Civil 3D Introduction - 2010

1. General Info
    a. AutoCAD is part of Civil 3D, but some AutoCAD commands are hard to find in Civil 3D
        i. <RC> in drawing to get Options dialogue box.
        ii. <RC> in drawing to get Quick Select dialogue box.
    b. Civil 3D has many more commands, specific for Civil Engineers.
2. Lots of help managing projects and creating/editing objects
    a. Manage projects with **Toolspace Pallette** and its **Prospector**, **Settings**, and **Survey** Tabs (**View Tab→Palettes Panel→Toolspace Button).**
    b. **Panorama** – A window that displays data in table form for the objects in a collection that is selected in Toolspace. For example, if you select a point group, the Panorama table displays a row for each point.
    c. Pops up when needed.
    d. **Labels** – lots of versatility in adding and changing labels
3. Intro Activities (**DON'T SAVE ANY DRAWINGS**!)
    a. All Tutorial drawings at Program Files/AutoCAD Civil 3D/Help/Civil Tutorials/Drawings. I've put Drawings we need in "Civil 3D Files" folder on p Drive, copy folder to your directory first!
    b. Layers, Alignments & Parcels (**intro-1.dwg**)
        i. Select the **Layer Drop Down List** and see all of the layers used in this simple site map! (**Home Tab→Layer Panel).**
        ii. The **Toolspace Prospector** is one way to manage the elements of a drawing (**View Tab→Palettes Panel→Toolspace Button→Prospector Tab).**
            1. **Points** & **Point Groups** – **Open Point Groups**, <RC> **All Points** & select **Edit Points**. Look at table of all of the points on the drawing.
            2. **Surfaces** – Just what they sound like. Digital Elevation Model. Surface made of triangles connecting closest points.
            3. **Alignments** – Horizontal features like roads. Can be part of a site.
            4. **Sites** – A set of related Alignments and parcels (e.g., housing development).
                a. Alignments
                b. Parcels – boundary, right-of-way, wetland
            5. **Pipe Networks** – A bit like an alignment, but specific to Pipe networks, which can branch and loop.
            6. **Corridors** – 3d road model with alignment (horizontal), profile (vertical), and cross-section (assembly)
            7. **Assemblies** – cross-sections (roads, ditches, berms)
            8. **Survey** – Interface with surveying data
                a. NOT the old **PNEZD** file (Point, Northing, Easting, ZED, Description) but the RAW data, so you can edit an erroneous rod height, for example, and correct data.
                b. Field crew can provide information to avoid having to connect all of the dots in the office.
        iii. **Toolspace→Prospector→Sites→Site 1→Alignments→Centerline Alignments**.
            1. RC **Alignment - (2)** and select **Zoom To**. Zoom, Pan & slide cursor over the road to see **Stations, PC**, **PT** & **PRC**.
            2. RC **Alignment - (3)** and select **Zoom To**. Then Zoom out a little and select the Alignment. Click on a grip and pull the alignment south. Note the stations are recalculated. Undo the alignment change.

iv. **Toolspace→Prospector→Sites→Site 1→Parcels**. Note the different kinds of parcels. See the **preview pane** below the Prospector. It lists all of the parcels in the site. If you don't, click on the **magnifying glass** near the top of the Prospector. Click on the different types of Parcels.
    1. <RC> on **Single-Family 126** & **Zoom To**. Then zoom out to also see the open space parcel to the North. RC it again & select **Properties**. Change its **Object Style** to **Open Space**. See its name on the **Prospector** change and its **color**. Change it back.
    2. <RC> on **Open Space 101** & **Zoom To**. Zoom out until you can see the parcels on either side. Click on the **Site Open Space Label** and move it to the empty land to the North. **Parcel Tab→Add Labels→Single Segment**. (Note: Parcel Tab or Parcel Segment Tab appears once one is selected in drawing.) Select the angled border of **Parcel Standard 130**. Select the arc boundary of **Parcel Standard 135**. **Esc**. The Length/Bearing/Angle dimensions are created automatically.

