary sewer: Leach field
VU-SSWR-PIPE	73	Continuous	Survey / Mapping Combined Utilities: Sanitary sewer: Piping
VU-SSWR-STRC	73	Continuous	Survey / Mapping Combined Utilities: Sanitary sewer: Structures (septic tanks, etc.)
VU-SSWR-TEXT	43	Continuous	Survey / Mapping Combined Utilities: Sanitary sewer: Text
VU-STEM	43	Continuous	Survey / Mapping Combined Utilities: Steam system
VU-STEM-INST	43	Continuous	Survey / Mapping Combined Utilities: Steam system: Instrumentation (meters, valves, pumps)
VU-STEM-PIPE	43	Continuous	Survey / Mapping Combined Utilities: Steam system: Piping

VU-STEM-STRC	43	Continuous	Survey / Mapping Combined Utilities: Steam system: Structures
VU-STEM-TEXT	43	Continuous	Survey / Mapping Combined Utilities: Steam system: Text
VU-STEM-UGND	43	Continuous	Survey / Mapping Combined Utilities: Steam system: Underground
VU-STRM	153	Continuous	Survey / Mapping Combined Utilities: Storm sewer
VU-STRM-DTCH	153	Continuous	Survey / Mapping Combined Utilities: Storm sewer: Ditches or washes
VU-STRM-PIPE	153	Continuous	Survey / Mapping Combined Utilities: Storm sewer: Piping (culverts)
VU-STRM-POND	153	Continuous	Survey / Mapping Combined Utilities: Storm sewer: Retention pond (lakes or reservoirs)
VU-STRM-STRC	152	Continuous	Survey / Mapping Combined Utilities: Storm sewer: Structures
VU-STRM-TEXT	43	Continuous	Survey / Mapping Combined Utilities: Storm sewer: Text
VU-TRAF	43	HIDDEN2	Survey / Mapping Combined Utilities: Traffic
VU-TRAF-INST	43	Continuous	Survey / Mapping Combined Utilities: Traffic: Instrumentation
VU-TRAF-TEXT	43	Continuous	Survey / Mapping Combined Utilities: Traffic: Text
VU-WATR	153	Continuous	Survey / Mapping Combined Utilities: Water supply
VU-WATR-03IN	153	03in-AND_LESS_WATER_LINE	Survey / Mapping Combined Utilities: Water supply: 3 inch or smaller pipe diameter Mains ONLY
VU-WATR-04IN	153	04in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: 4 inch pipe diameter
VU-WATR-06IN	153	06in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: 6 inch pipe diameter
VU-WATR-08IN	153	08in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: 8 inch pipe diameter
VU-WATR-10IN	153	10in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: 10 inch pipe diameter
VU-WATR-12IN	153	12in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: 12 inch pipe diameter
VU-WATR-14IN	153	14in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: 14 inch pipe diameter
VU-WATR-15IN	153	15in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: 15 inch pipe diameter
VU-WATR-16IN	153	16in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: 16 inch pipe diameter
VU-WATR-18IN	153	18in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: 18 inch pipe diameter

VU-WATR-20IN	153	20in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: 20 inch pipe diameter
VU-WATR-24IN	153	24in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: 24 inch pipe diameter
VU-WATR-COND	154	CONDUIT	Survey / Mapping Combined Utilities: Water supply: Conduits
VU-WATR-DOMW	153	Continuous	Survey / Mapping Combined Utilities: Water supply: Domestic water systems ONLY
VU-WATR-STRC	153	Continuous	Survey / Mapping Combined Utilities: Water supply: Structures
VU-WATR-INST	153	Continuous	Survey / Mapping Combined Utilities: Water supply: Instrumentation (meters, valves, etc.)
VU-WATR-IRRG	183	03in-AND_LESS_WATER_LINE	Survey / Mapping Combined Utilities: Water supply: Irrigation water systems ONLY
VU-WATR-NPW~-03IN	153	03in-AND_LESS_WATER_LINE	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: 3 inch or smaller pipe diameter
VU-WATR-NPW~-04IN	153	04in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: 4 inch pipe diameter
VU-WATR-NPW~-06IN	153	06in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: 6 inch pipe diameter
VU-WATR-NPW~-08IN	153	08in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: 8 inch pipe diameter
VU-WATR-NPW~-10IN	153	10in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: 10 inch pipe diameter
VU-WATR-NPW~-12IN	153	12in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: 12 inch pipe diameter
VU-WATR-NPW~-14IN	153	14in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: 14 inch pipe diameter
VU-WATR-NPW~-15IN	153	15in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: 15 inch pipe diameter
VU-WATR-NPW~-16IN	153	16in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: 16 inch pipe diameter
VU-WATR-NPW~-18IN	153	18in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: 18 inch pipe diameter
VU-WATR-NPW~-20IN	153	20in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: 20 inch pipe diameter

VU-WATR-NPW~-24IN	153	24in-WATER_LINE	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: 24 inch pipe diameter
VU-WATR-NPW~-COND	185	CONDUIT	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: Conduits
VU-WATR-NPW~-STRC	152	Continuous	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: Structures
VU-WATR-NPW~-VALV	142	Continuous	Survey / Mapping Combined Utilities: Water supply: Non-potable water - system: Valves
VU-WATR-PATT	151	Continuous	Survey / Mapping Combined Utilities: Water supply (Conduits): Texture or hatch patterns
VU-WATR-STRC	153	Continuous	Survey / Mapping Combined Utilities: Water supply: Structures
VU-WATR-TEXT	43	Continuous	Survey / Mapping Combined Utilities: Water supply: Text
VU-WATR-VALV	183	Continuous	Survey / Mapping Combined Utilities: Water supply: Valves
VU-WATR-WELL	153	Continuous	Survey / Mapping Combined Utilities: Water supply: Well

Symbols/blocks

Denver Water has developed a standard set of symbology for use on civil plans. Symbols are for *graphic respresentation only and are NOT drawn to scale*, however they are annotative. Many blocks contain wipeouts; in order for the wipeouts to be effective the display order must be adjusted – bring symbols to the front. **Turn off wipeout frames before plotting hard copies, PDF's or DWF's** (see next page).

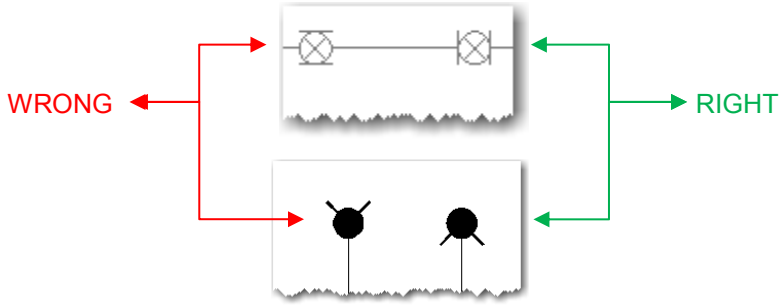
The symbols have been added to the template drawing (*MainExtensions.dwg*) as blocks and placed on the proper layers for ease of use. Most blocks have dynamic properties (see *FAQ's – Main Extensions - Page 20.0-51*):

SYMBOL	BLOCK NAME Visibility state	DESCRIPTION	PROPOSED LAYER
	DW_Bend DI pipe		
	90 degrees	90° DI pipe fitting	CU-WATR-STRC
	45 degrees	45° DI pipe fitting	
	22 1/2 degrees	22.5° DI pipe	
	11 1/4 degrees	11.25° DI pipe fitting	
	DW_Blowoff-Distribution		
	2" BO – Temporary	2" Distribution pipe Blow off – Temporary	CU-WATR-VALV
	2" BO – Temporary – 90 degrees	2" Distribution pipe Blow off – Temporary – 90°	
	2" BO – Permanent	2" Distribution pipe Blow off – Permanent	
	DW_Casing	Pipe casing	CU-CSWK
	DW_Corp Stop	Corp stop	CU-WATR-STRC
	DW_Coupling	Transition coupling	CU-WATR-STRC
	DW_Curb Stop	Curb stop	CU-WATR-STRC
FDC	DW_FDC	Fire Department Connection	CU-WATR-STRC
12345	DW_Fire Hydrant	Fire Hydrant	CU-FIRE-HYDT
	DW_Meter		
M	Meter MH	Water meter in manhole	CU-WATR-INST
	Meter Vault	Water meter in vault	
	DW_Plug	Plug or cap	CU-WATR-STRC
	DW_Pitot	Pitot valve	CU-WATR-VALV
	DW_Reducer	Reducer	CU-WATR-STRC
	DWPN_Sleeve	Sleeve	CU-WATR-STRC
	DW_Tee or Cross		
	Tee	Tee fitting on distribution pipe	CU-WATR-STRC
	Cross	Cross fitting on distribution pipe	
	DW_Valve-Butterfly		
	Valve	Butterfly valve	CU-WATR-VALV
	Valve w/ 60" Manhole	Butterfly valve in manhole	
	DW_Valve-Check	Check valve	CU-WATR-VALV
	DW_Valve-Gate		
	Open	Open gate valve	VARIES
	Closed	Closed gate valve	
	Inoperable	Inoperable gate valve	
	DW_Valve-Tap Sleeve	Tap sleeve valve	VARIES
PRV	DW_Valve-PRV		
	PRV MH	Pressure reducing valve in manhole	CU-WATR-INST
PRV	PRV Vault	Pressure reducing valve in vault	
W	SRVY_MH		
	Water	Water manhole	CU-WATR-STRC
	DW_Air Valve		
	2",4" & 6" AV ASSY	2", 4" & 6" Air Valve Assembly	CU-WATR-STRC
	2", 4" & 6" AV ASSY – 20" ACS	2", 4" & 6" Air Valve Assembly with 20" Access Manhole	
	2", 4" & 6" AV ASSY – 24" ACS	2", 4" & 6" Air Valve Assembly with 24" Access Manhole	
	DW_Backflow Preventer		
RP	RP	Backflow Preventer – Reduced Pressure (High hazard)	CU-WATR-STRC
DC	DC	Backflow Preventer – Double Check (Low hazard)	
PVB	PVB	Backflow Preventer – Pressure Vacuum Breaker (Irrigation only)	

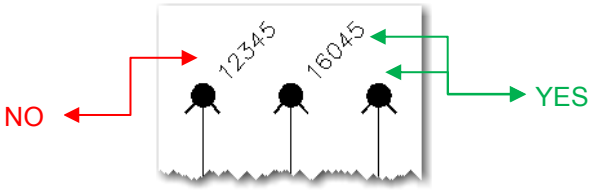
Drafting Tips

Following is a few useful drafting tips when using Denver Water's provided blocks.

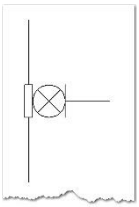
- *Rotate the symbols to the proper orientation:*



- *Adjust or remove hydrant number as needed – DO NOT leave 12345, adjust rotation of hydrant number as needed:*



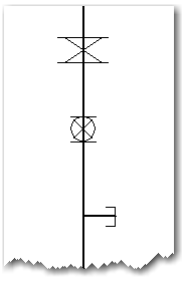
- *Tap Sleeves do not require a Tee symbol, place the sleeve portion along the main:*



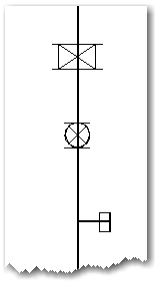
- *Graphically place the plug or valve away from the fitting on tee's or crosses:*

- *Adjust symbols with wipeouts as needed:*

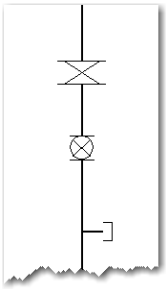
Wrong display order



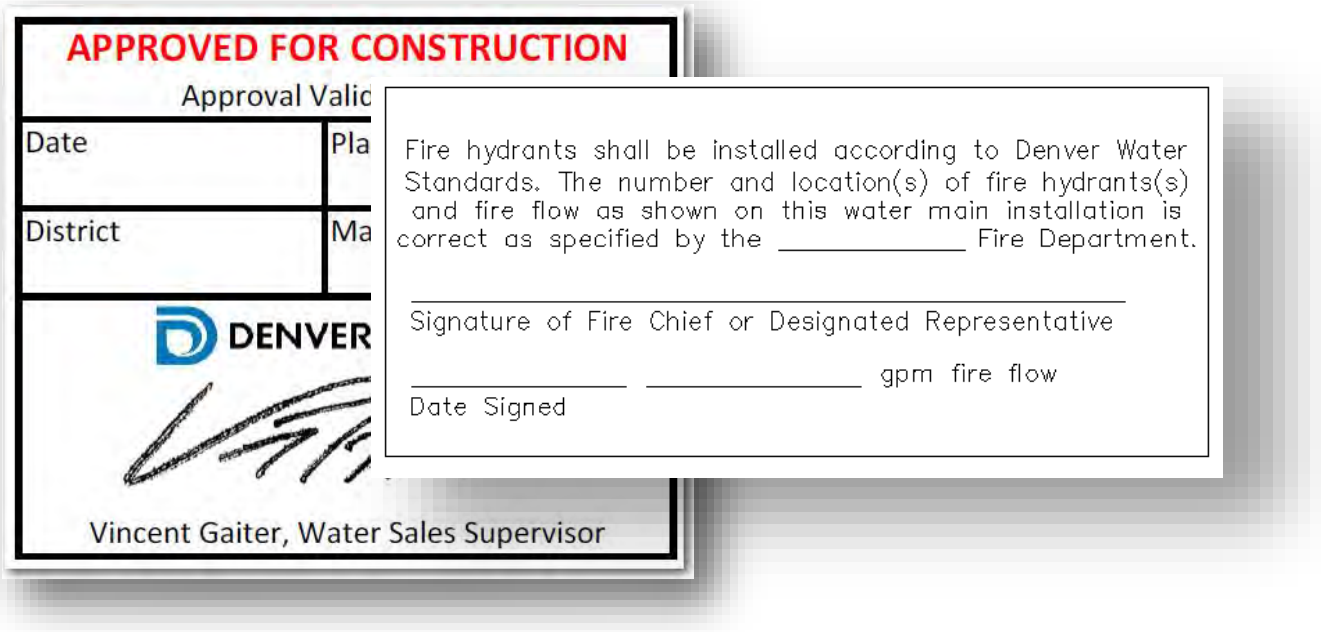
Wipeout frames are on



Wipeout frames are off and display order is correct



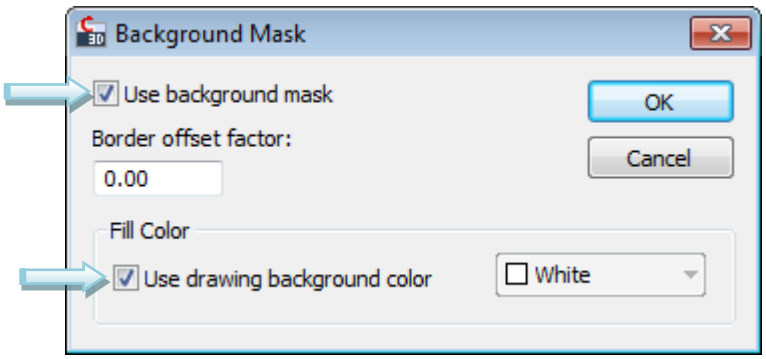
The Approval and Fire Prevention Bureau stamps have been added as blocks in the template drawing; both of which are required on submitted plans (see *All Submittals – Main Extensions - Page 20.0-53*):



Text

It is preferred all text used for labeling water facilities is placed on CU-WATR-TEXT.

Background masking, used with MText, is allowed so long as the *Fill Color* is defined as "Use drawing background color":



ATTENTION
DO NOT use hatching, solids or wipeouts to create text, these methods cause problems when

Example Sheets

The following is an example of required information needed for Main Extension submittals. These examples are to be used in conjunction with the Denver Water's current Engineering Standards and Denver Water CAD Standards.

The provided examples illustrate common submittal types and are for graphic representation only. Graphic examples are not given for every submittal type; further clarification can be requested by contacting Denver Water's Sales Administration section. Denver Water has protocol of water facilities only; the remainder of the plan presentation is at the discretion of the submitting engineering firm.

- Callouts in **BLUE** indicate which layer can be used
- Callouts in **MAGENTA** are directions for reference purposes – *each magenta reference is hyperlinked for PDF use*

Index of Sheets

ATTENTION
Denver Water will not provide Main Extension example drawings as DWGs.

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PROJECT NAME

SECTION, TOWNSHIP AND RANGE
CITY OF GREENWOOD VILLAGE COLORADO
COUNTY OF ARAPAHOE, STATE OF COLORADO

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.1.a

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.1.c

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.1.e

WATER RELATED SYMBOLS PROVIDED IN TEMPLATE DRAWING

COVER SHEET
REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.1

Revision Date: August 30, 2012

General Construction and Water Notes:

Main Extension Notes:

1. All materials and workmanship shall be in conformance with Denver Water's Engineering Standards, Materials Specifications, and Drawings. All main installations/system modifications will be approved and inspected by Denver Water.
2. Contractors shall maintain a copy of the current Engineering Standards on-site at all times during construction. See the chart below for a quick reference to the frequently used material specifications.

Material Specification Quick References:

Material Specification	Description
MS 01	DI Pipe
MS 02	PVC Pipe
MS 03	Fittings
MS 4, MS 5	Valves
MS 8	Tapping Valves
MS 9	Tapping Sleeves
MS 12	Valve Boxes (Recycled water system valve boxes shall be fitted with triangular covers cast with the words "Denver Water Recycles" and shall be coated with a fusion bonded epoxy coating, pantone 2577U in color.)
MS 13	Dry Barrel Fire Hydrants
MS 23	Brass and Bronze Goods
MS 29	Restraint Device

3. Tracer wire, 12 gauge, shall be installed on all non-metallic water mains.
4. For all pipe installations, the depth of cover over the pipe, measured from official street grade to the top of the pipe, shall be a minimum of 4-1/2 feet and shall be known as the cover over the pipe. If difficulties arise when crossing interference, and where specifically approved by Denver Water, deviations from 4-1/2 feet of cover will be permitted. The cover over the pipe shall be a minimum of 4-1/2 feet and a maximum of 10 feet. Refer to Standard Drawing Sheet 16.
5. Any changes in alignment and grade shall be authorized by Denver Water and shall be accomplished by the installation of additional fittings. The deflection of joints is permitted only when installing pipe on horizontal or vertical curves.
6. The Contractor shall adjust all valve boxes and fire hydrants to the final finished grade.
7. All bends, tees, fire hydrants, blow-offs, and plugs at dead-end mains shall be protected from thrust with mechanical restraint and concrete thrust blocks in accordance with Denver Water's Engineering Standard Drawings Sheet 28 and 32.
8. All valves are to be located on property line extensions, except for tapping tees where an additional valve shall be placed on the tapping tee. Other valve locations may be required as shown on the plans.
9. When it is necessary to lower or raise water lines at storm drains and other utility crossings, a minimum clearance of 1.5 feet shall be maintained between the outside of the pipes.
10. The Contractor shall have one signed copy of the approved water plans in his/her possession at all times.
11. Only one point of connection will be allowed until the testing of the new installations is complete.
12. Newly installed water mains and firelines shall be hydrostatically tested in accordance with Denver Water Engineering Standards, Section 8.25.
13. Prior to the installation of water mains, road construction must have progressed to at least the sub-grade state. Sub-grade is defined as an elevation of no more than 7 inches below the finished street grade.
14. The Contractor is responsible for:
    a. Notifying customers who may be affected by a water outage during construction.
    b. Obtaining, at the Contractor's expense, applicable licenses, permits, bonds, etc. that are required for the main installation/system modification.
    c. Contact Denver Water's Construction Engineering personnel for the Pre-construction Meeting and Inspection, 303-628-6038, at least 48 hours prior to beginning construction. In the event of an emergency in Denver or in a Total Service Area after working hours, call Denver Water's Westside Dispatcher: 303-628-6390. In a Master Meter District, please contact the representative of the District in which the Project is taking place.
    d. Paying all additional charges for inspection outside normal work hours.

Note: Be advised that on occasion valves in our system may be inoperable. On such occasions, it may become necessary to back up an additional block for the shut out. If that occurs, make additional notifications to customers with the mandatory 24 hours advance notice. When valve maintenance is required, a delay of several days should be expected.

Tap and Meter Notes (for Denver, Total Service, and Read and Bill Areas only. In Master Meter Districts, please refer to the Specification for that District).