c. Surfaces & Contours (**intro-2.dwg**)
    i. Colors show different elevations – leave cursor over different colors & see different elevations
    ii. Switch to SE Isometric View & back (**View Tab→Views Panel→View Box Drop Down**). See surface as what it really is, irregular triangles between points of known elevation, a TIN. Switch back to top view.
    iii. **Toolspace→Prospector→Surfaces** <RC> on EG (a surface)→**Surface Properties**. In **Surface Properties** box – **Information** tab, change **Surface Style** to Border & Contour. OK. Now you see contour lines.
    iv. Go back to **Surface Properties** box, select drop down box to right of Border & Contour & select **Edit Current Selection**. Go to **Contours** Tab and open **Contour Interval** & change Minor Interval to 10 (Note Major Interval changes). OK. OK. Switch to SE Isometric and Back.
    v. In the **Surface Style Box** you can change numerous properties. E.g., in **Display** tab you can determine, for a give surface style, what surface properties will show up in 2D or 3D views.
        1. Get to **Surface Style** box 2 different ways: (1) **Toolspace→Prospector→Surfaces** RC on EG (a surface)→**Surface Properties**. Information tab. Pick **Surface Style** and select **Edit Current Selection** from drop down list to right; or (2) **Toolspace→Settings→ Surface→Surface Styles** then RC on a style (e.g., Standard) **→Edit Surface Style**.

d. More Surfaces & Contours (**surface-2.dwg**)
    i. Edit **Surface Styles** in **Toolspace→Settings→Surfaces→Surface Styles** then RC on a style (e.g., Standard) & select **Edit**. Note –**Display** tab is where you can select what is displayed in a given surface style. Turn off **Points**; turn on **Elevation**. The **Analysis** tab is where you can adjust elevation settings. On the **Contour** tab see Contour Depressions. Change the **Tick Mark Length** to 50' and select **Apply**. See the depressions on the map? Change it back to 5'.
    ii. To Select different **Surface Styles, Toolspace→Prospector→Surfaces** then RC XGN (a surface) **→Surface** Properties. Select **Surface Style** in **Information** Tab. Border & Triangles & Points style has 3X vertical exaggeration to help see relief. **View Tab→Navigate Panel→Free Orbit (in middle drop down list)** and play. Use **Undo** to return to Boundaries & Contours style.
    iii. Label Contours & Add Elevations
        1. Go to a previous defined closeup using **View Tab→Views Panel→Named View**. In **View Manager** open **Model Views** and select **Surface Labels**. Select **Set Current**. OK. Draw a **Polyline** (**Home Tab→Draw Panel→Polyline**) from the left circle to the middle circle to the right circle. Click on any object on the map (except the polyline) to get the Surface Tab to appear. **Surface Tab→Add Labels→ Contour – Multiple**. With cursor in drawing, <RC> and select **Object**. Select **Yes**. Select the **Polyline** ↵. See the elevations you just

created. Select the **Polyline** again and move a **grip** to change the label values and locations.

2. In the **Add Labels** drop down list select **Spot Elevation**. <LC> to put elevation labels along the ridgeline and down the ridge to define one of the saddles. Select one of the spot elevations. The **Labels Tab** appears. In the **Modify Panel**, select Edit Label Style from the leftmost drop down list. Change **Standard** to **Foot Meter**. OK. See how the spot elevation changes.

e. Watersheds – Areas that drain off the surface boundary or to a flat area or depression. (**Surface-4B.dwg**)
   i. Water Drop Analysis
      1. **Click on an object in the map to get the Surfaces tab to appear.** In the **Analyze Panel**, select the **Water Drop** button. In the **Water Drop** Dialogue Box make sure the settings are: **Path Layer** is **C-TOP-WSHD, Place Marker at Start Point** is **YES**, and **Start Marker Style** is **WD Start**. OK. Click various high points in the drawing to see the water drop path. Try the center of road on the West side (Zoom in first).

f. Importing Survey Data (**survey-2.dwg**)
   i. After specifying a number of setting & creating various Survey Equipment & Figure Prefix Databases (already done for **survey-2.dwg**), one can import survey data from an electronic field book created by surveying a site using a Total Station.
   ii. **Home Tab→Create Ground Data Panel→Import Survey Data**
   iii. In the **Import Survey Data Box**, on the **Specify Database** page, under **Survey Databases**, select **Survey 1**. If you need to create a survey database, you can click **Create New Survey Database** and type **Survey 1**. Click **Next**.
   iv. On the **Specify Data Source** page, under **Data Source Type**, select **Field Book File**. Under **Source File**, browse to **Survey-1.fbk** and open it. It should be in the same folder as the survey-2.dwg file. Click **Next**.
   v. On the **Specify Network** page, click **Create New Network**. In the **New Network Dialog box**, for Name, enter **Survey Network 1**. **OK**. Click **Next**.
   vi. On the **Import Options** page, specify the following parameters: Current Equipment Database-**Sample**; Current Equipment-**Sample**; Show Interactive Graphics-**Yes**; Current Figure Prefix Database-**Sample**; Process Linework During Import-**Yes**; Current Linework Code Set-**Sample**; Process Linework Sequence-**By Import Order**; Assign Offset To Point Identifiers-**Yes**; Point Identifier Offset-**10000**; Insert Network Object-**Yes**; Insert Figure Objects-**Yes**; and Insert Survey Points-**Yes**. Accept the remaining default values.
   vii. Select Finish and watch survey data importing into drawing.
      1. Look at entire drawing and look at where stations & rod were used.
      2. **Toolspace→Survey→Survey Databases→Survey 1→Networks→Survey Network 1→Setups** & <RC> on a Station & **Zoom To**. Also look at preview pane. Zoom out to see entire site. Select Survey lines & delete, or (**Toolspace→Prospector→Survey→ Networks→Survey Network 1** and select **Remove from Drawing**.)
      3. **Toolspace→Survey→Survey Databases→Survey 1→Figures** & <RC> on a Figure & **Zoom To**.
         a. <RC> & **Remove from drawing** (check Prospector)
         b. <RC> & **Insert Into Drawing**
      4. **Toolspace→Prospector→Survey→Figures** <RC> on a Figure & **Zoom To**.
         a. In drawing, select a Figure, <RC> **Browse to Survey Data** & you go back to **Toolspace→Survey**.

5. **Toolspace→Survey→Survey Databases→Survey 1→Survey Points** to see all points in preview pane.
6. **Toolspace→Prospector→Survey 1→Point Groups→Survey-1.fbk** <RC> **Delete Points** to get rid of points and labels.

g. Create Design Panel - (**align-1.dwg**) - **Home Tab→Create Design Panel**
   i. **Parcel** – A discrete piece of 2D area. For example, a subdivision is composed of numerous parcels. Synonymous with lot.
   ii. **Feature Line** – An object in that the grading commands can recognize and use as a footprint. Usually, a line that marks some important feature in the drawing, such as a ridge line, or the bottom of a swale. See also footprint.
   iii. **Grading** – The process used to model the finished ground surface.
   iv. **Alignment** – A series of 2D coordinates (northings and eastings), connected by lines, curves, or spirals, used to represent features such as the road centerlines, edges of pavement, sidewalks, or rights-of-way.
   v. **Profile** – An object that contains elevation data along a horizontal alignment or other line. There are two main types of profiles: surface and layout. Profile data objects can be viewed within a profile view object.
   vi. **Corridor** – Any path, the length and location of which are typically governed by one or more horizontal and vertical alignments. Examples are roadways, railways, traveled ways, channels, ditches, utility runs, and airport runways.
   vii. **Intersection** – The point where two or more lines, arcs, figures, or objects join or cross in two- or three-dimensional space.
   viii. **Assembly** – An AutoCAD Civil 3D drawing object (AECCAssembly) that manages a collection of subassembly components, such as travel lanes, curbs, shoulders, and ditches, to form the structural elements of a roadway or other corridor-type structure.
   ix. **Pipe Network** – A pipe network object manages a collection of pipe objects and structure objects that are used to represent a pipe network in a drawing.