1. Before any taps are made from mains, application(s) for the taps must be received and approved by the Distributor and by Denver Water.
2. Denver Water will make all taps that are 2 inches and smaller.
3. Individual service line PRVs are required when area pressure exceeds 80 psi.
4. Services and Meters:
    a. The Contractor shall hold an on-site pre-construction conference with the Meter Inspector for all taps, service lines, and meters larger than one inch, and for projects involving more than one tap and service. To schedule a preconstruction conference call 303-628-6145.
    b. A copy of these plans with Denver Water's approval sticker must be present onsite at the time the tap is made and at the time the meter is inspected or installed.
    c. Prior to the tap being made, the curb valve, meter yoke, and meter pit / vault shall be in place. The contractor will have 3 additional working days to complete the installation of service line. Denver Water Meter Inspections will mobilize to the premise 3 working days after the tap is made to conduct the meter inspection.
    d. A Soil Amendment inspection will be required prior to the completion of the Certificate of Occupancy. Contact Conservation at 303-628-6670 for information and to schedule a soil amendment inspection.
    e. Meters cannot be set or inspected, or services activated, until the requirements for backflow prevention have been completed. Contact the Backflow Prevention Program personnel at 303-628-5940 for further information.
    f. Allow at least 3 working days advance notice when scheduling taps. To schedule a tap call 303-628-6701; for questions related to a meter inspection call 303-628-6145. Service activation will take place when the service and meter setting pass inspection.
    g. All meter and Automatic Meter Reading device locations shall be approved by a Denver Water meter inspector, except in Master Meter Distributor Districts.
    h. Meter pits and vaults must be set flush with the final grade of the landscape, including proper depth of soil amendment. If final grading has not been completed at the time of meter inspection, the Owner will be required to raise or lower the meter pit/vault when final grade is established. Adjustment of the pit may require adjustment of the meter setting within the pit.
    i. Meter setting, valves, and service lines from the main to the Backflow Preventer Assembly, if present, or to 5 feet after the meter vault, must meet all applicable Engineering Standards in effect at the time of activation. If necessary to comply with current standards, modifications may be required from the details on these plans.
    j. No present or future fences or walls are permitted between the Right Of Way (ROW) or easement and the meter setting. There shall be no permanent obstructions within 5 feet of the outside wall of the meter pit or vault. Tap relocation (from what is shown on these plans) may be necessary to avoid paved areas or other obstructions that are not shown on the plans. Deviations from these plans and standards must be approved prior to construction.
    l. Inside the City of Denver and in Total Service and Read & Bill Distributor Districts, meters must be furnished with Automatic Meter Reading (AMR) devices as specified by Denver Water. The AMR devices will be installed by Denver Water at the time of service activation.
    m. Meter pits and vaults shall have appropriate lids based on the location and the application. Contact Meter Inspection at 303-628-6145 to determine the correct lid configuration.
    n. The Contractor shall provide a remote AMR device mounting box when required. Install a double-gang 4x4 electrical junction box; mount as directed 7 feet above grade. Install Belden #9451 cable in 3/4-inch or larger conduit from the meter to the mounting box. Two boxes and two cables are required for compound meters.
    o. Inside the City of Denver, all multi-family dwellings with a single tap, service line, and meter are required to sub-m[illegible] Denver modifications to the Internati[illegible] 576, Series of 2004). Call the City an[illegible] information at 720-865-2625.
    p. Inside the City of Denver, all service l[illegible] proposed street trees. Contact the Cl[illegible] 913-0647 for information.
    q. Existing services must be metered at[illegible] main and witnessed by Denver Wate[illegible]

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.1.f

CURRENT NOTES FOUND:
http://www.denverwater.org/DoingBusinesswithUs/PlanReviews/ConstructionWaterNotes/

Cross-Connection Control Requirements:

The licensees listed below shall be in conformance with Denver Water's Engineering Standards, Chapter 5.05, Cross-Connection Control and Backflow Prevention. Backflow prevention assemblies are required to be installed on the following water service lines:

1. **Commercial Properties:** Real estate zoned for businesses and/or industrial use that consist of six or more units with a domestic, fireline, or dedicated water irrigation service tap (defined as such for cross-connection purposes).
    * Domestic, dedicated irrigation, fireline and/or recycled water service lines.
2. **Multi-Family Residential:** A dwelling with two to five units with a domestic, fireline, and/or dedicated water service tap (defined as such for cross-connection purposes).
    * Premises over three stories/greater than 30 feet, fire protection system, common boiler, auxiliary water, swimming pool and irrigation systems.
3. **Single Family Residents:** A single unit dwelling (defined as such for cross-connection purposes)
    * Dual Water Supply Agreement.
    A. All backflow prevention assemblies shall be a model manufactured in compliance with AWWA C510 and C511 and shall have met the specifications by the University of California Foundation for Cross-Connection Control and Hydraulic Research:

        Foundation for Cross-Connection Control and
        Hydraulic Research
        School of Engineering MC-2531
        University of Southern California
        P.O. Box 77902
        Los Angeles, CA 90007
        Foundation Office: (866) 545-6340
        http://www.usc.edu/dept/fccchr/

    B. The licensee is required to have a certified American Backflow Prevention Association (ABPA) or American Society of Sanitary Engineering (ASSE) tester inspect and test the existing and/or newly installed containment backflow prevention assemblies on the dedicated water service lines (domestic, dedicated irrigation, fireline, and recycled) upon installation and annually thereafter.
    C. The ABPA or ASSE certified backflow tester is responsible to meet the requirements listed in the Engineering Standards, Chapter 5.05.
        * If the ABPA or ASSE certified backflow tester is testing a backflow prevention assembly installed on a recycled water service line, the tester is required to have a dedicated recycled water test gauge.
    D. Within 48 hours of Denver Water setting the meter and turning on the water service, the ABPA or ASSE certified backflow tester is required to submit the containment backflow assembly test report(s) to the Cross-Connection Control Offices:

        Phone: 303-628-5969
        Fax: 303-794-8325
        E-mail: CrossConnectionControl@denverwater.org
        Mailing Address: Denver Water
        Attn: Cross-Connection Control
        6100 W. Quincy Avenue
        Denver, CO 80235

    E. There shall be no unprotected takeoffs from the service line ahead of any meter or ahead of a backflow prevention assembly located at the point of delivery to the customer's water system.
    F. No branch lines or taps are allowed on dedicated commercial irrigation water service lines or recycled water service lines for domestic (potable) use (e.g., drinking fountains, water play features, swimming pool, restroom facilities, etc.):
        1. Between the irrigation tap and the meter.
        2. Between the meter and the backflow prevention assembly.
        3. Downstream from the backflow prevention assembly.
4. **Commercial Irrigation Water Service Line Taps:**
    *Comply with the Cross-Connection Control requirements listed above (A-F).
    *Require an approved USC FCCCHR Reduced Pressure Principle (RP) backflow prevention assembly to be installed 5 feet downstream from the meter pit as an above ground installation before any connections. Refer to the manufacturer's installation instructions for height and orientation requirements.
        * If the backflow prevention assembly cannot be installed 5 feet downstream from the meter pit, include a variance letter justifying the need for relocation.
5. **Recycled Water Service Lines Taps :**
    Backflow prevention assemblies are required to be installed on commercial recycled water service line taps
    *If chemical injection is used downstream from the meter.
    *If pumps are used downstream from the meter.
    *If the existing or proposed system poses a risk to the integrity of the recycled water system.
        * Comply with the Cross-Connection Control requirements listed above (A-F).
        * Require an approved USC FCCCHR Reduced Pressure Principle (RP) backflow prevention assembly to be installed 5 feet downstream from the meter pit as an above ground installation before any connections. *Refer to the manufacturer's installation instructions for height and orientation requirements.*
            * If the backflow prevention assembly cannot be installed 5 feet downstream from the meter pit, include a variance letter justifying the need for relocation.
        * Backflow prevention assemblies installed on recycled water service lines shall be identified as "Recycled Water."
6. **Recycled or Raw Water (ditch water, pond, well. etc.) used for irrigation on the premises:**
    *Comply with the Cross-Connection Control requirements listed above (A-F).
    *Requires an approved USC FCCCHR backflow prevention assembly (containment) to be installed 5 feet downstream from the meter pit on any potable water service line.
        * The backflow assembly type is determined by the 'Degree of Hazard' downstream from the meter; refer to Denver Water's Engineering Standards, 1.06, Degree of Hazard, or contact Cross-Connection Control at 303-628-5940.
7. It is at the sole discretion of Denver Water's Cross-Connection Control section to approve a variance request related to a proposed backflow prevention assembly installation.

Health Notes/Water Quality:

1. The Colorado Department of Public Health & Environment (CDPHE) regulates asbestos activities through the Air Pollution Control Division (APCD) and the Solid Waste and Materials Management Division (SWMMD) when soil contamination is involved. Denver Water will require contractors and developers to follow the procedures below when cement asbestos pipe is encountered:
    * The pipe must be removed from the excavation for proper disposal.
    * The Contractor/Developer will manage the pipe in accordance with the following regulations:
        * Colorado Air Regulations No 8 - Control of Hazardous Air Pollutants
        * OSHA 29 CFR 1910.1001 - General Industry Standards - Asbestos
        * OSHA 29 CFR 1926.1101 - Construction Standards - Asbestos
    * If large amounts of cement asbestos pipe are anticipated to be removed, the material must be managed by an appropriate asbestos abatement contractor (160 square feet or 260 linear fe[illegible]

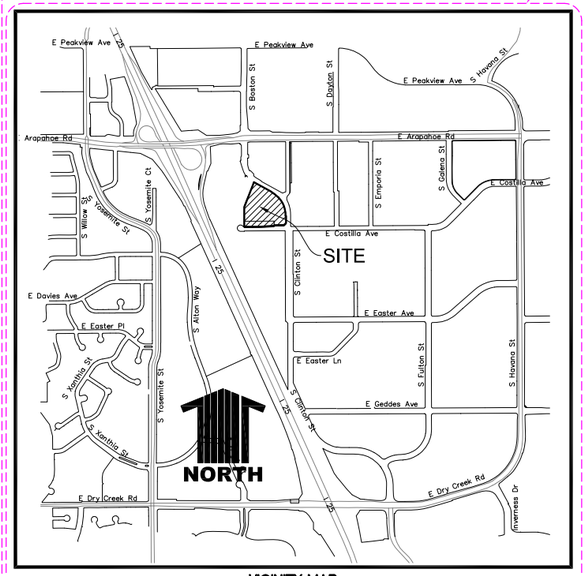
Note: Cement Asbestos Pipe is considered a non-friable asbestos material, defined as containing more than 1% asbestos by weight, and cannot be crumbled, pulverized, or reduced to powder by hand pressure. Therefore, a release of asbestos fibers is not likely during normal use and handling of this material.

2. Denver Water personnel are not responsible for work site safety or the compliance/enforcement of safety regulations and standards established by other agencies. All safety compliance/enforcement at the wo[illegible] Contractor's sole responsibility.
3. The Water Quality Control Division of The Colorado De[illegible] and Environment (CDPHE) requires all water line contr[illegible] Discharge Permit for discharges of chlorinated and process waters associated with the installation of new mains or conduits. Contact CDPHE Water Quality Control Division at 303-692-3539 for information on obtaining the required permit.
4. Chlorination and Flushing: All water mains shall be installed and chlorinated in accordance with Denver Water's Engineering Standards, Section 8.24. The lines shall be chlorinated in accordance with AWWA C-651, "Disinfecting Water Mains." The preferred method is to use sufficient chlorine tablets to produce a 25 mg/l solution. Tablets should be attached to the top of the pipe with an approved adhesive certified to NSF Standard 61, prior to pipe installation in the trench. Chlorination of 16 Inch and larger pipe requires a chlorine slurry. The chlorination of any finished pipeline shall be completed prior to hydrostatic testing.

Irrigation Notes:

1. Irrigation of medians and other public landscaped areas less than 25 feet in width must be done in accordance with Denver Water Operating Rule 14.02.3 . (Call DW Conservation Section at 303-628-6343 for information regarding irrigation systems.)
    * For strips of land less than 6 feet in width - Spray Irrigation shall be prohibited. Low-flow irrigation systems are required.
    * For strips of land between 6 feet and 15 feet in width - Only low flow irrigation, or spray irrigation using low-angle spray nozzles designed for the specific width to be irrigated shall be permitted. All spray heads must be pressure reducing and designed to prevent low head drainage.
    * For strips of land more than 15 feet in width - Only gear-driven rotors with low angle nozzles may be used to irrigate turf areas. Planting beds may be irrigated with low-flow or spray irrigation. All spray heads must be pressure reducing and designed to prevent low head drainage.
2. Irrigation service lines require an approved University of Southern California (USC) Reduced Pressure Principle (RP) backflow prevention assembly (containment) to be installed 5 feet downstream from the meter pit as an above ground installation before any connections. Refer to the manufacturer's installation instructions for height and orientation requirements.
3. If recycled or raw water (ditch water, pond, well, etc.) is used for irrigation on the premises, an approved University of Southern California (USC) backflow prevention assembly (containment) shall be installed 5 feet downstream from the meter pit on **any potable water service line.** The backflow assembly type is determined by the degree of hazard downstream from the meter (RP-High Hazard installed above ground or DC-Low Hazard Installed below ground - 60 Inch diameter manhole). For additional Information, please reference Denver Water's Engineering Standards, 6.11, or contact Cross-Connection Control at 303-628-5940.
4. A soil amendment will be required on every property requiring new water service.

DISCLAIMER: *Denver Water Standard Operating Procedures represent recommended practices that should be applicable to most situations encountered. These procedures should be followed to the extent applicable; however, they by no means represent the only method to perform the tasks they describe. It is understood that field conditions, emergencies, and other circumstances may require deviation from Standard Operating Procedures.*



VICINITY MAP
SCALE: 1" = 1000'

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.1.b

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.1.d

STANDARD ABBREVIATIONS

AC	–ASPHALTIC CONCRETE
BCR	–BEGINNING OF CURB RETURN
BM	–BENCHMARK
BW	–BOTTOM OF WALL
C1	–CURVE LABEL (SEE CURVE TABLE)
CL	–CENTER LINE
CP	–CONTROL POINT
CPP	–CORRUGATED PLASTIC PIPE
DIA	–DIAMETER
E	–ELECTRIC
EL	–ELEVATION
EQ	–EQUAL
EXIST	–EXISTING
FF	–FINISHED FLOOR
FG	–FINISHED GRADE
FH	–FIRE HYDRANT
FL	–FLOW LINE
G	–GAS
GB	–GRADE BREAK
HDCP	–HANDICAP
HORIZ	–HORIZONTAL
HP	–HIGH POINT
ID	–INSIDE DIAMETER
INV	–INVERT
JT	–JOINT TRENCH
L1	–LINE LABEL (SEE LINE TABLE)
LF	–LINEAL FEET
LS	–LANDSCAPE
MATL	–MATERIAL
MAX	–MAXIMUM
MH	–MANHOLE
MIN	–MINIMUM
NO	–NUMBER
OD	–OUTSIDE DIAMETER
PC	–POINT OF CURVATURE
PCC	–POINT OF COMPOUND CURVATURE
PCR	–POINT CURB RETURN
PT	–POINT OF TANGENCY
PVC	–POLYVINYL CHLORIDE PIPE
R	–RADIUS
RCP	–REINFORCED CONCRETE PIPE
RL	–RIDGELINE
RR	–RAILROAD
SAN	–SANITARY
SF	–SQUARE FOOTAGE
STM	–STORM
T	–TELEPHONE
TC	–TOP OF CURB
TF	–TOP OF FOOTING
TG	–TOP OF GRATE
TW	–TOP OF WALL
TYP	–TYPICAL
VERT	–VERTICAL
W	–WATER
W/	–WITH

LEGEND

- CONSTRUCTION NOTE
- PARKING STALL COUNT
- EXISTING FIRE HYDRANT
- PROPOSED FIRE HYDRANT
- EXISTING VALVE
- PROPOSED VALVE
- FIRE DEPARTMENT CONNECTION
- BEND FITTINGS
- TEE & CROSS FITTINGS
- PRV MANHOLE
- EXISTING MANHOLE
- PROPOSED MANHOLE
- EXISTING LIGHT STANDARD
- PROPOSED LIGHT STANDARD
- SIGNAGE AS NOTED
- EXISTING ELECTRIC LINE
- PROPOSED ELECTRIC LINE
- EXISTING GAS LINE
- PROPOSED GAS LINE
- SANITARY LINE WITH MANHOLE
- PROPOSED SANITARY LINE
- PROPOSED 6" WATER
- PROPOSED FIRELINE
- PROPOSED 8" WATER
- EXISTING 20" WATER LINE
- EXISTING STORM DRAINAGE LINE
- PROPOSED STORM DRAINAGE PLAN
- PROPERTY LINE
- EXISTING MAJOR CONTOURS
- PROPOSED MAJOR CONTOURS
- SCREEN WALL
- HANDICAP PARKING (V=VAN ACCESSIBLE) W/ WHEEL STOPS SHOWN
- HEAVY DUTY ASPHALT
- CONCRETE PAVEMENT

CIVIL ENGINEER
DOE ENGINEERING SERVICES, INC.
100 E. HAMPDEN AVENUE, SUITE 2
DENVER, CO. 80224
PH: 303–555–5555
FAX: 303–555–5556
CONTACT: JOHN DOE, P.E.
JOHN.DOE@EMAIL.COM

SHEET INDEX

MATERIALS LIST

DESCRIPTION	QTY.	UNIT
20"x20"x8" WET TAP W/KICKBLOCK	1	EA
8"x8"x8" WET TAP W/KICKBLOCK	1	EA
20"x20"x6" WET TAP W/KICKBLOCK	1	EA
8"x8"x6" SWIVEL TEE W/KICKBLOCK	3	EA
FIRE HYDRANT ASSEMBLY (INCL. 6" GATE VALVE AND BOX)	4	EA
20" GATE VALVE	1	EA
8" GATE VALVE	5	EA
8" PVC	950	LF
6" DIP – FIRE HYDRANT	153	LF

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.A.7

PROVIDED IN TEMPLATE DRAWING

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.1.i

PROVIDED IN TEMPLATE DRAWING

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.1.g

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.1.h

To be completed by Denver Water

Denver Water's review of these plans relates only to Denver Water requirements, and does not include a full analysis of: soil conditions, support or load factors, or any other matters. Any modification of these plans must be resubmitted to Denver Water for review prior to construction. The Professional Engineer, Contractors, and Owners designing and constructing this proposed water distribution system shall be solely responsible for the adequacy of the design, installation, and materials utilized in this water distribution system for any specific site location.

Date	I.D. No.
Contract No.	Map No.

☐ Approved for Construction
Approval Valid for 1 year

DENVER WATER

Sales Administrator

Fire hydrants shall be installed according to Denver Water Standards. The number and location(s) of fire hydrants(s) and fire flow as shown on this water main installation is correct as specified by the _____ Fire Department.

Signature of Fire Chief or Designated Representative

_____ _____ gpm fire flow
Date Signed

FIRE FLOW DATA:

FIRE FLOW REQUIREMENTS ARE 2,500 GPM
THIS BUILDING REQUIRES 2, FIRE HYDRANTS TO MEET FIRE FLOW REQUIREMENTS
EACH FIRE HYDRANT MUST SUPPLY 1500 GPM MINIMUM @ 20 PSI RESIDUAL PRESSURE

CODE USED FOR ANALYSIS: NFPA 13, 2007 EDITION

OCCUPANCY GROUP: MERCANTILE

CONSTRUCTION TYPE: II–B

FIRE AREA: ENTIRE BUILDING, 55,113 SFT.

THIS BUILDING IS FULLY SPRINKLERED

811 FOR BURIED UTILITY INFORMATION
THREE (3) BUSINESS DAYS BEFORE YOU DIG
CALL 811
(or 1–800–922–1987)
UTILITY NOTIFICATION CENTER OF COLORADO (UNCC)
www.uncc.org

PREPARED UNDER THE SUPERVISION OF

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.A.4

COVER SHEET
REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.A.2

TITLE BLOCK AS PER ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.A.3

Drawing name: \\denverwater.org\shares\Sharepoint\Technical Support Solutions\Working With Others\Distribution Example Sheets\EX1_A-Cover.dwg CS Jun 14, 2016 12:37pm by: tagraf

WATER ONLY PLAN
REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.2

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.2.g

104.12' TO SHUT OFF VALVE

CU-FIRE-HYDT-LINE-E or VU-FIRE-HYDT-LINE

CU-FIRE-HYDT-E or VU-FIRE-HYDT

20488

20" X 8" TAPPING SLEEVE
8" TAPPING VALVE
N 99548.62
E 98649.65

CU-WATR-TEXT

337' PROPOSED TAPPING SLEEVE TO EXISTING VALVE

52'-8" PVC
N 28°37'11" E

8" VALVE
N 99507.36
E 98627.13

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.2.b

SOUTH CLINTON STREET (60' ROW)

SOUTH CLINTON CT.

PROPOSED RETENTION

SEE DETAIL A THIS SHEET

CU-WATR-20IN-E or VU-WATR-20IN

8" X 6" SWIVEL TEE
6" VALVE
N 99362.80
E 98548.26
19.16'~6" DIP
S 61°22'50" E
6" NEW HYDRANT
N 99353.63
E 98565.07

DRAINAGE EASEMENT

159.68'~8" PVC
N 28°37'11" E

5.00'~8" PVC
N 28°37'11" E

8" VALVE
N 99358.42
E 98545.86

20" X 6" TAPPING SLEEVE
6" TAPPING VALVE
N 99361.60
E 98946.14
89.80'~6" DIP
N 47°50'39" E
6" HYDRANT
N 99304.69
E 98883.27

16.83'

CU-FIRE-HYDT-LINE

CU-FIRE-HYDT

5' (TYP.)

SIDEWALK EASEMENT

442'± FROM PROPOSED HYDRANT TEE TO SHUTOFF VALVE ON NORTH PROPERTY LINE OF COSTILLA AVE.

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.2.e

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.2.c

152.30'~8" PVC
N 28°37'11" E

45° BEND W/ KB
N 99224.73
E 98472.91

CU-WATR-STRC

12345 S. CLINTON STREET

CU-FIRE-LINE-E or VU-FIRE-LINE

EXISTING 6" FIRE SERVICE TO REMAIN

30' WATER EASEMENT

15'

115.60'~8" PVC
S 16°23'01" E

8" X 6" SWIVEL TEE
6" VALVE
N 99071.55
E 98585.96
16.50'~6" DIP
N 28°36'49" E
6" HYDRANT
N 99057.06
E 98578.06

CU-WATR-STRC-E or VU-WATR-STRC

FDC

CU-WATR-03IN-E or VU-WATR-03IN

EXISTING 2" WATER METER TO REMAIN

CU-WATR-TEXT-E or VU-WATR-TEXT

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.2.b

5.00'~8" PVC
S 61°23'11" E

8" VALVE
N 99069.15
E 98590.35

45° BEND W/ KB
N 99115.74
E 98504.96

92.28'~8" PVC
S 61°23'11" E

8" X 6" SWIVEL TEE
6" VALVE
N 98958.83
E 98792.24
47.56'~6" DIP
N 44°44'18" E
6" HYDRANT
N 98992.61
E 98825.72

45° BEND W/ KB
N 98979.21
E 98771.68

LIGHTING FIXTURE (TYP.)

16.31'~8" PVC
N 89°44'18" E

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.2.d

CU-WATR-08IN

187.97'~8" PVC
S 61°23'11" E

PROPOSED DETENTION

DRAINAGE EASEMENT

PROPOSED DETENTION

22 1/2° & 11 1/4° BENDS W/ KB
N 98979.13
E 98755.37

28.96'~8" PVC
S 45°15'42" E

8.91'~8" PVC
S 45°15'42" E

45° BEND W/ KB
N 98952.55
E 98798.58

23.86'~8" PVC
S 00°15'42" E

CU-WATR-20IN-E or VU-WATR-20IN

CU-WATR-VALV-E or VU-WATR-VALV

8" VALVE
N 98928.69
E 98798.89

49.14'~8" PVC
S 00°15'42" E

EAST COSTILLA AVE

8" DI

60' ROW

20'

CU-WATR-08IN-E or VU-WATR-08IN

8" X 8" TEE
N 98879.55
E 98798.91

8" VALVE
N 98879.65
E 98803.91

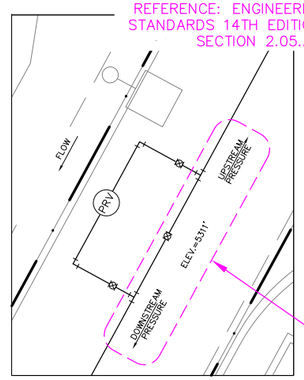
179'± TO FROM PROPOSED VALVE TO EXISTING VALVE ON PROPERTY LINE EXTENDED

5.00'~8" PVC
N 89°44'18" E

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.2.g

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.A.9

NOTE:
COORDINATES SHOWN ON THIS PLAN SET ARE ARBITRATRY. TO CONVERT TO NAD83:
- ADD 1,542,010.46 FEET TO PROJECT NORTHING TO GET NAD83 SPC (0502 CO C)
- ADD 3,076,078.11 FEET TO PROJECT EASTING TO GET NAD83 SPC (00502 CO C)
- ROTATE PROJECT BEARINGS 00 DEGREES 00 MINUTES 33 SECONDS COUNTERCLOCKWISE ABOUT PROJECT SITE BENCHMARK/PROPERTY PIN & CAP ON NORTHEASTERLY PROPERTY LINE FOR GRID BEARINGS.



DETAIL A
SCALE: 1" = 10'

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.A.6

NORTH

0 20 40 80
SCALE: 1"= 40' HORIZ.

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.A.5

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.2.f

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.2.r

STANDARD DRAWING INDEX

STANDARD DETAILS INCORPORATED BY REFERENCE WITHIN THESE DRAWINGS SHALL CONSIST OF THE FOLLOWING STANDARD DETAILS INDICATED AND ALL SUBSEQUENT DETAILS WHICH MAY BE REFERENCE THEREIN.

SHEET 13 – TYPICAL TRENCH SECTION
SHEET 28 – CONCRETE KICK BLOCKS BEARING SURFACES AND INSTALLATION
SHEET 32 – LENGTH OF RESTRAINED PIPE
SHEET 53 – GENERAL METER NOTES
SHEET 54 – 2" AND SMALLER SERVICE LINE, STOP BOX AND OUTSIDE METER INSTALLATION
SHEET 58 – OUTSIDE SETTING FOR 1 1/2" AND 2" METER AND BYPASS IN MANHOLE WITH INSIDE BACKFLOW PREVENTION ASSEMBLY

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.A.7

PROVIDED IN TEMPLATE DRAWING

To be completed by Denver Water

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Date	I.D. No.
Contract No.	Map No.