h. Alignments (stay with **align-1.dwg**)
   i. Zoom in to see circles A through E. **Home Tab→Create Design Panel→Alignment Drop Down→ Alignment Creation Tools**. In **Create Alignment - Layout box** change **Alignment Style** to **Local Road**. Make sure the **Site** dropdown list is set to **Site**. OK. The **Alignment Layout** Toolbar opens. On left-most drop down list, select **Tangent-Tangent (with Curves)**. Click the centers of circles A, B & C in that order. Adjust object snap settings if needed. **Return**. Close the **Alignment Layout** Toolbar.
      1. **Toolspace→Prospector→Alignments**. Alignment 1 has been created. <RC> on **Alignment – (1)** in the **Prospector** & select **Zoom To**. At circle B, note the Point of Curve (**PC**) & Point of Tangent (**PT**).
      2. **Annotate Tab→ Labels & Tables Panel→Add Label Drop Down List/Alignment/Single Segment** & click on straight segments between A & B and B & C. See Length & Bearing, Length, Radius & Angle. Zoom In.
   ii. **Home Tab→Create Design Panel→Alignment Drop Down→Alignment Creation Tools**. In **Create Alignment - Layout** box change **Alignment Style** to **Design Style**. Make sure the **Site** dropdown list is set to **Site**. OK. The **Alignment Layout** Toolbar opens. On left-most drop down list, select **Curve and Spiral Settings**. Check **Spiral in**, **Curve** & **Spiral out**. Change **Spiral in Length** to **50**, **Default Radius** to **150** & **Spiral out Length** to **50**. On left-most drop down list, select **Tangent-Tangent (with Curves).** Click the centers of circles C, D & E in that order. **Return**.

1. **Toolspace→Prospector→Alignments→Centerline Alignments**. Alignment 2 has been created. <RC> on **Alignment – (2)** in the **Prospector** & select **Zoom To**. At circle D, note the Tangent to Spiral (**TS**), Spiral to Curve (**SC**), Curve to Sprial (CS) & Spiral to Tangent (ST).

i. Profiles (**profile – 1.dwg**)
   i. This drawing has two parallel alignments: **Ridge Road** & **Power Line**. Look at the alignments more closely, then return to original drawing view.
   ii. **Home Tab→Create Design Panel→Profile Drop Down→Create Surface Profile**. In **Create Profile From Surface** box, in **Alignment** drop down list select **Ridge Road**. Click **Add**.
      1. Select **Sample Offsets**. Enter **25,-25** in Sample Offsets field. Click **Add**. In **Profile List** change **Descriptions** to **CL** (Centerline), **RO** (Right Offset) & **LO** (Left Offset). In **Update Mode** column, change **Left Offset** value to **Static**. Select **Draw in Profile View**.
      2. In **Create Profile View** wizard select **Profile Display Options**. In **Specify Profile Draw Options** Table, DC **Style** cell for **Left Offset**. In **Pick Profile Style** box, change style to **Existing Ground**. OK.
      3. Select **Create Profile View**. Put cursor to right of drawing and LC. Look at the profiles more closely. Note the different style for the Left Offset. Note the Points of Vertical Intersection (PVI) with station (S) and elevation (E) information. PVI identify points where the slope changes.
         a. **Toolspace→Prospector→Profile-1→Sites→Site→Alignments→Centerline Alignments→RidgeRoad→Profiles** to see the profiles belong to their alignment.
      4. Click on the **Ridge Road** Alignment in on the plan view, grab a grip and move the alignment. Go back to the profile you just made and see that the dynamic profiles are updated, but the **LO** profile (static) is not.