☐ Approved for Construction
Approval Valid for 1 year

DENVER WATER

Sales Administrator

PREPARED UNDER THE SUPERVISION OF

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.A.4

WATER ONLY PLAN
TITLE BLOCK AS PER ENGINEERING STANDARDS 14TH EDITION
SECTION 2.05.A.3

Drawing name: \\denverwater.org\shares\Sharepoint\Technical Support Solutions\Working With Others\Distribution Example Sheets\EX1_B-Water Only.dwg Water Only Jun 14, 2016 12:38pm by: tagraf

OVERALL UTILITY PLAN
REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.3

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.A.6

NORTH

SCALE: 1"= 40' HORIZ.

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.A.5

CU-FIRE-HYDT-LINE-E or VU-FIRE-HYDT-LINE

CU-FIRE-HYDT-E or VU-FIRE-HYDT

20488

PROPOSED TEE AND VALVE CUT INTO EXISTING WATERLINE

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.3.a

S61°23'11"E 269.62'

SOUTH CLINTON STREET (60' ROW)

S55°10'58"E 76.40'

EXISTING 20" DIP WATERMAIN

S49°08'28"E 72.40'

SOUTH CLINTON CT.

STORM INLET

PROPOSED RETENTION

STORM INLET

DRAINAGE EASEMENT

8" WATERLINE

386.08'

N21°04'05"E

CU-WATR-20IN-E or VU-WATR-20IN

PROPOSED TEE AND VALVE CUT INTO EXISTING WATERLINE

16.83'

CU-FIRE-HYDT-LINE

EXISTING 10" HDPE SANITARY SEWER

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.3.g

CU-FIRE-HYDT

SIDEWALK EASEMENT

R=366.00'
L=209.57'
D=45°29'16"

CU-WATR-STRC

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.3.d

CU-WATR-STRC-E or VU-WATR-STRC

CU-FIRE-LINE-E or VU-FIRE-LINE

30' WATER EASEMENT

15'

(12345 S. CLINTON STREET)

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.3.b

FF=5823.00

INV=16.50

FDC

2" DOMESTIC WATER

EXISTING GAS

EXISTING 6" FIRE SERVICE TO REMAIN

CU-WATR-03IN-E or VU-WATR-03IN

EXISTING 2" WATER METER TO REMAIN

CLEANOUT INV=13.50

4" PVC @ 6%

STORM INLET

INV=5807.60

LIGHTING FIXTURE (TYP.)

EXISTING SANITARY SEWER MH INV=5806.86

S89°45'43"E 8.20'

S00°09'15"W 103.19'

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.3.c

CU-WATR-20IN-E or VU-WATR-20IN

CU-WATR-VALV-E or VU-WATR-VALV

S44°47'13"W 40.42'

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.A.9

STORM INLET (TYP.)

TYPE R INLET

CU-WATR-08IN

8" WATERLINE

N00°00'04"W 280.67'

PROPOSED DETENTION

DRAINAGE EASEMENT

PROPOSED DETENTION

LIGHTING FIXTURE (TYP.)

30'

S89°37'38"W 240.00'

S86°27'13"W 190.46'

S00°00'08"E 10.00'

S89°37'38"W 142.53'

EAST COSTILLA AVE

EXISTING 8" WATERLINE

8" DI

60' ROW

20'

CU-WATR-08IN-E or VU-WATR-08IN

EXISTING SANITARY FORCE MAIN

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.3.e

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.B.3.f

① INSTALL 4' DIAMETER SANITARY MANHOLE. COORDINATE EXACT LOCATION WITH MECHANICAL PLANS.

② CONNECT 4" PVC TO EXISTING SERVICE WITH CLEANOUT. CONTRACTOR SHALL POTHOLE TO LOCATE LINE AND VERIFY ELEVATION.

③ CONNECT PROPOSED 6" D.I.P. FIRE SERVICE LINE TO EXISTING. CONTRACTOR SHALL POTHOLE TO LOCATE LINE AND NOTIFY ENGINEER OF EXACT LOCATION.

④ CONTRACTOR SHALL COORDINATE EXACT LOCATION OF FIRE SERVICE WITH FIRE PROTECTION PLANS.

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.A.7

PROVIDED IN TEMPLATE DRAWING

To be completed by Denver Water	
Denver Water's review of these plans relates only to Denver Water requirements, and does not include a full analysis of: soil conditions, support or load factors, or any other matters. Any modification of these plans must be resubmitted to Denver Water for review prior to construction. The Professional Engineer, Contractors, and Owners designing and constructing this proposed water distribution system shall be solely responsible for the adequacy of the design, installation, and materials utilized in this water distribution system for any specific site location.	
Date	I.D. No.
Contract No.	Map No.
☐ Approved for Construction Approval Valid for 1 year DENVER WATER	
Sales Administrator	

NOTE:
COORDINATES SHOWN ON THIS PLAN SET ARE ARBITRATRY. TO CONVERT TO NAD83:
- ADD 1,542,010.46 FEET TO PROJECT NORTHING TO GET NAD83 SPC (0502 CO C)
- ADD 3,076,078.11 FEET TO PROJECT EASTING TO GET NAD83 SPC (00502 CO C)
- ROTATE PROJECT BEARINGS 00 DEGREES 00 MINUTES 33 SECONDS COUNTERCLOCKWISE ABOUT PROJECT SITE BENCHMARK/PROPERTY PIN & CAP ON NORTHEASTERLY PROPERTY LINE FOR GRID BEARINGS.

PREPARED UNDER THE SUPERVISION OF

REFERENCE: ENGINEERING STANDARDS 14TH EDITION, SECTION 2.05.A.4

OVERALL UTILITY PLAN
REFERENCE: ENGINEERING STANDARDS 14TH EDITION
TITLE BLOCK AS PER ENGINEERING STANDARDS 14TH EDITION SECTION 2.05.A.3

Drawing name: \\denverwater.org\shares\Sharepoint\Technical Support Solutions\Working With Others\Distribution Example Sheets\EX1_C-Utility.dwg Utility Plan Jun 14, 2016 12:38pm by: tagraf

FAQ's – Main Extensions

Q: What are Dynamic blocks?

A: Dynamic block references contain grips or custom properties that change the way the reference is displayed in the drawings after it is inserted. Dynamic blocks included in the template drawing:

- *DW_Bend DI pipe* – includes a pull-down list to choose appropriate fitting and rotates 360°
- *DW_Blowoff-Distribution* – includes a pull-down list to choose Blowoff type and rotates 360°
- *DW_Casing* – stretches by increments of 0.25 also rotates 360°
- *DW_Coupling* – rotates 360°
- *DW_FDC* – rotates 360°
- *DW_Fire* Hydrant – rotates 360°
- *DW_Meter* – includes a pull-down list to choose meter type and rotates 360°
- *DW_Plug* – rotates 360°
- *DW_Reducer* – rotates 360°
- *DW_Tee or Cross* – includes a pull-down list to choose fitting type and rotates 360°
- *DW_Valve-Butterfly* – includes a pull-down list to choose valve type and rotates 360°
- *DW_Valve-Check* – rotates 360°
- *DW_Valve-Gate* – includes a pull-down list to choose valve type and rotates 360°
- *DW_Valve-PRV* – includes a pull-down list to choose valve type and rotates 360°
- *DW_Valve-Tap Sleeve* – rotates 360°
- *SRVY_MH* – includes a pull-down list to choose manhole type and rotates 360°
    - Note: only the Water manhole is shown
- *DW_Air Valve* – includes a pull-down list to choose valve and manhole type and rotates 360°
- *DW_Backflow Preventer* – includes a pull-down list to choose backflow preventer type and rotates 360°

Q: What does Annotative refer to?

A: Objects that are commonly used to annotate drawings are considered Annotative. This property allows you to automate the process of scaling annotations so that they plot or display at the correct size on the paper.

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All Submittals – Main Extensions

Pre-submittals are .dwf only, see Water Plan Submittal – PRE-DESIGN LAYOUT – Pre-Submittal Review on www.DenverWater.org.

Formal submittals to Denver Water are to include, but are not limited to: .dwg files, .dwf files and an E-transmit of said files.

Submitting plans to Denver Water please refer to Denver Water's current Engineering Standards, CAD Standards and the Plan Reviews portion of the website, for full compliance.

.DWF files

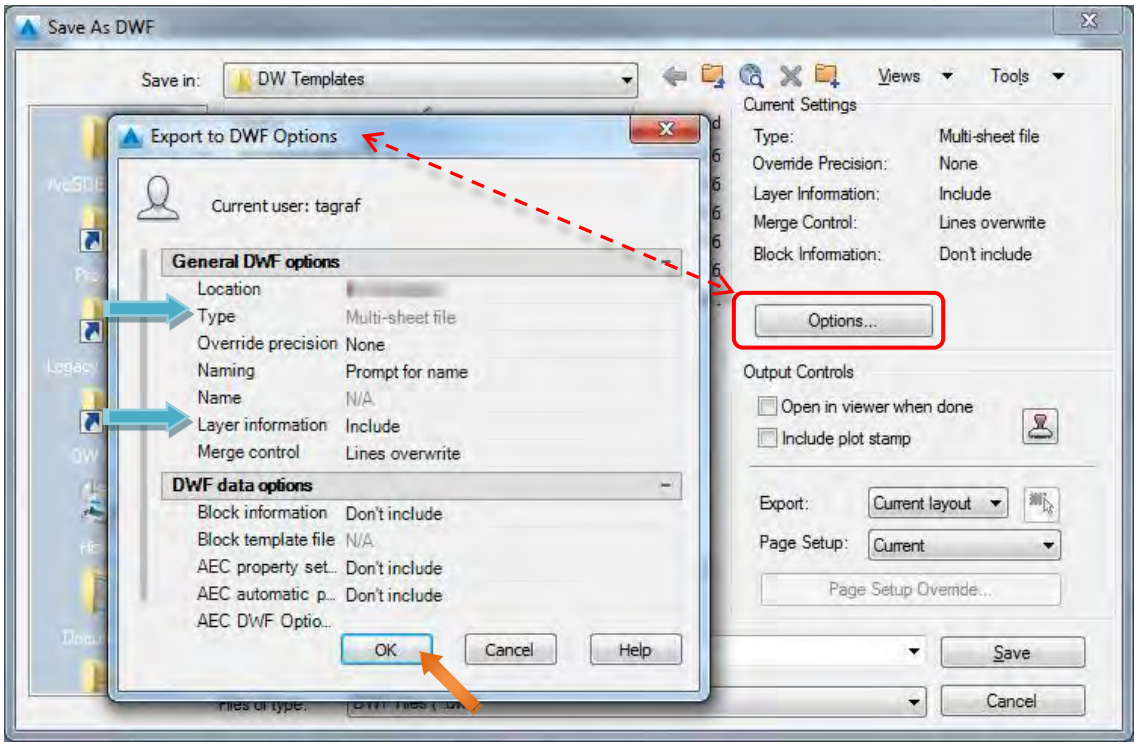
The .dwf files will be used for the entire Plan Review process (see *Support Documents - Page 20.0-22***)**.

An electronic drawing set is the digital equivalent of a set of plotted drawings, the .dwf files and hardcopies must be identical, it is suggested to plot hard copies from the .dwf files.

To create a .dwf file click the *Application Menu*, in the top left corner of the AutoCAD® software, select *Export* and choose *DWF* (alternalely type **_EXPORTDWF** at the command line):

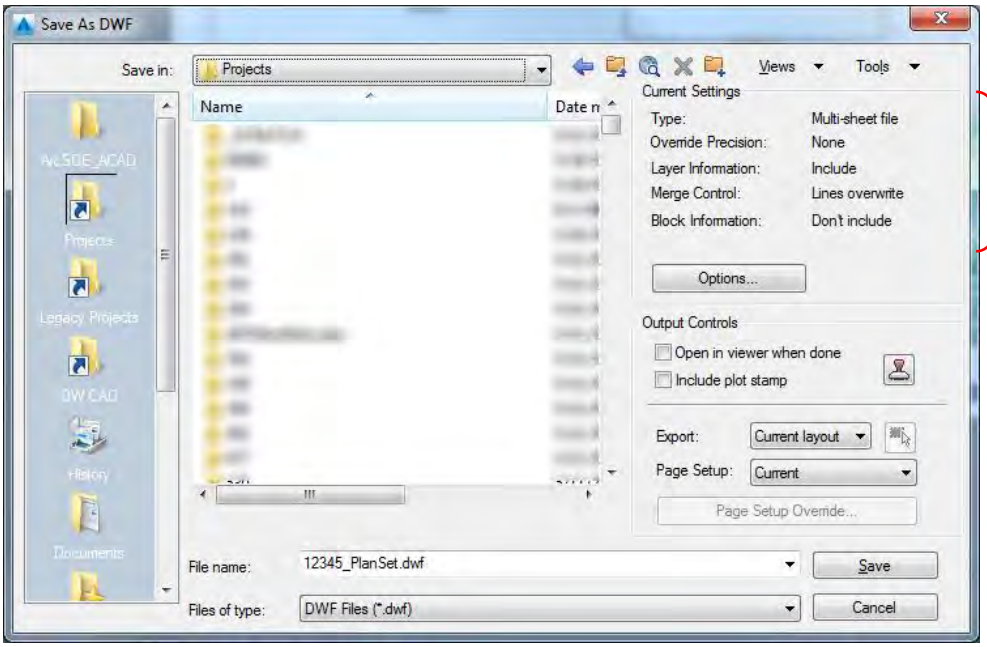
The *Save As DWF* dialog will appear, click the Options... button and change the following options, click OK when finished:

- Type: Multi-sheet file
- Layer information: Include



*Note: if the "Type" will not change from Single-sheet file, type **EXPORTSETTINGS** at the command line to adjust the options before procceding.*

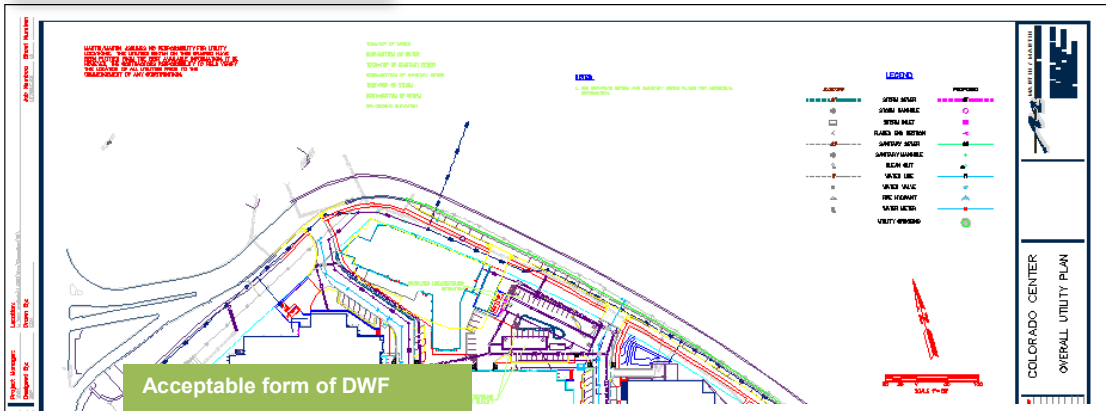
Choose where to save the file and name appropriately:



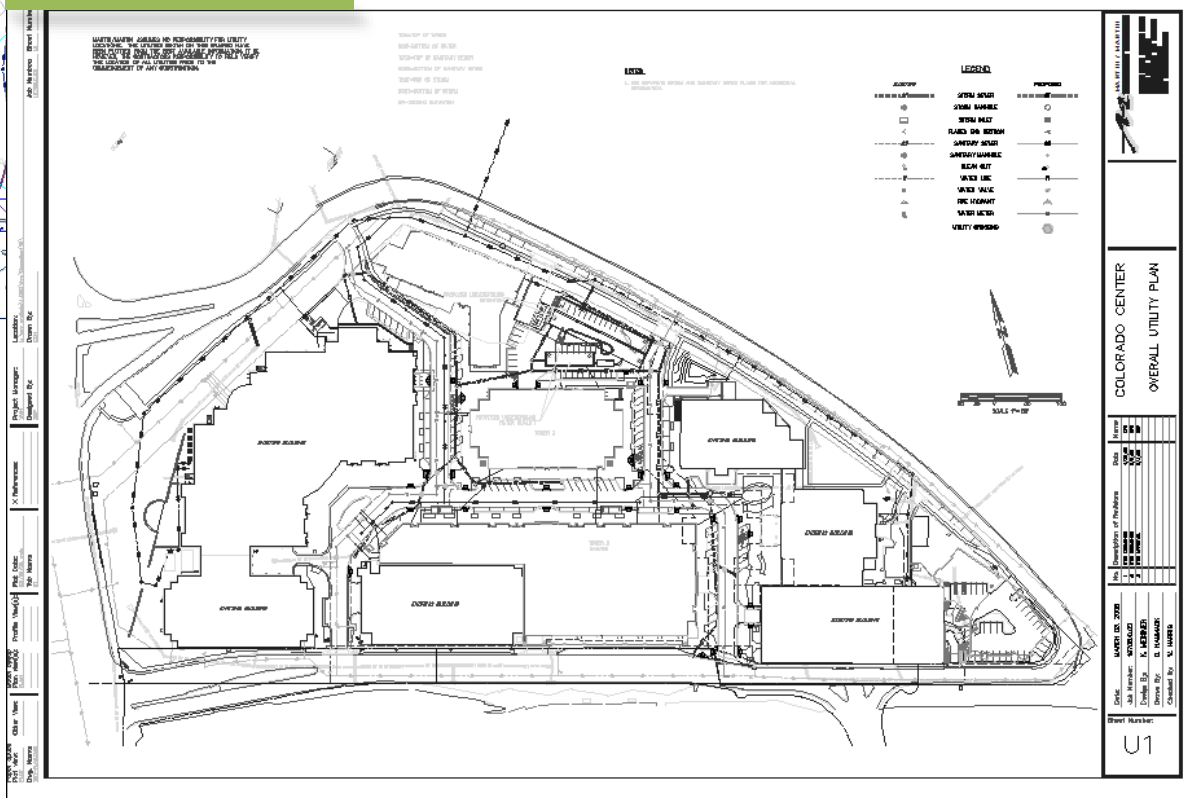
Quick Facts - Do's and Don'ts for .DWFs

- All sheets per .DWF file - no single-sheets
    - Denver Water specifies that a multi-sheet DWF file is generated for each drawing set
- Do not use color DWF's – Grayscale (black & white) only
- When creating DWF's there is better response when created from Layout tabs (paper space) – *zoom extents in layout tab before Publishing*
- Do not save as a .DWFx file, use .DWF only
- Do not use hatching, solids, or wipeouts to mask text as these methods cause problems when publishing to DWF's (see *Text - Page 20.0-36*)
- DWF file names shall match the title of each plot sheet (example: PID_PlanSet.dwf)
- Open DWF to QC before submitting

Color DWF's not acceptable



Acceptable form of DWF



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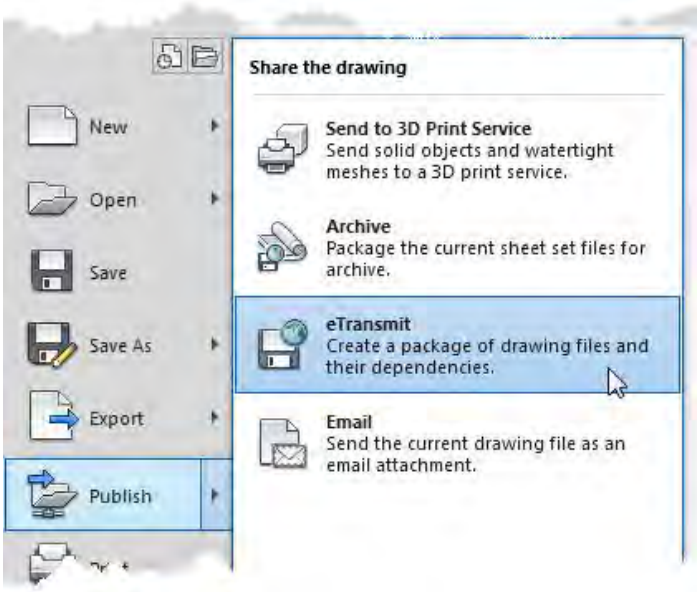
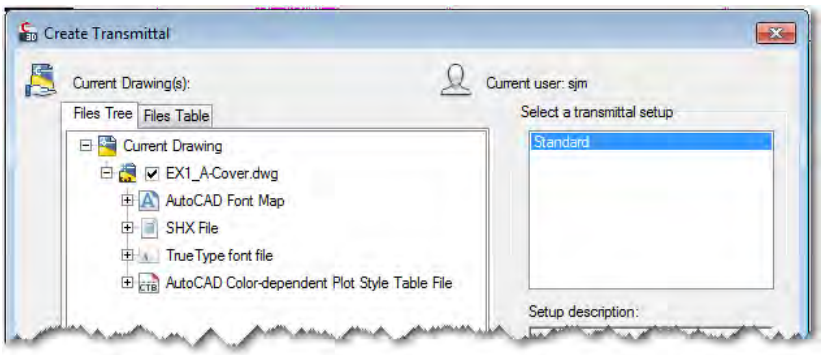
E-Transmit

Submittals to Denver Water can be streamlined by using eTransmit, which in essence packages a set of files for easy sharing. These files should include the AutoCAD® drawing files, AutoCAD® line and font definition files and other all related dependent files. E-Transmit will automate this process.

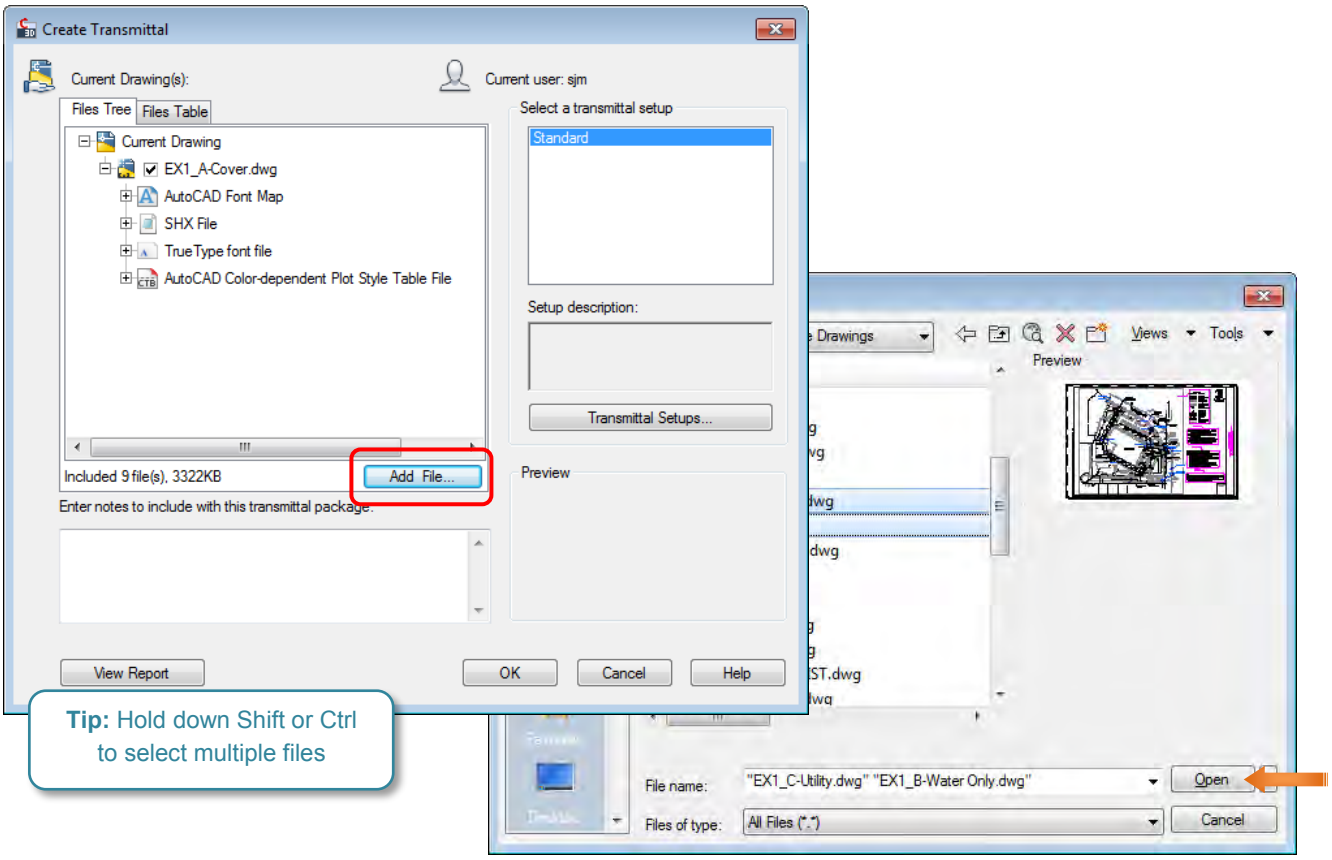
To create an eTransmit click the *Application Menu*, in the top left corner of the AutoCAD® software, select *Publish* and choose *eTransmit* (alternately type **_ETRANSMIT** at the command line):



The *Create Transmittal* dialog box will appear, listing information for the current drawing only:

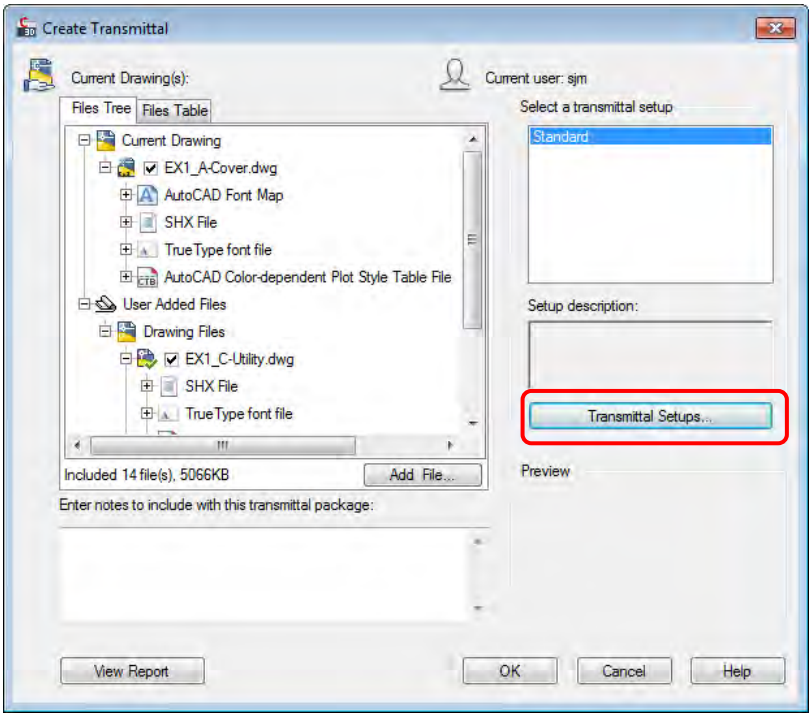


To add more drawings to the submittal click Add File... the *Add File To Transmittal* dialog window will appear. Browse to the additional file location(s) and select the files to be included in the transmittal, click Open.

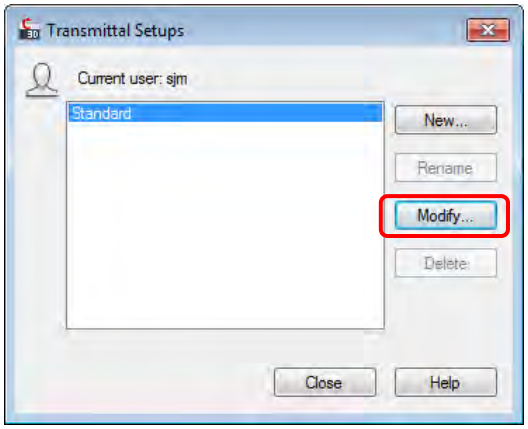


Tip: Hold down Shift or Ctrl to select multiple files

Specific settings must be maintained when submitting to Denver Water. Click the Transmittal Setups... button:



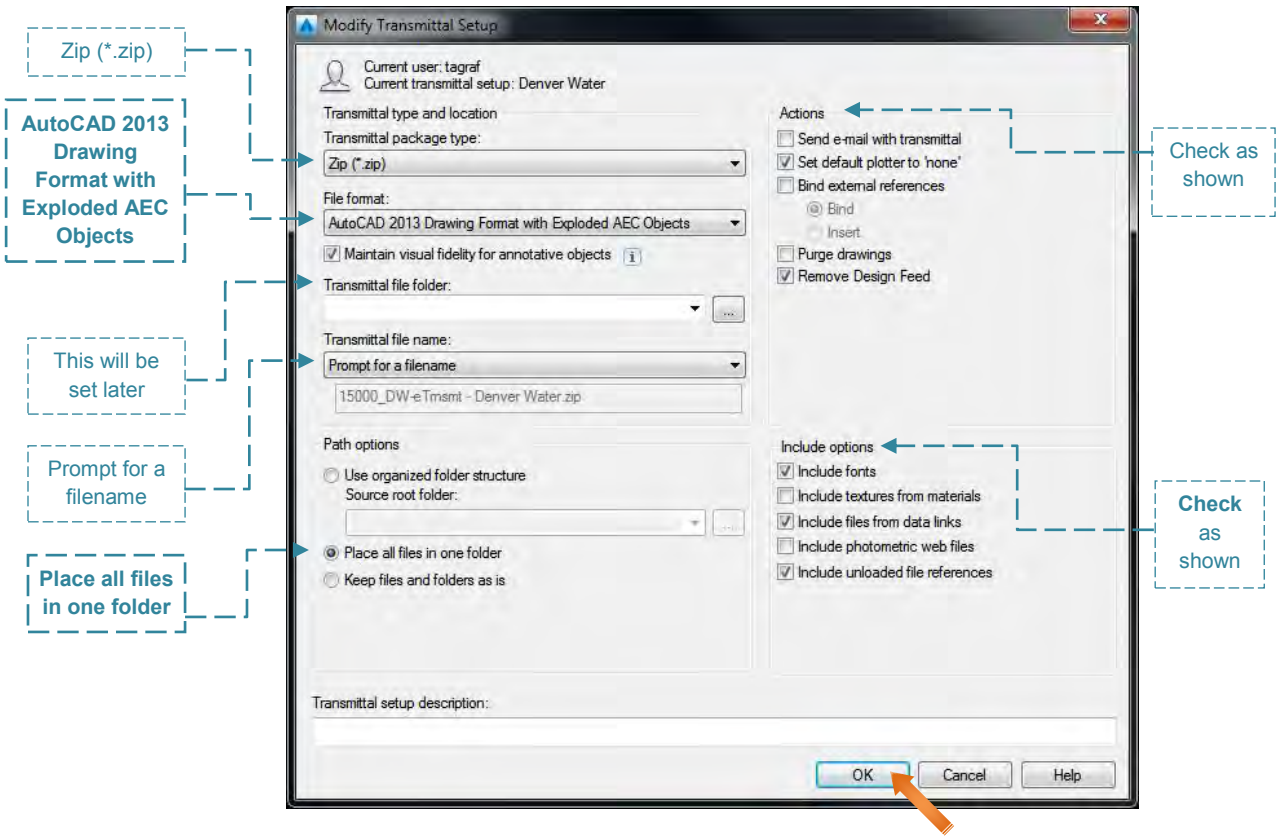
In the *Transmittal Setups* window select “Standard” and click Modify... :



Tip: an eTransmit specific to Denver Water can be saved by clicking

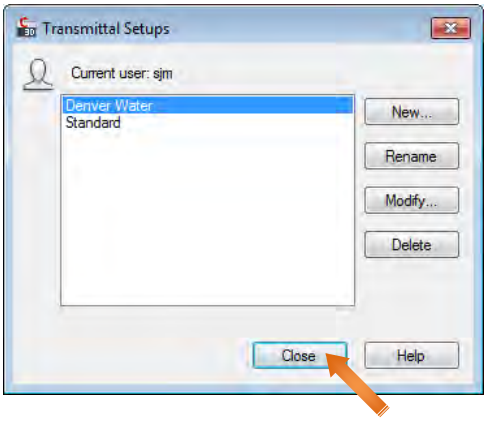
New...

The *Modify Transmittal Setup* pop-up will appear; the example below shows the *required* options, click OK when finished:

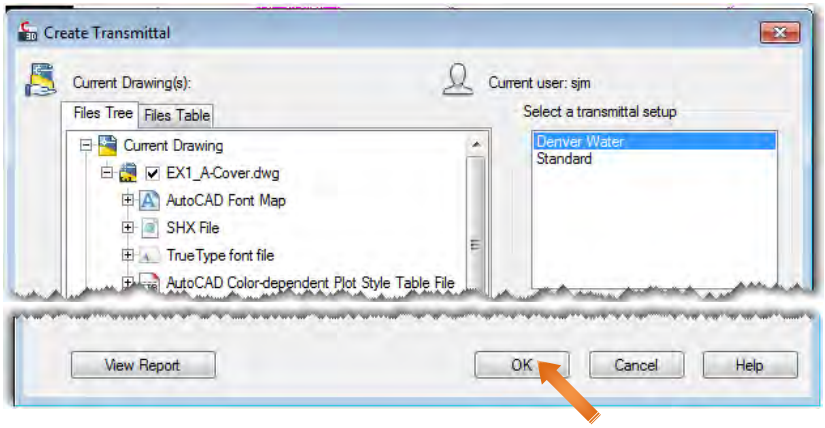


Note: CAD files should be free of Proxy objects; when selecting the “file format” with an E-Transmit, choose the option “AutoCAD 2013 Drawing Format with Exploded AEC Objects.”

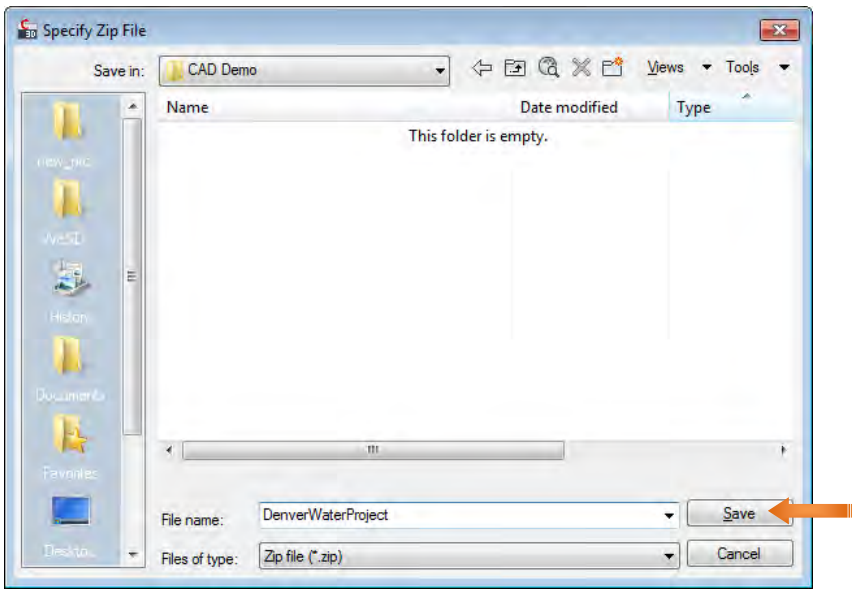
Close the *Transmittal Setups* pop-up:



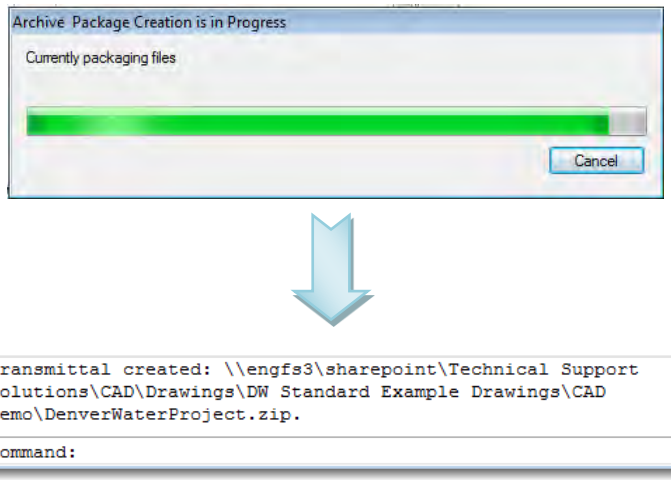
In the *Create Transmittal* window click OK:



The *Specify Zip File* pop-up window will appear, navigate to the location where the .zip file should be stored and name the .zip file appropriately, click Save



The *Archive Package Creation is in Progress* pop-up will appear; wait a few seconds for this to finish and review the command line, which will show the status of the transmittal package:



Plan Submittal via Dropbox

STEP 1: PRE-SUBMITTAL REVIEW

For developments in the City and County of Denver or Total Service Contract Areas:

1. The consulting Engineer/designer shall create a plan set in accordance with Denver Water's current Engineering Standards and Operating Rules.
2. The consulting Engineer shall create a Dropbox folder and upload the following items into their Dropbox folder:
    a. Full design layout in AutoCAD prepared in accordance with current Denver Water Engineering Standards and CAD Standards – Section 20.0.
    b. AutoCAD standard audit report of the "Water Only" sheet(s) (each AutoCAD submittal).
    c. Multi-sheet .dwf set of the project created from AutoCAD.
    d. **A full PDF version of the project will also be required on all submittals.**
3. The Engineer shall request a Pre-Submittal Review via Dropbox and share link to WaterSalesPlanReview@Denverwater.org.
4. Sales Administration will reply to the consulting Engineer with confirmation of the assigned PRC.
5. Plans will be reviewed by the PRC and Denver Water review comments will be returned to the Engineer within five business days from the time of initial acceptance email notification via Dropbox.
6. The PRC will provide a cost estimate for the Plan Review Fees due at the time of the first formal plan submittal based on the proposed project scope.

For developments in Master Meter or Read and Bill Distributor Contract Areas:

- Follow steps 1–5 above.
- A signed Distributor Conditional Water Plan approval application is required at first submittal.

STEP 2: FORMAL PLAN SUBMITTAL

After the pre-submittal comments are addressed, the Consulting Engineer shall submit the required information for formal plan review, via Dropbox **only,** to their assigned PRC Representative.

1. The Consulting Engineer shall upload the following items into their Dropbox account:
    a. All items on the completed Plan Acceptance Checklist, including the checklist.
    b. Formal comment response letter addressing pre-submittal comments.
    c. Full design layout in AutoCAD prepared in accordance with current Denver Water Engineering Standards and CAD Standards — Section 20.0.
    d. Individual .dwf sheets of the project created from the AutoCAD files.
    e. **A full PDF version of the project with fire department's signature will also be required on first and final submittals.**
    f. A completed Fire Line/Domestic/Irrigation Connection form for each fire sprinkler line and any tap 3-inch and larger. Domestic demand data may be requested for some 2-inch and smaller multi-family domestic taps.
    g. An AutoCAD Audit Report of the "Water Only" sheets is required for all submittals.
2. Water Supply License for each fire line is required and a Stub-In Permit is required for domestic service lines that are 3-inch and larger. All associated fees must be paid at time of first submittal.
    a. Domestic taps require the payment of fees at the time the Water Supply License is submitted. Please contact the PRC for fee information.
3. Plans will be reviewed by the PRC and Denver Water review comments will be returned to the Engineer within **seven** business days from the time of notification via Dropbox.
4. In Read & Bill and Master Meter Districts, a Distributor Conditional Water Plan Approval Application is required.
5. A complete Easement package (if applicable) prepared in accordance with Chapter 4 of the Engineering Standards is required at time of first submittal.

STEP 3: SUBSEQUENT PLAN SUBMITTALS

Plans shall be resubmitted via Dropbox with a formal response letter addressing the Denver Water plan review comments received during Formal Plan Submittal. For each resubmittal, a response letter is required that addresses all redline comments; a new AutoCAD drawing with all changes is also required. *Plans that require more than two formal submittals to obtain plan approval will be subject to additional review fees equal to the amount of the original review cost.*

After the comments have been satisfactorily addressed and the design is accepted by Denver Water, the PRC will provide the Consulting Engineer a list of the outstanding items required for final plan approval such as but not limited to:

a. Final Comment Response Letter
b. Full size bond copy of the plans stamped and signed by PE of record and fire department signature.
c. Final PDF and DWF sheet set
d. A signed owner/developer compliance letter
e. Inspection fees.

STEP 4: FINAL PLAN APPROVAL

Once the required items have been submitted and associated fees have been paid, the plans will be approved by Denver Water and construction activities shall proceed in accordance with Chapter 2 of Denver Water's current Engineering Standards.

f. Inside Denver and Total Service contract areas: the owner/developer must select a water line contractor from Denver Water's Prequalified Contractor lists.
g. The water line Contractor or water District (if Read & Bill or Master Meter contract service area) shall call and schedule a pre-construction meeting a minimum of **48** hours prior to start of construction.
h. Water line contractor must have an approved Denver Water stamped set of plans at time of pre-construction meeting on the job site at all times.

Please see Water Plan Submittal for more information or contact Water Sales at WaterSales@denverwater.org if you have any questions concerning Plan Review.

Final Product – Main Extensions

The final product submitted to Denver Water shall be (excluding Pre-Submittals):

- Plans and supporting documentation submittal in compliance with current Denver Water's Engineering Standards - **Chapter 2**
- Dropbox
  - A single Zip file including DWG files and all supporting dependencies (see *e-Transmit - Page 20.0-57*)
  - Any remaining support files not included with e-Transmit
  - Multi sheet DWF of complete drawing set (see *.DWF files - Page 20.0-53*)
  - Standards Audit file (see *Printing Standards Audit Report - Page 20.0-16*)

Overview - Easements & Licenses

Introduction

The following procedures will be used to process easements and revocable licenses. *Work done within Denver Water's Property Management section is comparable.*

Submitted CAD drawings shall meet requirements and specifications as detailed in current Denver Water's Engineering Standards – **Chapter 4** as well as all requirements listed within the CAD Standards.

Basic Drawing Guidelines

In order for projects to be shared easily it is important that the method of drafting and structure of the drawing set be standardized; use the following lists as guidelines for standardization.

General Checklist

- ☐ Plans in compliance with Denver Water's current Engineering Standards
- ☐ Defined drawing scales – model space and paper space viewports. The scale used shall be large enough so that the dimensions are clearly shown. Whenever possible, the entire easement should be on one sheet.
  - See *Annotation Scales - Page 20.0-7*
- ☐ Use of DW standard layers and linetypes.
  - See example DW STANDARDS 4-06A Page 1 – *20.0-74*
- ☐ Use of DW standard blocks and symbols.
  - See example DW STANDARDS 4-06A Page 2 – *20.0-75*
- ☐ Each sheet is a separate layout – layouts may be contained in one drawing file or separated into individual drawings files at the engineering firm's discretion.
  - See *Expected Use of Model Space and Paper Space - Page 20.0-7*
- ☐ Drawings that have a typical profile of crossing shall meet the requirements on examples:
  - CROSSING OVERHEAD 4-06D – *20-0-79*
  - CROSSING UNDERGROUND 4-06E – *20.0-80*
  - UNDERGROUND DITCH/CANAL CROSSING 4-06F – *20.0-81*
  - SIMPLIFIED AREA 4-06H – *20.0-83*
- ☐ Refer to the Denver Water's current Engineering Standards for abbreviations.
- ☐ Standards check has been performed:
  - See *Batch Standards Checker – In CAD - Page 20.0-13*
- ☐ Plot using **DW Engineering-PMGT.ctb**.
  - See *Layer Color Chart - Page 20.0-11*
- ☐ Submittal package is complete.
  - See *Final Product – Easements and Licenses - Page 20.0-99*

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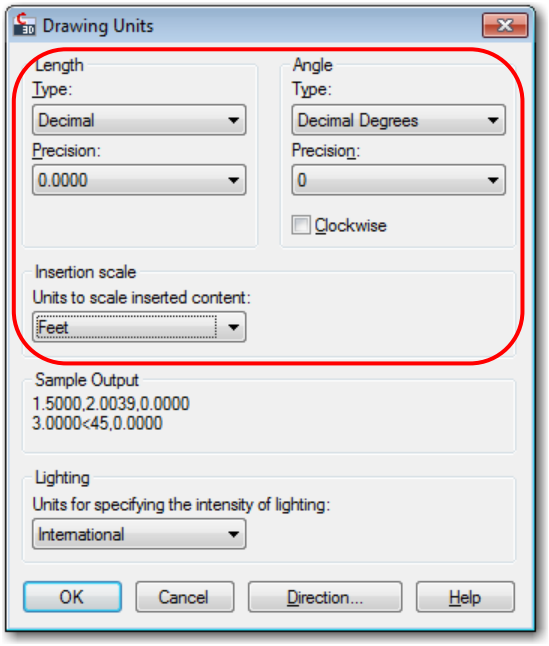
Template Overview (EasementsAndLicenses.dwg)

The provided drawing, also referred to as the template drawing or example drawings, is intended to aid in the compliance of the Denver Water CAD Standards. Located within the template (provided as an AutoCAD® drawing *EasementsAndLicenses.dwg*) are required layers, linetypes and symbols. All information is basic AutoCAD® features with no intelligence, such as Civil 3D styles. AutoCAD® Civil 3D styles are available for use, if desired (see *Support Files - Page 20.0-22*).

The following describes what is in the template drawing, *EasementsAndLicenses.dwg*

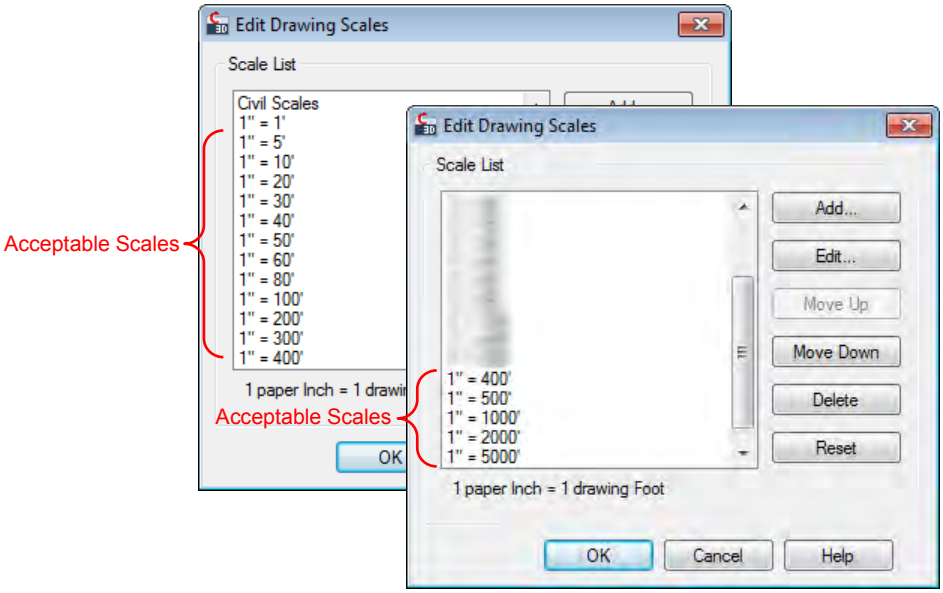
Drawing units

The *Drawing Units* are set to Decimal – Feet:



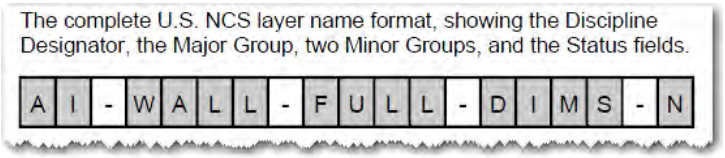
Drawing Scales

Only the acceptable drawings scales (See *Annotation Scales - Page 20.0-7*) have been added to the template drawing:



Layering

Layer names are based on the NCS and consist of distinct data fields separated from one another by dashes. These fields are: *Discipline Designator, Major Group, Minor Groups* (up to two), and *Status*.



Layer Fields

The following lists common layer fields that may be encountered when working with the provided template drawing:

Discipline Designators

Designator	Description
C	Civil
G	General
V	Survey/Mapping
VF	Field Survey (points)

Template Layers – Easements & Licenses

The provided drawings come preloaded with the acceptable layers, including color, linetype and line weights.

Common layers: these layers will exist in almost every drawing

Layer name	Color	Linetype	Description
0	**7**	Continuous	DO NOT USE THIS LAYER
Defpoints	**7**	Continuous	DO NOT USE THIS LAYER

REQUIRED LAYERS

Layer Name	Color	Linetype	Description
_VPRT	**212**	Continuous	General: Viewport
C-ANNO-L050	**211**	Continuous	Civil: Annotation: Text size Leroy 50
C-ANNO-L060	**212**	Continuous	Civil: Annotation: Text size Leroy 60
C-ANNO-L060-ITAL	**212**	Continuous	Civil: Annotation: Text size Leroy 60: Italicized (applies to text styles)
C-ANNO-L080	**222**	Continuous	Civil: Annotation: Text size Leroy 80
C-ANNO-L100	**143**	Continuous	Civil: Annotation: Text size Leroy 100
C-ANNO-L120	**93**	Continuous	Civil: Annotation: Text size Leroy 120
C-ANNO-L120-ITAL	**93**	Continuous	Civil: Annotation: Text size Leroy 120: Italicized (applies to text styles)
C-ANNO-L120-SHAD	**211**	Continuous	Civil: Annotation: Text size Leroy 120: Shadow (applies to text styles)
C-ANNO-L140	**245**	Continuous	Civil: Annotation: Text size Leroy 140
C-ANNO-L140-ITAL	**245**	Continuous	Civil: Annotation: Text size Leroy 140: Italicized (applies to text styles)
C-ANNO-L175	**126**	Continuous	Civil: Annotation: Text size Leroy 175
C-ANNO-L175-SHAD	**211**	Continuous	Civil: Annotation: Text size Leroy 175: Shadow (applies to text styles)

Layer Name	Color	Linetype	Description
C-ANNO-TTLB	**white**	Continuous	Civil: Annotation: Border and titleblock
C-CHAN-CNTR	**212**	CENTER2	Civil: Navigable Channels: Center Line
C-DTCH-CNTR	**212**	CENTER2	Civil: Ditch or washes: Center Line
C-ESMT-ACQU	**26**	Continuous	Civil: Easements: Acquired
C-ESMT-CONV	**26**	Continuous	Civil: Easements: Conveyed
C-ESMT-DIST	**165**	DWDROW	Civil: Easements: District
C-ESMT-DW	**white**	DWDROW	Civil: Easements: Denver Water (and Total service area)
C-ESMT-OTHR	**212**	DASHED2	Civil: Easements: Other - Unidentified
C-FENC	**212**	FENCELINE3	Civil: Fence: Line
C-GRLN-PROF	**223**	Continuous	Civil: Grade line: Profile
C-LICN-ACQU	**white**	Continuous	Civil: License: Acquired
C-LICN-ACQU-AREA	**26**	Continuous	Civil: License: Acquired: Area
C-LICN-CONV	**white**	Continuous	Civil: License: Conveyed
C-LICN-CONV-AREA	**26**	Continuous	Civil: License: Conveyed: Area
C-NPLT	**212**	Continuous	Civil: Non-plotting graphic information
C-PATT	**211**	Continuous	Civil: Detail: Texture or hatch patterns
C-POND	**164**	RIVER2	Civil: Ponds (lakes or reservoirs)
C-PROP-ACQU	**26**	Continuous	Civil: Property boundary (non-Denver Water): Acquired
C-PROP-CONV	**26**	Continuous	Civil: Property boundary (non-Denver Water): Conveyed
C-PROP-DW	**white**	DWDPROP	Civil: Property boundary: Denver Water
C-PROP-LINE	**212**	DIVIDE2	Civil: Property boundary (non-Denver Water): Ownership Line
C-PROP-LOTS	**212**	Continuous	Civil: Property boundary: Lots
C-ROAD-CNTR	**212**	CENTER2	Civil: Roadways: Center Line
C-ROAD-CURB	**212**	Continuous	Civil: Roadways: Curb & gutter
C-ROAD-RWAY	**85**	Continuous	Civil: Roadways: Right-of-way
C-SECT-LINE-16TH	**212**	SEC_16TH	Civil: Section: Line: Sixteenth section
C-SECT-LINE-64TH	**212**	SEC_64TH	Civil: Section: Line: Sixty-fourth section
C-SECT-LINE-FULL	**212**	SEC_FULL	Civil: Section: Line: Full section line
C-SECT-LINE-QTRS	**212**	SEC_QUARTER	Civil: Section: Line: Quarter section
C-SITE	**211**	Continuous	Civil: Site features (Facilities)
CU-COND-CNTR	**212**	CENTER2	Civil Utilities: Conduit: Center Line
CU-WATR-CNTR	**212**	CENTER2	Civil Utilities: Water Supply: Center Line
G-ANNO-LOGO	**211**	Continuous	General: Annotation: Company logo
G-ANNO-TTL2	**112**	Continuous	General: Annotation: Title layer 2
G-NPLT	**white**	Continuous	General: Non-plotting graphic information
V-CTRL	**85**	Continuous	Survey/Mapping: Control points
VF-MONM	**212**	Continuous	Field Survey (points): Monuments and property corners

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Index of Example sheets

The following is a list of the example sheets given for Easements and Licenses submittals, including how to use each sheet; sheet notes are not always specific to the given example and may be used throughout:

- **GENERAL INSTRUCTIONS 4-06** - *Page 20.0-73*
  - This sheet gives general instructions of how the drawings should be set up and how they should look
- **DW STANDARDS 4-06A Page 1** - *Page 20.0-74*
  - This sheet lists all acceptable layers, colors, text styles, line weights and linetypes for Easements and Licenses submittals, use only the supplied information
  - Line weights are based on Denver Water's plot file (DW Engineering-PMGT.ctb) and are set to default within the example drawings
- **DW STANDARDS 4-06A Page 2** - *Page 20.0-75*
  - Callouts in **BLUE** indicate which layer is used
  - Callouts in **MAGENTA** are directions for reference purposes
- **BORDER/TITLE BLOCK 4-06B** - *Page 20.0-76*
  - See GENERAL INSTRUCTIONS 4-06 - *Page 20.0-73*, note 6 for North Arrow specifications
  - Callouts in **BLUE** indicate which layer is used
  - Callouts in **MAGENTA** are directions for reference purposes
  - The North Arrow is provided as a dynamic block. Symbol name: NorthArrow (see *FAQ's – Easements and Licenses - Page 20.0-87*)
  - *Legend has been provided as a dynamic block. Symbol name: Legend (see *FAQ's – Easements and Licenses - Page 20.0-87*)
- **BORDER/TITLE BLOCK 4-06B Blank** - *Page 20.0-77*
  - See GENERAL INSTRUCTIONS 4-06 - *Page 20.0-73*, note 6 for North Arrow specifications
  - Callouts in **BLUE** indicate which layer is used
  - Callouts in **MAGENTA** are directions for reference purposes
  - The North Arrow is provided as a dynamic block. Symbol name: NorthArrow (see *FAQ's – Easements and Licenses - Page 20.0-87*)
  - *Legend has been provided as a dynamic block. Symbol name: Legend (see *FAQ's – Easements and Licenses - Page 20.0-87*)
- **PERIMETER DESCRIPTION 4-06C** - *Page 20.0-78*
  - *In some cases linetype scales can be forced to show properly
  - Callouts in **BLUE** indicate which layer is used
  - Callouts in **MAGENTA** are directions for reference purposes
  - Street names can use either layer C-ANNO-L140-ITAL or C-ANNO-L120-ITAL, with corresponding text styles, depending on street width and scale of drawing
  - Shadow fonts can use either layer C-ANNO-L120-SHAD or C-ANNO-L175-SHAD, with corresponding text styles, depending on scale of drawing
- **CROSSING OVERHEAD 4-06D** - *Page 20.0-79*
  - *In some cases linetype scales can be forced to show properly
  - Callouts in **BLUE** indicate which layer is used
  - Callouts in **MAGENTA** are directions for reference purposes
  - Round stationing to the nearest 5 feet (i.e. 1232+75)
  - Bar scale not required on sheets with profiles, when scale is clearly labeled
- **CROSSING UNDERGROUND 4-06E** - *Page 20.0-80*
  - Callouts in **BLUE** indicate which layer is used
  - Callouts in **MAGENTA** are directions for reference purposes

- **UNDERGROUND DITCH/CANAL CROSSING 4-06F** - *Page 20.0-81*
  - *In some cases linetype scales can be forced to show properly
  - Callouts in **BLUE** indicate which layer is used
  - Callouts in **MAGENTA** are directions for reference purposes
- **CENTERLINE DESCRIPTION 4-06G** - *Page 20.0-82*
  - *LEGEND – AREA LICENSE GRANTED – is shown as a "user defined" example on this sheet
  - Callouts in **BLUE** indicate which layer is used
  - Callouts in **MAGENTA** are directions for reference purposes
- **SIMPLIFIED AREA 4-06H** - *Page 20.0-83*
  - Callouts in **BLUE** indicate which layer is used
  - Callouts in **MAGENTA** are directions for reference purposes
  - This sheet should only be used when requesting a License for an irregular area for a use such as grading, riprap, or a lawn irrigation system. The perimeter should be simplified to avoid using multiple small courses
- **FIRE HYDRANT EASEMENT 4-06I** - *Page 20.0-84*
  - Callouts in **BLUE** indicate which layer is used
  - Callouts in **MAGENTA** are directions for reference purposes
  - The fire hydrant is provided as a dynamic block. Symbol name: DW_Fire Hydrant (see *FAQ's – Easements and Licenses - Page 20.0-87*)
  - This sheet is for informational purposes only
- **DISTRIBUTOR PERIMETER DESCRIPTION 4-06J** - *Page 20.0-85*
  - *In some cases linetype scales can be forced to show properly
  - Callouts in **BLUE** indicate which layer is used
  - Callouts in **MAGENTA** are directions for reference purposes
  - Street names can use either layer C-ANNO-L140-ITAL or C-ANNO-L120-ITAL, with corresponding text styles, depending on street width and scale of drawing
  - Shadow fonts can use either layer C-ANNO-L120-SHAD or C-ANNO-L175-SHAD, with corresponding text styles, depending on scale of drawing
- **DISTRIBUTOR BORDER/TITLE BLOCK 4-06K** - *Page 20.0-86*
  - See BORDER/TITLE BLOCK 4-06B - *Page 20.0-76* for specifications
- **DISTRIBUTOR BORDER/TITLE BLOCK 4-06K Blank** - *Page 20.0-87*
  - See BORDER/TITLE BLOCK 4-06B - *Page 20.0-76* for specifications

GENERAL INSTRUCTIONS 4–06

INSTRUCTIONS FOR THE PREPARATION OF DENVER WATER EXHIBIT DRAWINGS

1) The purpose of the drawing is to clearly show the easement area or the location of the item to be licensed and the area immediately surrounding it.

2) You must start your drawing using one of our standards drawings which contain all of the proper layers, linetypes and settings required. Then bring your line work and information into it.

3) Submitted CAD drawing files must not contain any X–referencing.

   Use the provided layers only do not change layer names or layer colors.

4) The LINETYPE scale and DRAWING scale must be the same.

5) All text sizes are based on the Simplex text style L100 being 0.10 of an inch high. Except for the Shadow Font. No substitutions for the Simplex template are allowed. The shadow font Shadow.shx is included with this standards package.

6) The North direction and arrow must be in the range from 90° to the left to 45° to the right. Having "North" at the top of the page is preferred. The 8 1/2" side of the drawing is always the bottom of the page.

7) The tie should be to a monumented corner of the quarter section in which the easement parcel or licensed item lies. A direct tie is preferred but a tie with a maximum of two courses will be accepted.

8) All designations for quarter section lines and land corners must be for the quarter section in which they lie. Place them within that quarter section.

9) Basis of Bearings: Note that the bearing basis has three parts.

   - Numeric value: degrees, minutes, seconds (i.e. S89°59'18"W)
   - Monumentation: The monuments used for the bearing basis must be shown on the parcel map or described in the Basis of Bearing note.
   - Source of Basis: Denver Metro Area, State Plane Central Zone: Outside the Metro Area, Subdivision Plat, or existing Denver Water Maps.
   - Denver Water requires two monumented corners for the Basis of Bearings.

10) A 0.10" tic mark must be used to delineate the end points of curves and angle points if its location is not obvious. Rotate tic marks to be radial to the curve or to bi–sect the angle and place them on the C–ANNO–L060 layer.

11) "Easement Hatching Lines". Hatch lines must be spaced 0.06" apart. (The Hatch Scale equals 0.48 times the drawing scale). The hatch angle must be 45° or 135° to match the Legend. Use the C–PATT layer for all hatch patterns.

12) Show the easement or property area in square feet and "round" it to the nearest foot if the area is less than one half acre. Show the easement or property area in acres and to three decimal places if the area is one half acre or more. i.e., 21,884 SQ FT or 0.503 acres.

13) The initials of the person who prepared the drawing should be entered in the area marked "DRN". All other fields will be completed by Denver Water.

14) A separate paper space layout tab must be created for each page of a drawing.

15) General Information:

   - All Z coordinates must be Zero.
   - Files must not be Zipped if they will fit on a CD.
   - The use of course tables should be avoided.
   - Label the quarter/quarter for each one shown on the parcel map.
   - Include a Bar Scale that matches the DW standard of 0.10" by 3.00".
   - Drawing Accuracy: All lines and curves must be drawn accurately to two decimal places for distance.
   - When multiple easement parcels exist they must be separated by the type of easement document being used and grouped by owners.

16) SIMPLIFIED AREA 4–06H should only be used when requesting a license for an irregular area for a use such as grading, riprap, or a lawn irrigation system. The perimeter should be simplified to avoid using multiple small courses.

17) Before submitting CAD files remove all drawings and tabs that are not necessary.

Note: If you have any questions while you are preparing your drawing regarding our standards please feel free to email and we will be glad to assist you.

LEGEND			
EASEMENT ACQUIRED	DOCUMENT DATED:	FACILITY TYPE	DENVER WATER
BNDRY EXISTING DW ESMT	SEC'Y FILE DOC.	EASEMENT/LICENSE/PERMIT	1600 West 12th Ave, Denver, Colorado 80204–3412, T: 303.628.6000, F: 303.628.6851, denverwater.org
BNDRY EXISTING DW PROP	RIMS ITEM NO.	COMPANY/OWNER	
	CARD NO.		
	DRN. / PM. / S.		SCALE: 1" = 100'
	APPD.		
	SHEET 1 OF 1 SHEET	DATE: DECEMBER 20, 2016	CAD XXXXX–X_PMGT

D.W.D. PROPERTY MANAGEMENT STANDARDS 12/20/2016

DW STANDARDS 4–06A Page 1

USE ONLY SUPPLIED LAYERS, COLORS, TEXT STYLES, LINE WEIGHTS, and LINETYPES SPECIFIED ON THIS SHEET

LAYER NAME	LAYER COLOR	TEXT STYLE	EXAMPLE	LINE WEIGHT
C–ANNO–L050	211	L50	STANDARDS 03/32012	0.005 IN
C–ANNO–L060	212	L60	Lot 1	0.007 IN
C–ANNO–L060–ITAL	212	L60 Italic	N Line NW 1/4 Sec 36	0.007 IN
C–ANNO–L080	223	L80	N89°22'45"W	0.010 IN
C–ANNO–L080	223	L80	BASIS OF BEARING:	0.010 IN
C–ANNO–L100	144	L100	BLK 1	0.014 IN
C–ANNO–L120	85	L120	SCALE 1" = 100'	0.020 IN
C–ANNO–L120–ITAL	85	L120 Italic	ANY STREET	0.020 IN
C–ANNO–L120–SHAD	212	L120 Shadow	POLLOCK OAKS	0.007 IN
C–ANNO–L140	26	L140	NE1/4 NE1/4	0.028 IN
C–ANNO–L140–ITAL	26	L140 Italic	ANY STREET	0.028 IN
C–ANNO–L175	137	L175	4–06A	0.039 IN
C–ANNO–L175–SHAD	212	L175 Shadow	BAILEY HEIGHTS	0.007 IN
G–ANNO–LOGO	211	N/A		0.005 IN
			LINETYPE	
C–ANNO–TTLB	7			0.039 IN
C–CHAN–CNTR	212			0.007 IN
C–DTCH–CNTR	212			0.007 IN
C–ESMT–ACQU	156			0.028 IN
C–ESMT–CONV	26			0.028 IN
C–ESMT–DIST	165			0.020 IN
C–ESMT–DW	7			0.039 IN
C–ESMT–OTHR	212			0.007 IN
C–FENC	212		x x	0.007 IN
C–GRLN–PROF	223			0.010 IN
C–LICN–ACQU	7			0.039 IN
C–LICN–ACQU–AREA	26			0.028 IN
C–LICN–CONV	7			0.039 IN
C–LICN–CONV–AREA	26			0.028 IN
C–NPLT	212			0.007 IN
C–PATT	212			0.007 IN
C–POND	164			0.014 IN
C–PROP–ACQU	156			0.028 IN
C–PROP–CONV	26			0.028 IN
C–PROP–DW	7			0.039 IN
C–PROP–LINE	212			0.007 IN
C–PROP–LOTS	212			0.007 IN
C–ROAD–CNTR	212			0.007 IN
C–ROAD–CURB	212			0.007 IN
C–ROAD–RWAY	85			0.020 IN
C–SECT–LINE–16TH	212			0.007 IN
C–SECT–LINE–64TH	212			0.007 IN
C–SECT–LINE–FULL	212			0.007 IN
C–SECT–LINE–QTRS	212			0.007 IN
C–SITE	211			0.010 IN
CU–COND–CNTR	212			0.007 IN
CU–WATR–CNTR	212			0.007 IN
V–CTRL	85			0.020 IN
VF–MONM	212			0.007 IN

LEGEND

- EASEMENT ACQUIRED
- BNDRY EXISTING DW ESMT
- BNDRY EXISTING DW PROP

DOCUMENT DATED:
SEC'Y FILE DOC.
RIMS ITEM NO.
CARD NO.

DRN.	PM.	S.
APPD.		

SHEET 1 OF 1 SHEET

FACILITY TYPE
EASEMENT/LICENSE/PERMIT
COMPANY/OWNER

DATE: DECEMBER 20, 2016

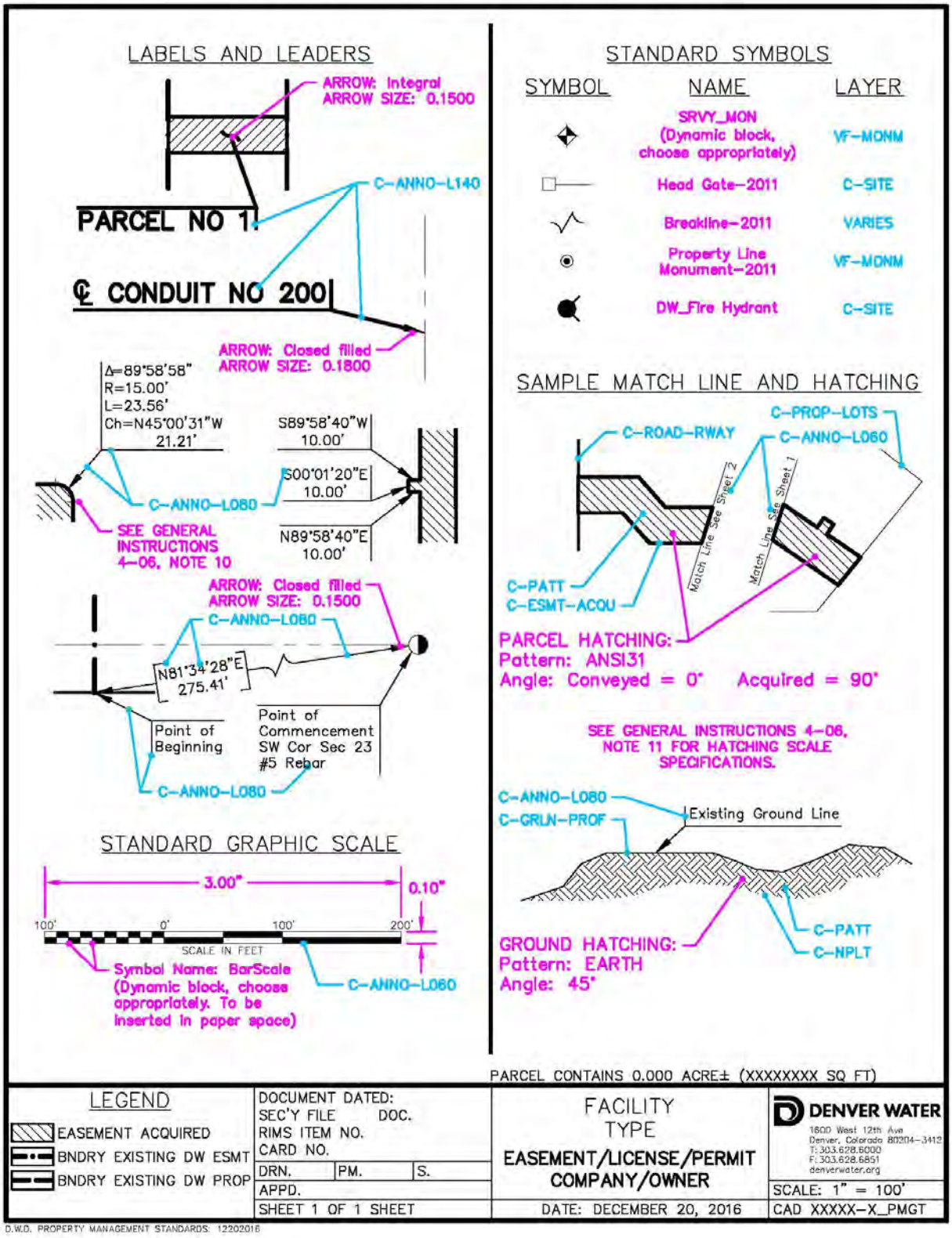
DENVER WATER
1600 West 12th Ave
Denver, Colorado 80204–3412
T: 303.628.6000
F: 303.628.6851
denverwater.org

SCALE: 1" = 100'

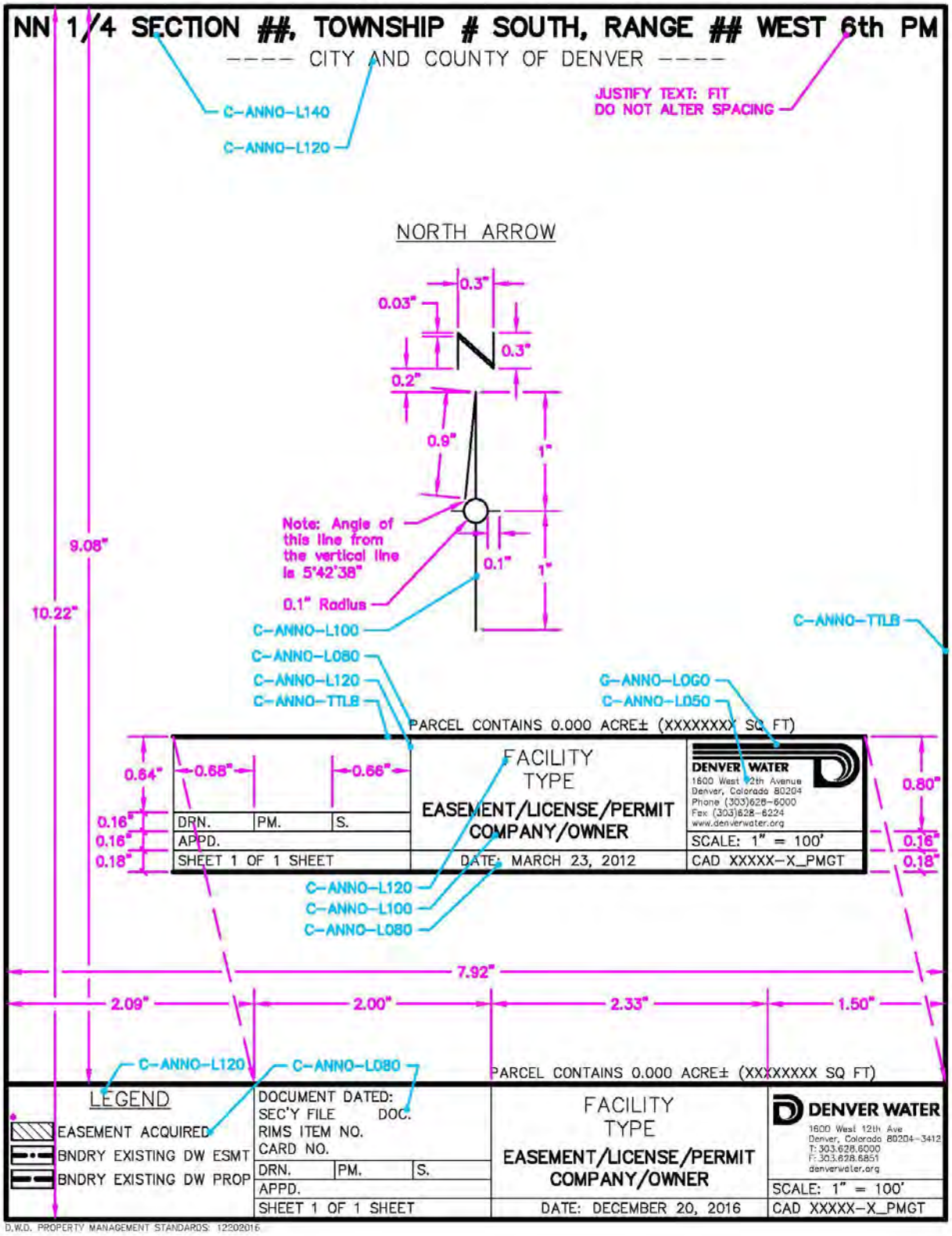
CAD XXXXX–X_PMGT

D.W.D. PROPERTY MANAGEMENT STANDARDS: 12202016

DW STANDARDS 4–06A Page 2



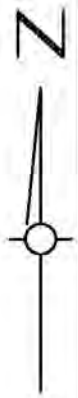
BORDER/TITLE BLOCK 4–06B



BORDER/TITLE BLOCK 4–06B

NW 1/4 SECTION ##, TOWNSHIP # SOUTH, RANGE ## WEST 6th PM

---- CITY AND COUNTY OF DENVER ----



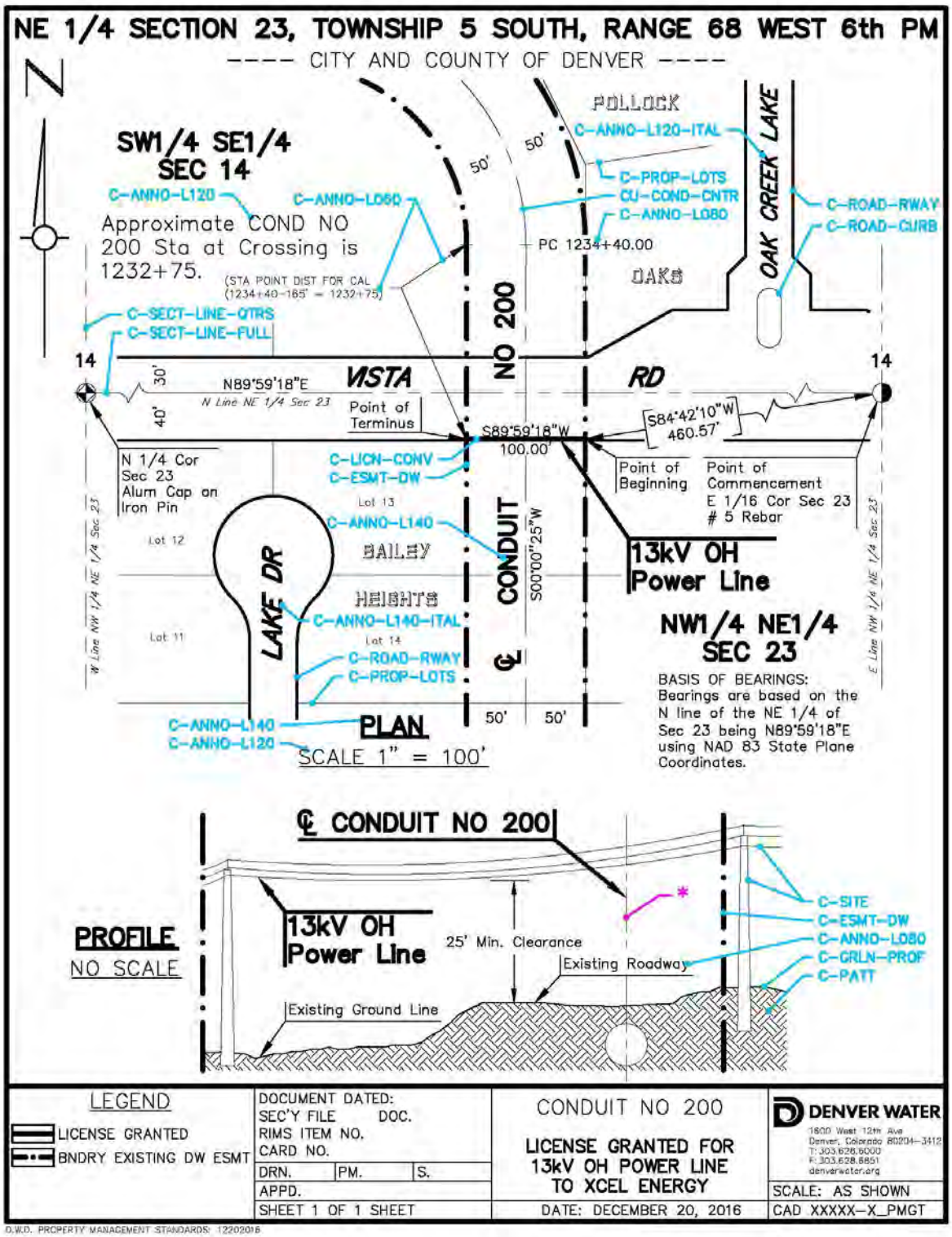
YOUR DRAWING IN THIS SPACE

PARCEL CONTAINS 0.000 ACRE± (XXXXXX SQ FT)

LEGEND	DOCUMENT DATED:	FACILITY TYPE	DENVER WATER
EASEMENT ACQUIRED	SEC'Y FILE DOC.	EASEMENT/LICENSE/PERMIT	1600 West 12th Ave Denver, Colorado 80204-3412 T: 303.628.6000 F: 303.628.6851 denverwater.org
BNDRY EXISTING DW ESMT	RIMS ITEM NO.	COMPANY/OWNER	
BNDRY EXISTING DW PROP	CARD NO.		
	DRN. | PM. | S.		
	APPD.		SCALE: 1" = 100'
	SHEET 1 OF 1 SHEET	DATE: DECEMBER 20, 2016	CAD XXXXX–X_PMGT

D.W.D. PROPERTY MANAGEMENT STANDARDS 12202016

CROSSING OVERHEAD 4–06D



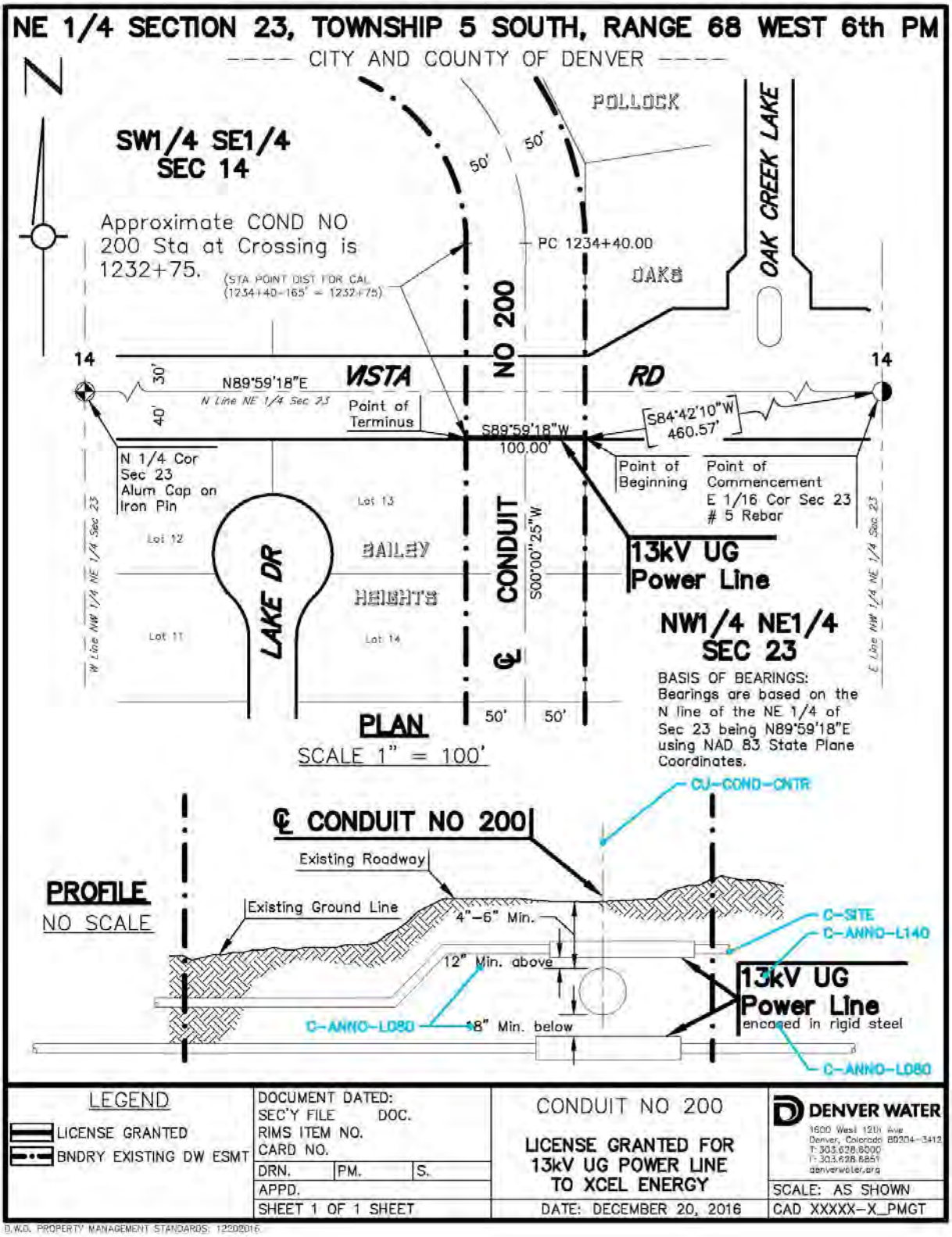
LEGEND	DOCUMENT DATED:	CONDUIT NO 200	DENVER WATER
LICENSE GRANTED	SEC'Y FILE DOC.	LICENSE GRANTED FOR 13kV OH POWER LINE TO XCEL ENERGY	1600 West 12th Ave Denver, Colorado 80204-3412 T: 303.628.6000 F: 303.628.6851 denverwater.org
BNDRY EXISTING DW ESMT	RIMS ITEM NO.		
	CARD NO.		
	DRN. PM. S.		SCALE: AS SHOWN
	APPD.		
	SHEET 1 OF 1 SHEET	DATE: DECEMBER 20, 2016	CAD XXXXX–X_PMGT

D.W.D. PROPERTY MANAGEMENT STANDARDS: 12202016

EASEMENT ACQUIRED	RIMS ITEM NO.	EASEMENT ACQUIRED FROM COMPANY/OWNER	1600 West 12th Ave Denver, Colorado 80204-3412 T: 303.628.6000 F: 303.628.6851 denverwater.org
BNDRY EXISTING DW ESMT	CARD NO.		
BNDRY EXISTING DW PROP	DRN. PM. S.		SCALE: 1" = 100'
	APPD.		
	SHEET 1 OF 1 SHEET	DATE: JUNE 15, 2016	CAD XXXXX–X_PMGT

D.W.D. PROPERTY MANAGEMENT STANDARDS: 12202016

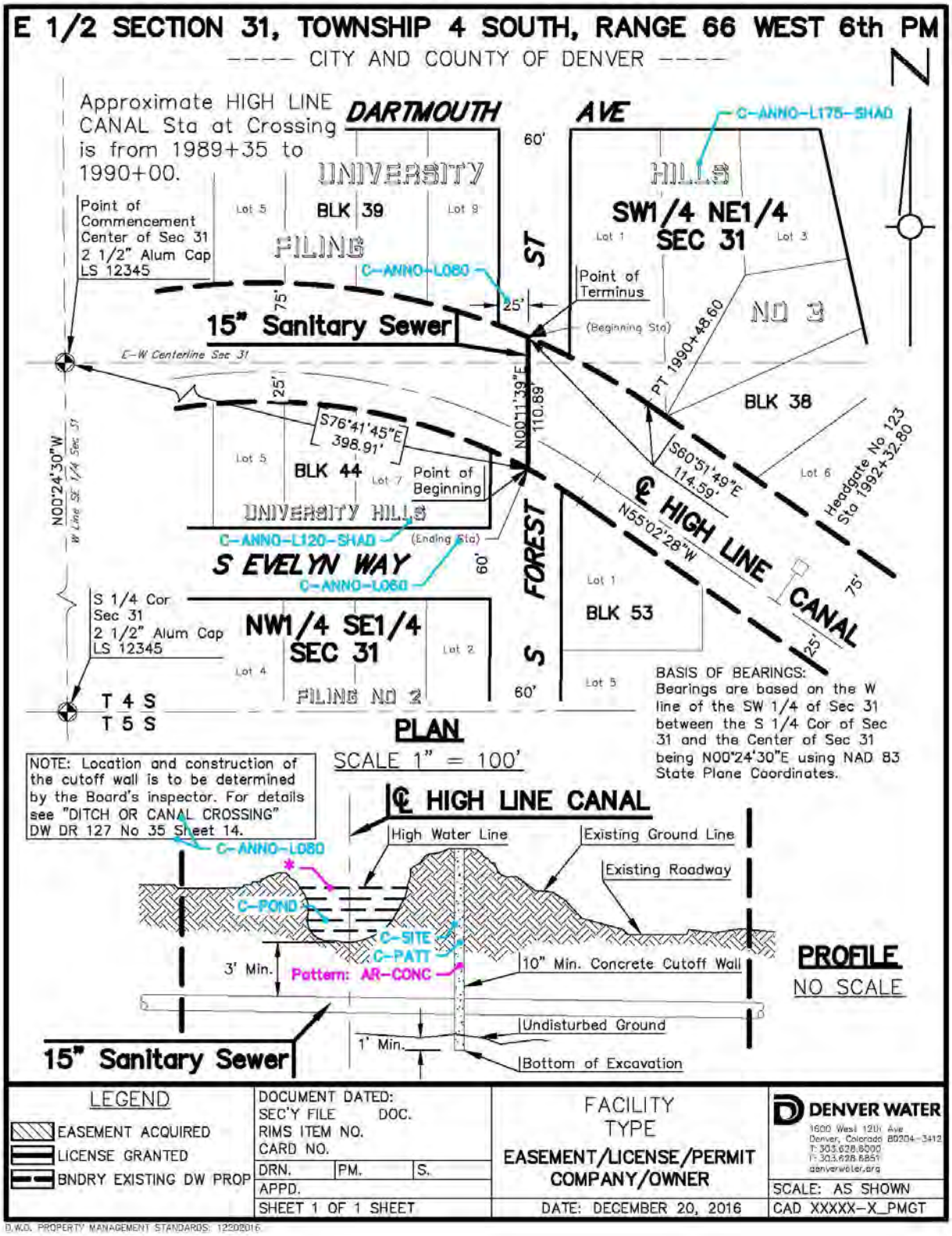
CROSSING UNDERGROUND 4–06E



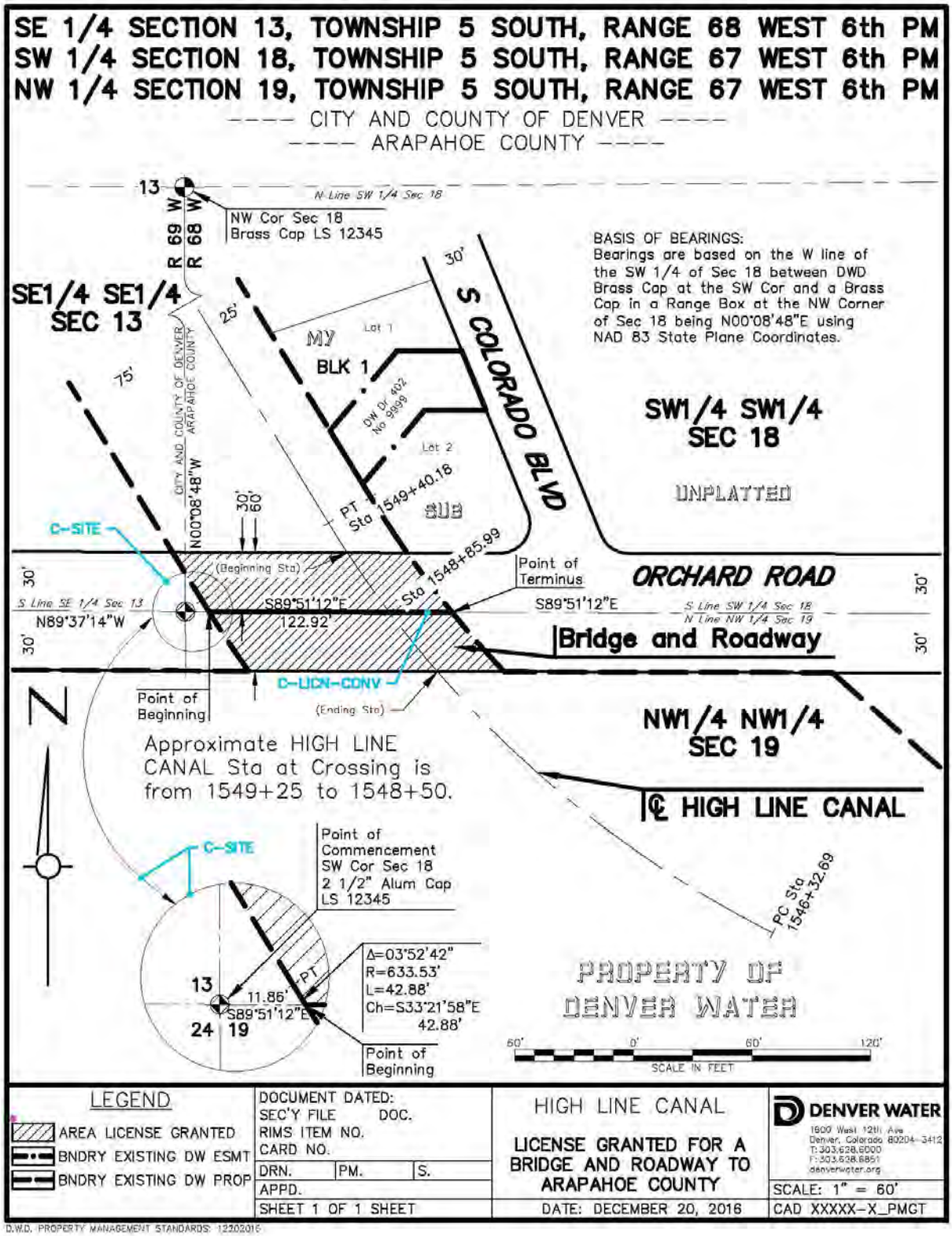
LEGEND	DOCUMENT DATED:	CONDUIT NO 200	DENVER WATER
LICENSE GRANTED	SEC'Y FILE DOC.	LICENSE GRANTED FOR 13kV UG POWER LINE TO XCEL ENERGY	1600 West 12th Ave Denver, Colorado 80204-3412 T: 303.628.6000 F: 303.628.6851 denverwater.org
BNDRY EXISTING DW ESMT	RIMS ITEM NO.		
	CARD NO.		
	DRN. PM. S.		
	APPD.		SCALE: AS SHOWN
	SHEET 1 OF 1 SHEET	DATE: DECEMBER 20, 2016	CAD XXXXX-X_PMGT

D.W.D. PROPERTY MANAGEMENT STANDARDS: 12202016

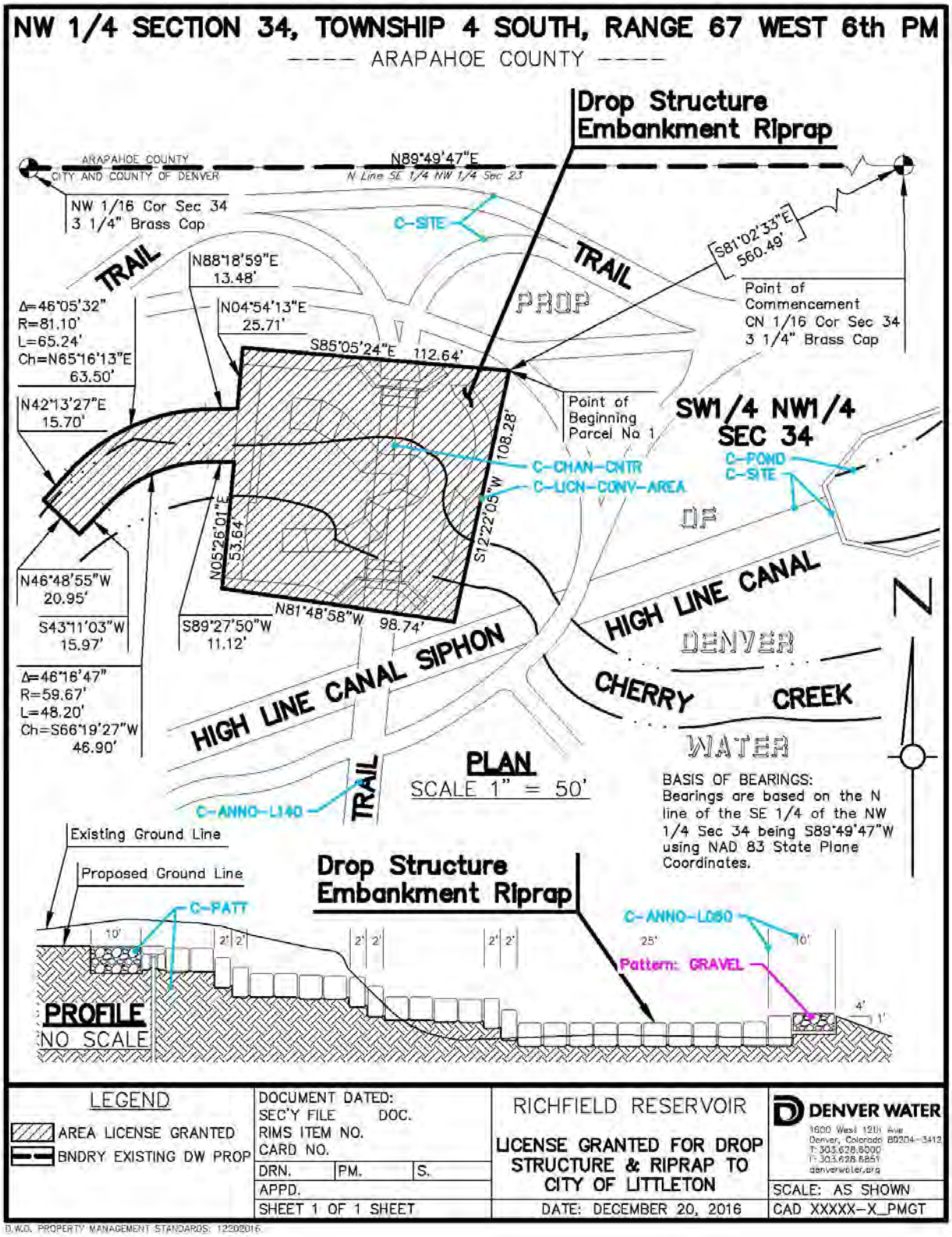
UNDERGROUND DITCH/CANAL CROSSING 4–06F



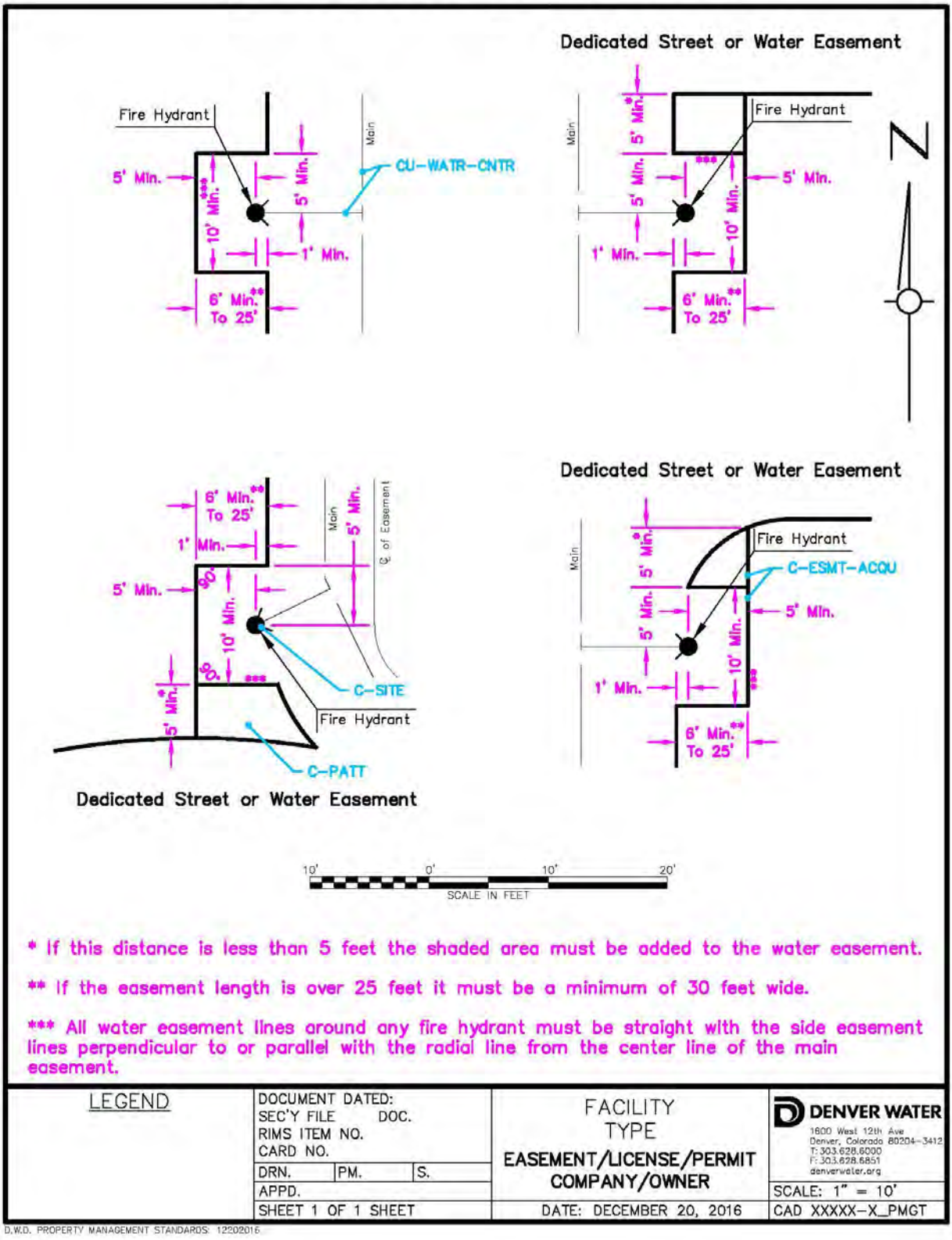
CENTERLINE DESCRIPTION 4–06G



SIMPLIFIED AREA 4–06H



FIRE HYDRANT EASEMENT 4–061



* If this distance is less than 5 feet the shaded area must be added to the water easement.

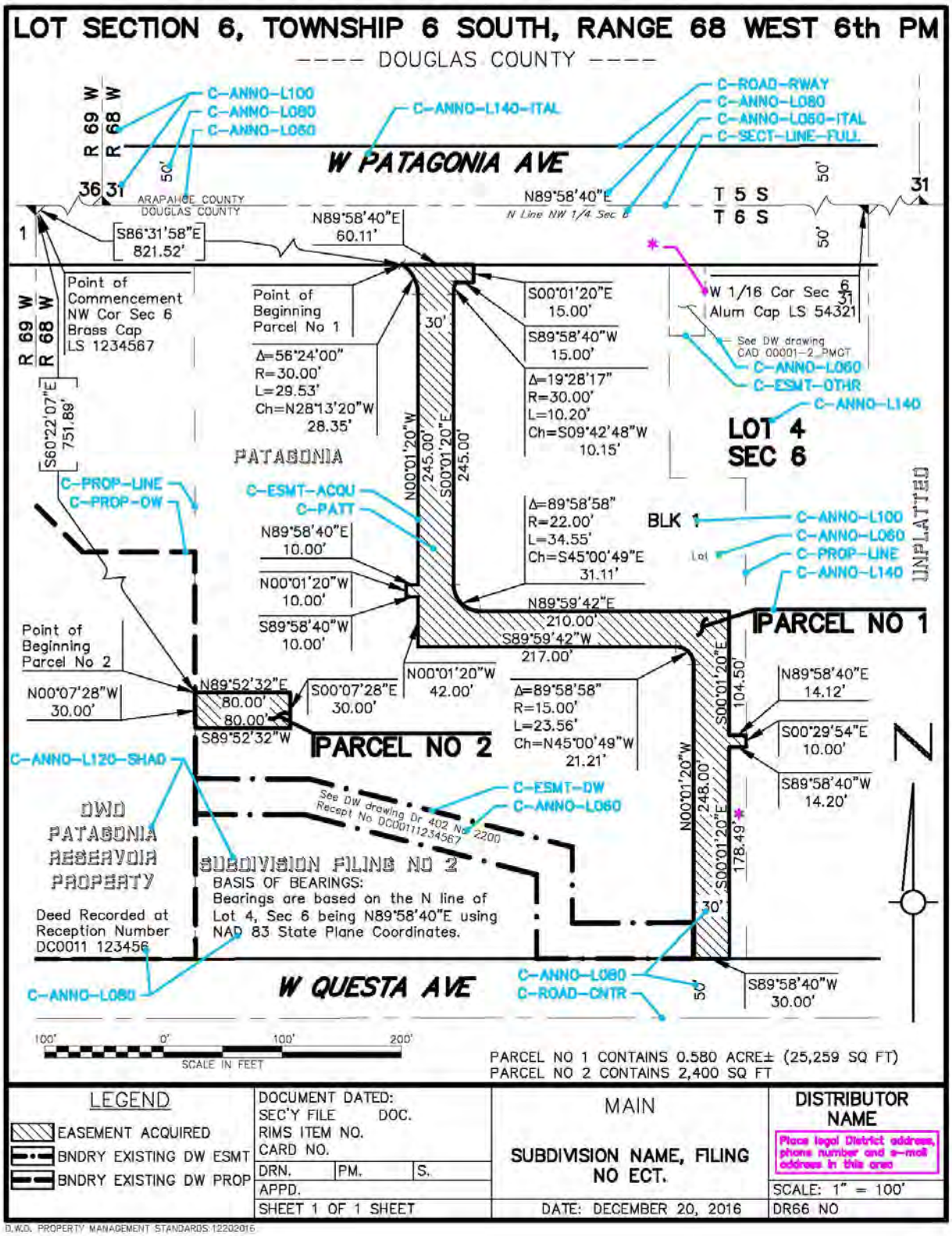
** If the easement length is over 25 feet it must be a minimum of 30 feet wide.

*** All water easement lines around any fire hydrant must be straight with the side easement lines perpendicular to or parallel with the radial line from the center line of the main easement.

LEGEND	DOCUMENT DATED: SEC'Y FILE DOC. RIMS ITEM NO. CARD NO.	FACILITY TYPE EASEMENT/LICENSE/PERMIT COMPANY/OWNER	DENVER WATER 1600 West 12th Ave Denver, Colorado 80204–3412 T: 303.628.6000 F: 303.628.6851 denverwater.org
	DRN. PM. S.		
	APPD.		SCALE: 1" = 10'
	SHEET 1 OF 1 SHEET	DATE: DECEMBER 20, 2016	CAD XXXXX–X_PMGT

D.W.D. PROPERTY MANAGEMENT STANDARDS: 12202016

DISTRIBUTOR PERIMETER DESCRIPTION 4–06J



DISTRIBUTOR BORDER/TITLEBLOCK 4–06K

NW 1/4 SECTION ##, TOWNSHIP # SOUTH, RANGE ## WEST 6th PM

---- ANY COUNTY ----

YOUR DRAWING IN THIS SPACE

PARCEL CONTAINS 0.000 ACRE± (XXXXXX SQ FT)

LEGEND					
EASEMENT ACQUIRED BNDRY EXISTING DW ESMT BNDRY EXISTING DW PROP	DOCUMENT DATED: SEC'Y FILE DOC. RIMS ITEM NO. CARD NO.			MAIN **SUBDIVISION NAME, FILING NO ECT.**	**DISTRIBUTOR NAME** Place legal District address, phone number and e-mail address in this area
	DRN.	PM.	S.		
	APPD.				SCALE: 1" = 100'
	SHEET 1 OF 1 SHEET			DATE: DECEMBER 20, 2016	DR66 NO

D.W.D. PROPERTY MANAGEMENT STANDARDS: 12202016

FAQ's – Easements and Licenses

Q: What are Dynamic blocks?

A: Dynamic block references contain grips or custom properties that change the way the reference is displayed in the drawings after it is inserted. Dynamic blocks included in these examples are:

- BarScale – includes a pull-down list to choose appropriate scale
- SRVY_MON – includes a pull-down list to choose monument type
- DW_Fire Hydrant – rotates 360°
- NorthArrow – rotates within specified parameters
- Legend – includes a pull-down list to choose appropriate legend item. A user defined attribute is included for any unlisted items, hatching shall go on C-PATT layer
- Rotation Note – includes a pull-down list to choose a rotation note or a user defined note

Q: What does Annotative refer to?

A: Objects that are commonly used to annotate drawings have a property called Annotative. This property allows you to automate the process of scaling annotations so that they plot or display at the correct size on the paper. Objects that are annotative in these examples are: text, dimensions, hatches, leaders/multileaders and blocks.

Note: any references given for specific sizes and scales are based on a drawing scale of 1" = 100'

Exhibit A example

The following shows an example of Exhibit A as described in current Denver Water's Engineering Standards, section 4.02.A.2

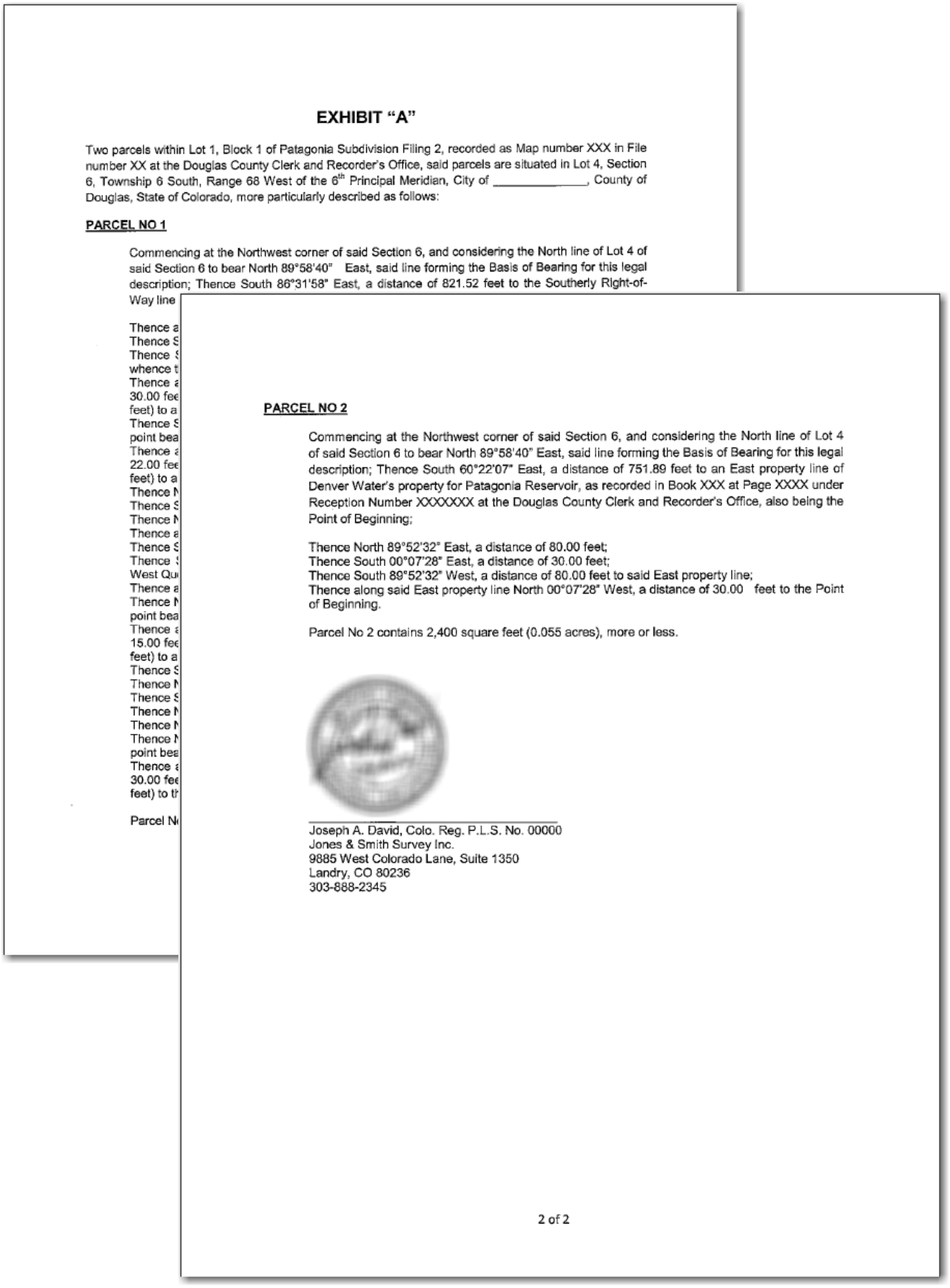


EXHIBIT "A"

Two parcels within Lot 1, Block 1 of Patagonia Subdivision Filing 2, recorded as Map number XXX in File number XX at the Douglas County Clerk and Recorder's Office, said parcels are situated in Lot 4, Section 6, Township 6 South, Range 68 West of the 6th Principal Meridian, City of _____, County of Douglas, State of Colorado, more particularly described as follows:

PARCEL NO 1

Commencing at the Northwest corner of said Section 6, and considering the North line of Lot 4 of said Section 6 to bear North 89°58'40" East, said line forming the Basis of Bearing for this legal description; Thence South 86°31'58" East, a distance of 821.52 feet to the Southerly Right-of-Way line

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Parcel No

PARCEL NO 2

Commencing at the Northwest corner of said Section 6, and considering the North line of Lot 4 of said Section 6 to bear North 89°58'40" East, said line forming the Basis of Bearing for this legal description; Thence South 60°22'07" East, a distance of 751.89 feet to an East property line of Denver Water's property for Patagonia Reservoir, as recorded in Book XXX at Page XXXX under Reception Number XXXXXXX at the Douglas County Clerk and Recorder's Office, also being the Point of Beginning;

Thence North 89°52'32" East, a distance of 80.00 feet;
Thence South 00°07'28" East, a distance of 30.00 feet;
Thence South 89°52'32" West, a distance of 80.00 feet to said East property line;
Thence along said East property line North 00°07'28" West, a distance of 30.00 feet to the Point of Beginning.

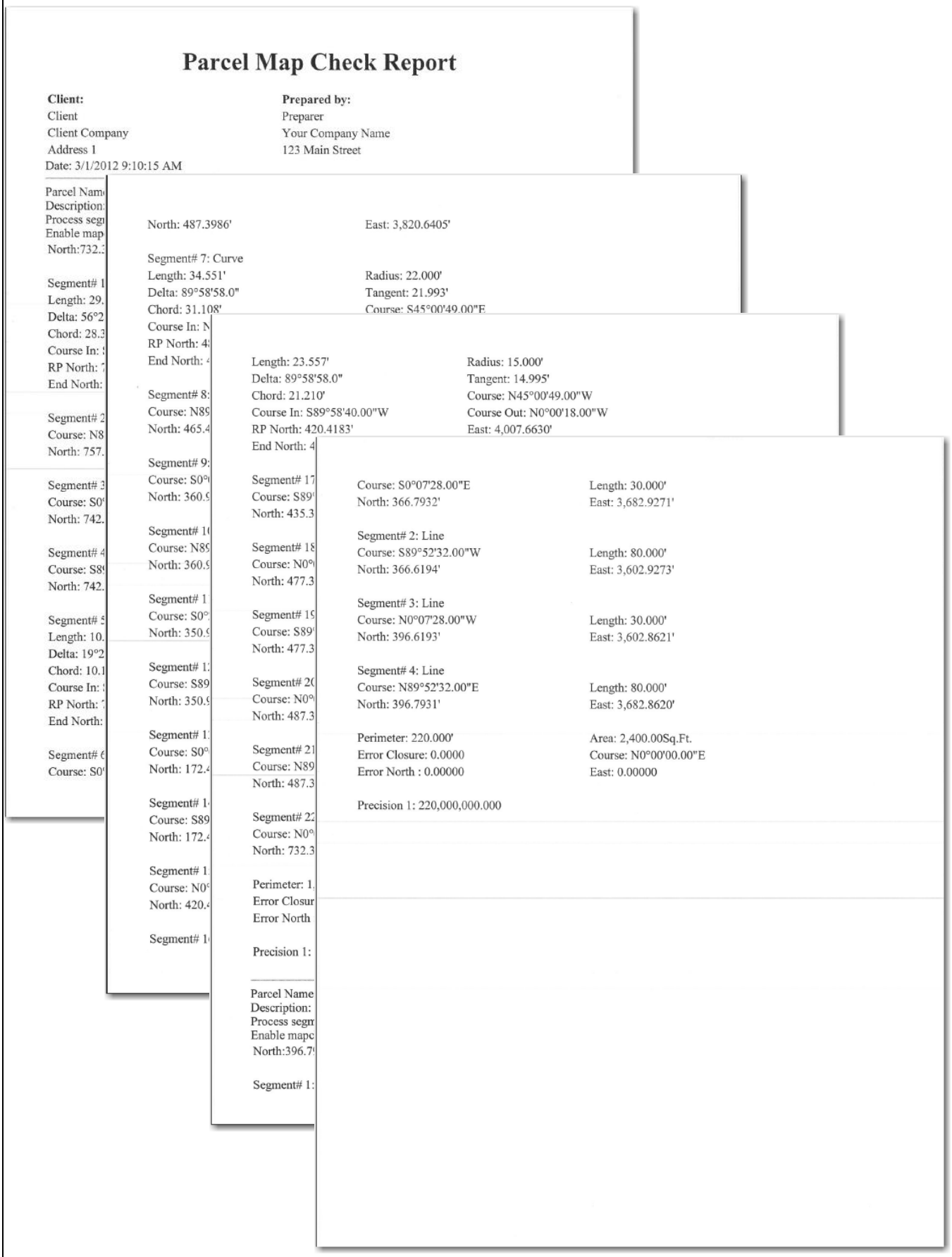
Parcel No 2 contains 2,400 square feet (0.055 acres), more or less.

Joseph A. David, Colo. Reg. P.L.S. No. 00000
Jones & Smith Survey Inc.
9885 West Colorado Lane, Suite 1350
Landry, CO 80236
303-888-2345

2 of 2

Closure Calculations Example

The following shows an example of the Closure Calculations as described in current Denver Water's Engineering Standards, section 4.02.A.2.h



Parcel Map Check Report

Client:
Client
Client Company
Address 1
Date: 3/1/2012 9:10:15 AM

Prepared by:
Preparer
Your Company Name
123 Main Street

North: 487.3986' East: 3,820.6405'

Segment# 7: Curve
Length: 34.551' Radius: 22.000'
Delta: 89°58'58.0" Tangent: 21.993'
Chord: 31.108' Course: S45°00'49.00"E
Course In: N
RP North: 4
End North:

Segment# 8:
Course: N89
North: 465.4

Length: 23.557' Radius: 15.000'
Delta: 89°58'58.0" Tangent: 14.995'
Chord: 21.210' Course: N45°00'49.00"W
Course In: S89°58'40.00"W Course Out: N0°00'18.00"W
RP North: 420.4183' East: 4,007.6630'
End North: 4

Segment# 9:
Course: S0°
North: 360.9

Segment# 17
Course: S89°
North: 435.3

Segment# 10
Course: N89
North: 360.9

Segment# 18
Course: N0°
North: 477.3

Segment# 1
Course: S0°
North: 350.9

Segment# 19
Course: S89°
North: 477.3

Segment# 1
Course: S89
North: 350.9

Segment# 20
Course: N0°
North: 487.3

Segment# 1
Course: S0°
North: 172.4

Segment# 21
Course: N89
North: 487.3

Segment# 1
Course: S89
North: 172.4

Segment# 22
Course: N0°
North: 732.3

Segment# 1
Course: N0°
North: 420.4

Perimeter: 1
Error Closur
Error North

Segment# 1

Precision 1:

Parcel Name
Description:
Process segm
Enable mapc
North:396.7

Segment# 1:

Course: S0°07'28.00"E Length: 30.000'
North: 366.7932' East: 3,682.9271'

Segment# 2: Line
Course: S89°52'32.00"W Length: 80.000'
North: 366.6194' East: 3,602.9273'

Segment# 3: Line
Course: N0°07'28.00"W Length: 30.000'
North: 396.6193' East: 3,602.8621'

Segment# 4: Line
Course: N89°52'32.00"E Length: 80.000'
North: 396.7931' East: 3,682.8620'

Perimeter: 220.000' Area: 2,400.00Sq.Ft.
Error Closure: 0.0000 Course: N0°00'00.00"E
Error North : 0.00000 East: 0.00000

Precision 1: 220,000,000.000

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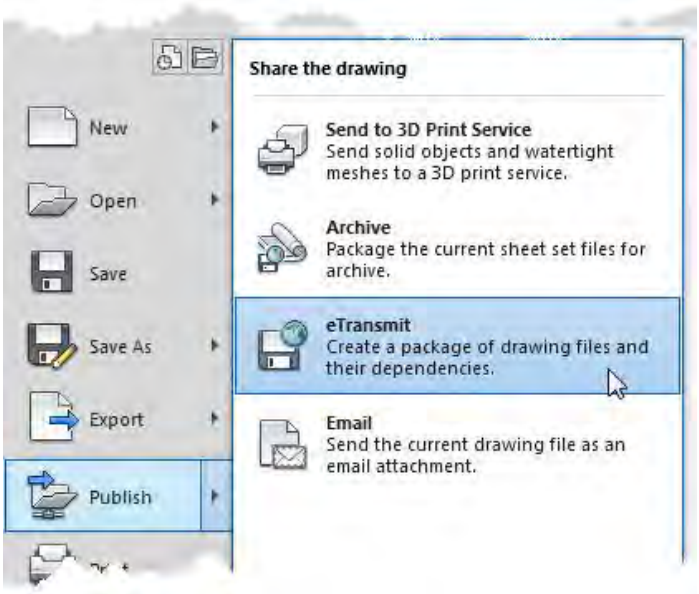
Submittals – Easements and Licenses

Submittals to Denver Water are to include, but are not limited to, hard copies, .DWG files, and an E-transmit of said files. When submitting plans, refer to current Denver Water's Engineering Standards, in addition to the CAD Standards, for full compliance.

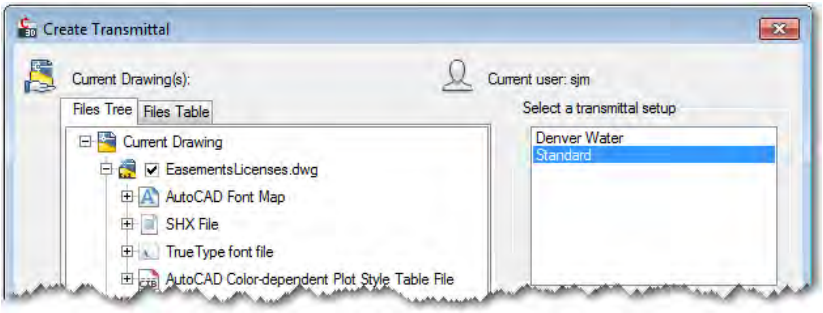
E-Transmit

Submittals to Denver Water can be streamlined by using eTransmit, which in essence packages a set of files for easy sharing. These files should include the AutoCAD® drawing files, AutoCAD® line and font definitions files and other all related dependent files. E-Transmit will automate this process.

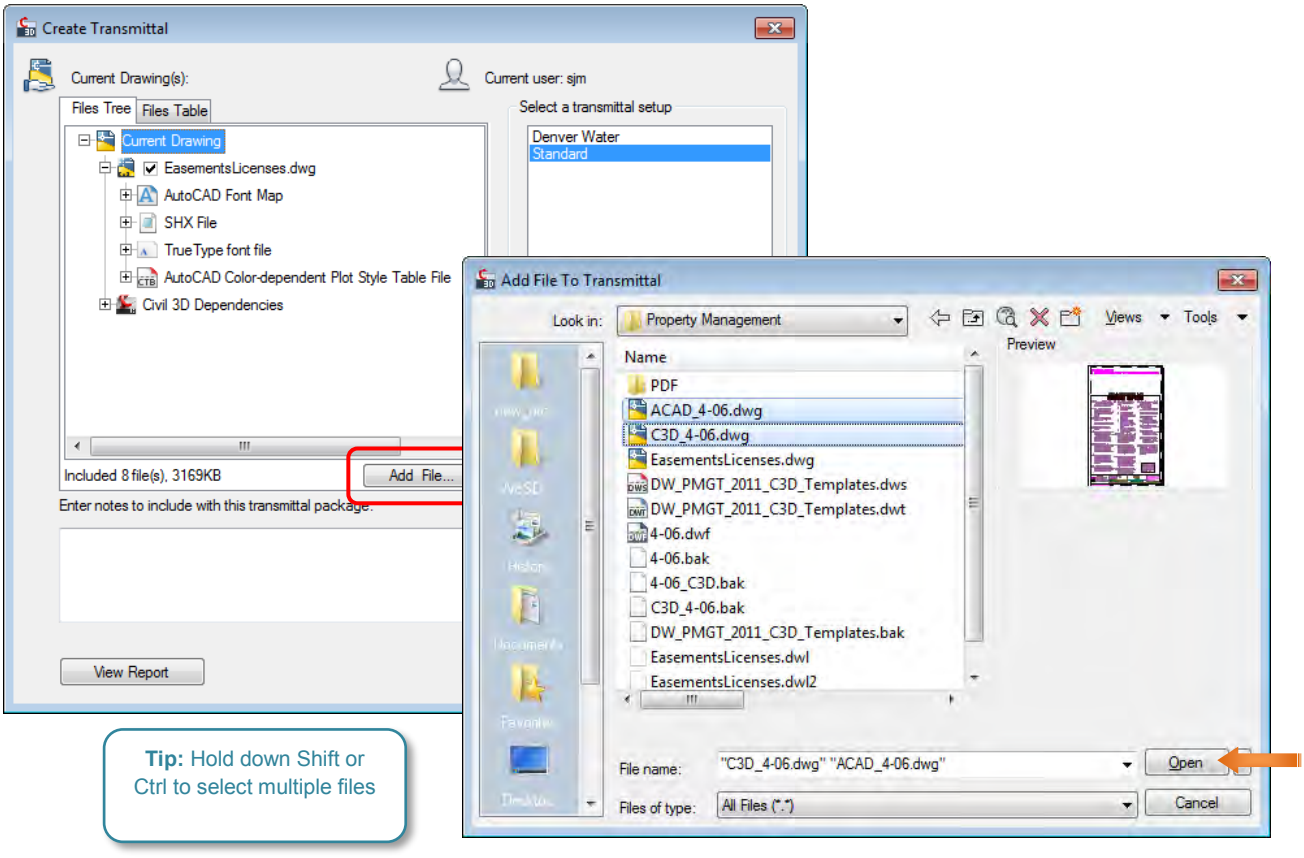
To create an eTransmit click the *Application Menu*, in the top left corner of the AutoCAD® software, select *Publish* and choose *eTransmit* (alternately type **_ETRANSMIT** at the command line):



The *Create Transmittal* dialog box will appear, listing information for the current drawing only:

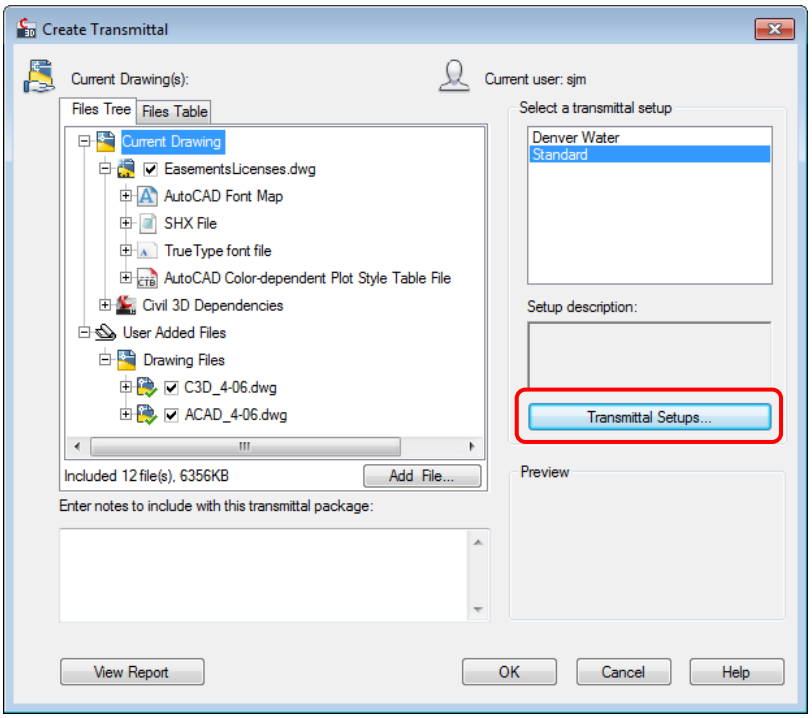


To add more drawings to the submittal click Add File... , the *Add File To Transmittal* dialog window will appear. Browse to the additional file location(s) and select the files to be included in the transmittal, click Open :

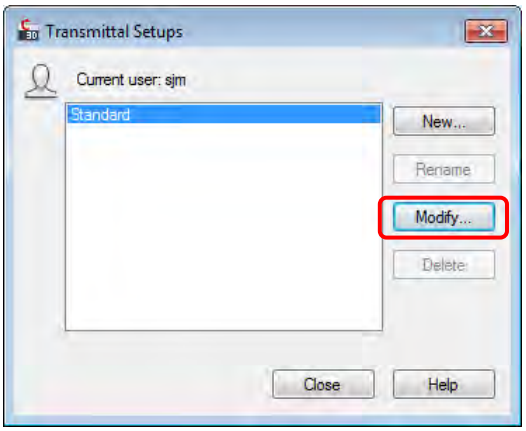


Tip: Hold down Shift or Ctrl to select multiple files

Specific settings must be maintained when submitting to Denver Water. Click the Transmittal Setups... button:



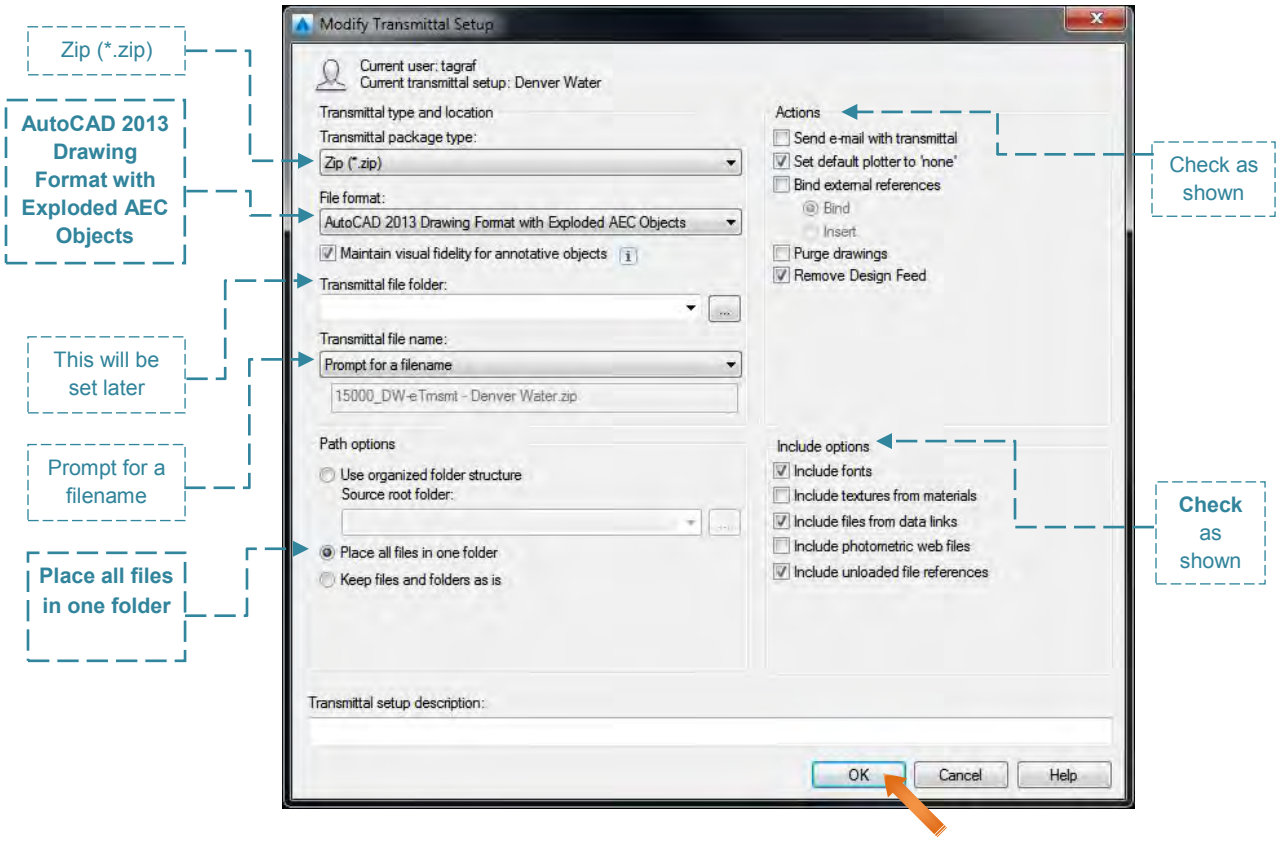
In the *Transmittal Setups* window select "Standard" and click Modify... :



Tip: an eTransmit specific to Denver Water can be saved by clicking

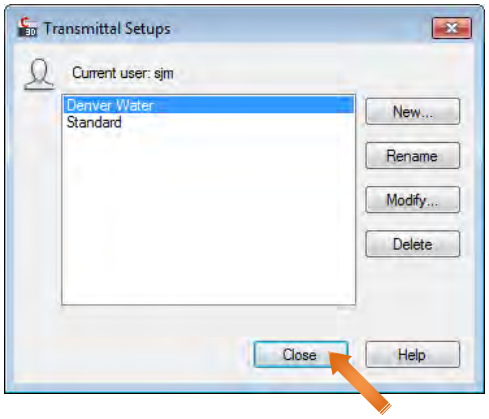
New...

The *Modify Transmittal Setup* pop-up will appear; the example below shows the *required* options, click OK when finished:

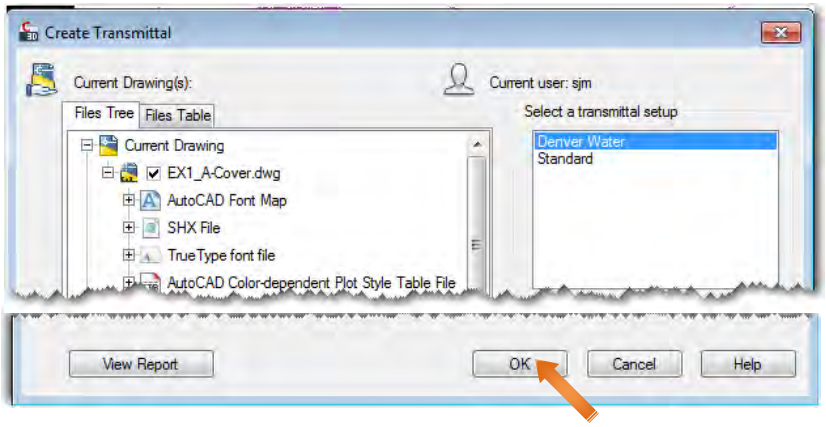


Note: CAD files should be free of Proxy objects; when selecting the "file format" with an E-Transmit, choose the option "AutoCAD 2013 Drawing Format with Exploded AEC Objects."

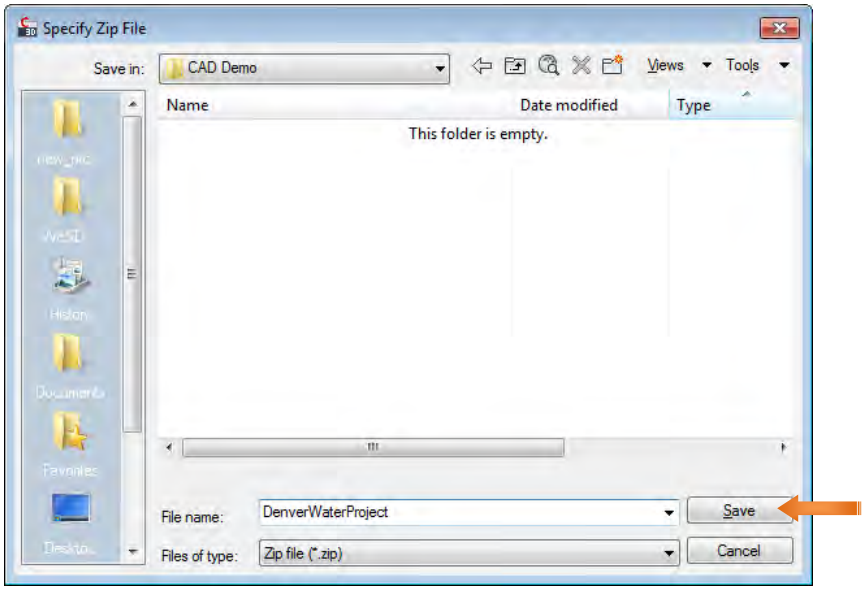
Close the *Transmittal Setups* pop-up:



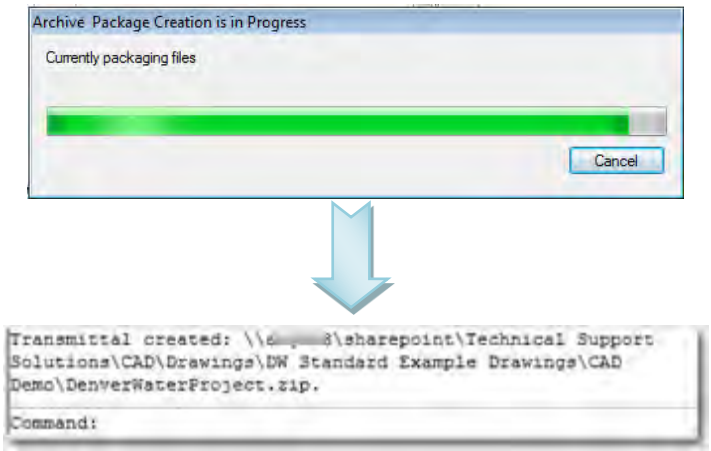
In the *Create Transmittal* window click OK:



The *Specify Zip File* pop-up window will appear, navigate to the location where the .zip file should be stored and name the zip file appropriately, click Save :



The *Archive Package Creation is in Progress* pop-up will appear; wait a few seconds for this to finish and review the command line, which will show the status of the transmittal package:



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Easements & Licenses Submittal via Dropbox

Refer to Denver Water's current Engineering Standards, Chapter 4 and CAD Standards — Section 20.0, Pages 20.0-59 – 99

For Inside Denver & Total Service

- ☐ A letter of request that Denver Water accepts the proposed easement, giving the name of the property owner (grantor) and the person(s) authorized to sign
- ☐ An original signed and sealed written legal description PDF with closure sheets
- ☐ AutoCAD file of easement exhibits in compliance with CAD Standards and current Engineering Standards' specifications (via Dropbox)
- ☐ Electronic file of the Title Commitment with legal description of the **easement area only** with hyperlinks to the referenced B-2 exceptions – a commitment for the entire property or for fee simple conveyance is not acceptable
- ☐ An exceptions map showing the proposed water line easement and all plotted exceptions
- ☐ A copy of the overall site plan
- ☐ A copy of the recorded or unrecorded plat if available and/or applicable or ASCM

For Read & Bill and Master Meter service areas

- ☐ AutoCAD easement via Dropbox, drawn to Denver Water's current Engineering Standards' specifications
- ☐ Copy of the fully executed and recorded easement agreement on Denver Water's standard form (Denver Water must review before recording)

NOTE: The full easement package must be submitted at the time of formal submittal.

Easement Types:

1. 30-foot PUD/PBG: Sample — PUD/PBG Easement Agreement

- Typically used in developed areas
- Non-Exclusive — Allows other utilities in the easement
- The entire 30-foot area must be hard surface
- Permanent delineation on both sides

2. 30-foot Exclusive: Sample — Exclusive Easement Agreement

- Typically not used because of its restrictiveness. This type of easement might be used to achieve a waterline loop through undeveloped land. Other utilities are not allowed in the easement; the crossing of utilities at right angles is also prohibited
- Hard surface and delineation is not required

3. 50-foot Non-Exclusive: Sample — Non-Exclusive Easement Agreement

- Typically used in undeveloped areas or to meet looping requirements outside of the roadway (i.e., crossing a greenbelt/open space area to achieve loop). ***NOTE: Not to be used to circumvent parking restrictions through a PUD easement***
- Non-exclusive — Allows other utilities in the easement
- Hard surface and delineation is not required

Helpful Hints for Easement Design — common errors and missed items include, but are not limited to the following:

- Acceptable street cross-section on the water only plan; must show other utilities, surfacing type, thickness, and easement delineation
- Parking is NOT allowed in the PUD/PBG easement
- Hydrant pocket easements require a minimum of 5-feet from the operating nut on the hydrant to the easement/property line
- When a hydrant lateral extends more the 20-feet beyond the edge of the ROW/ESMT, then a 30 or 50 foot easement is required in lieu of the 10-foot pocket easement
- Easement widths are a minimum of 30 to 50 feet depending on the easement type
- Structures, light poles, signs, trees, shrubs, fencing, etc. shall not encroach into the easement
- Delineation is required on both sides of the PUD easement
- The easement must follow the radius of the curbs in the roadway for delineation
- Gates are allowed by special provision, but they must be a minimum of 14-feet wide and centered over the waterline; Denver Water must have 24-hour access to the main
- The easement must be clearly shown and marked on the plans
- Landscaping is not allowed in the PUD/PBG easement
- Traffic islands are not allowed in the easement
- The easement may not have more than a 4% cross slope

Please see Easement Requirements for more information or contact Water Sales at WaterSales@denverwater.org if you have any questions concerning Plan Review.

Final Product – Easements & Licenses

The final product submitted to Denver Water shall be:

- Plans and supporting documentation submittal in compliance with current Denver Water's Engineering Standards, Chapter 4
- Plotted hard copy of drawing(s) using ***DW Engineering-PMGT.ctb*** (no exceptions) (see *Layer Color Chart - Page 20.0-11*)
- CD-R containing
  - Zip file including DWG files and all supporting dependencies (see *e-Transmit - Page 20.0-91*)
  - Remaining support files not added with e-Transmit
  - Standards Audit file (see *Printing Standards Audit Report - Page 20.0-16*)

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