## Video web page for training

This outline, sample files and related videos are at http://www.traverse-pc.com/videos_g2346.htm.
Or just visit www.traverse-pc.com and click the 'Online Videos' link and scroll down to the PLSS section.

## Desktop Layout

1) Learning Guide p5 "Using the TPC Desktop"
2) "TPC Desktop" video – 5 min

## Using program settings

1) Open G2346-1.trv
2) From the desktop, choose ***Tools | Program Settings…***
3) Set the ***Survey Data*** path
   a) Click the Survey Data tab
   b) Change the ***Survey Folder*** to C:\Tmp
4) Check the ***Program Data*** path
   a) Click the ***Program Data*** tab
   b) Windows 7 uses C:\ProgramData\...
   c) TPC stores drawing templates, blocks, dictionary, and all your user settings here
5) Close the ***Program Settings*** dialog
6) Extra Credit: Use Windows Explorer to open C:\ProgramData\Traverse PC\TPC Desktop 2011

## Starting a new survey

1) Create a new job folder ..\G0001
2) Create a new survey ..\G0001\G0001.trv.
   a) File | New Survey… and click the Survey tab
   b) Use Browse to create the G001 folder and G0001.trv filename
   c) Notice that Browse starts at your Survey Data folder
   d) Enter the following survey information
      i) Survey: Dependent Resury
      ii) Location: T29SR12W
      iii) Job ID: G0001
      iv) Units: Feet
3) Set the CRS
   a) Click the Coordinate Reference System tab
   b) Choose NAD83 (Conus), Oregon South, International Foot, GRS80
4) Set the Project Factors
   a) Click the Project Factors tab
   b) Set Elevation to 2800
   c) Choose the PLSS preferences for ***Distance*** and ***Direction***
5) ***OK*** to close the ***Survey Information*** dialog.
6) Do ***Tools | Survey Information***
   a) Three dots… means there is a dialog
***7)*** Do ***Tasks | Survey Information | Edit Survey Information…***
8) We manage survey stuff in desktop window
   a) survey info, LS network, import/export, save file, coordinate conversion, etc.

## Importing Trimble geodetic points

Import ASCII from GPS software (Trimble Business Center)

***1)*** Choose ***File | Import…***
2) Select ***ASCII*** from the ***Type*** list
***3)*** Click the settings button ***[…]***
   a) Enter ***P,T,G,D*** for Import/Export formats
   b) Enter ****.asc*** for extension
   c) Choose ***Save*** for Save Format dialog
      i) Choose ***New***
      ii) Enter ***Trimble Business Center*** and ***OK***
      iii) ***OK*** to close ***Save Format*** dialog
   d) ***OK*** to close ***ASCII*** settings dialog
4) Use ***Browse*** => ***Preview*** => ***Settings*** to match imported file format
   a) Browse and open ..\TrimbleBusinessCenter\TBC export lat/long.asc
   b) Press ***Preview*** to view data
   c) Check with your ASCII settings
5) Choose ***Import***
   a) Read the Details report and note how many points were imported
6) Close the ***Import*** dialog
7) Open the Point Manager to see the imported points. Guess how many points are listed – 39
8) Choose ***File | Save Survey*** or click the disk icon in the desktop toolbar.

## Importing CMM geodetic points

1) Create a new survey ..\G2346\G2346.trv
2) Set the CRS
   a) Click the ***Coordinate Reference System*** tab
   b) Choose ***NAD83*** (Conus), ***Oregon South***, ***International Foot***, ***GRS80***
3) Set the Project Factors

a) Click the ***Project Factors*** tab
b) Set ***Elevation*** to ***3800***
c) Choose the PLSS preferences for Distance and Direction

4) Choose ***File | Import…***
5) Select ***ASCII*** from the ***Type*** list
***6)*** Click the settings button ***[…]***
   a) Enter ***P T -G Z*** for Import/Export formats
   b) Enter ****.txt*** for extension
   c) Choose ***Save*** for Save Format dialog
      i) Choose ***New***
      ii) Enter ***CMM COGO List*** and choose ***OK***
      iii) ***OK*** to close Save Format dialog
   d) ***OK*** to close ASCII settings dialog
7) Use ***Browse*** => ***Preview*** => ***Settings*** to match imported file format
   a) ..\G2346\GPS_coors.txt
8) Close the Import dialog
9) Open the Points manager to see the imported points. Guess how many points are listed – 4
10) Choose ***File | Save Survey*** or click the disk icon in the desktop toolbar.

## Entering geographical control points

You can enter geodetic positions from OPUS, etc.

1) Open G2346-1.trv and save it as G2346.trv
   a) Use ***File | Save Survey As…***
2) Open the Points manager and pin it
3) Format the Points manager to include Latitude, Longitude, etc.
   a) Choose ***Tools | View | Format View*** or press [F9]
   b) Set the ***Format*** to ***PDQJyx*** and ***OK***
4) Enter Lat/Lon directly in Point Manager
   a) Latitudes +/N/n for North
   b) Longitudes -/W/w for West. Use minus key on the number pad
   c) Double click any blank line in Point manager or choose ***Tools | Insert Point***
   d) Enter your own geodetic position like 42.421512345 or -123.151512345
      i) You can do everything from the keypad
5) Coordinate vs Geodetic preference / CRS
   a) Geodetic computed points have Geodetic preference
   b) Grid computed points have Coordinate preference
6) Double click ***GPS_coors.txt*** in the Traverses manager. TPC displays the New Traverse dialog
   a) From ***Format***, choose ***GPS 2D*** and ***OK***
   b) Double click any blank line past point 8 or choose ***Edit | Insert New Point | Append to End*** or arrow down past point 8
   c) Enter your own geodetic position like 42.421512345 or -123.151512345
   d) Notice that coordinates are computed for you
7) Open the Point manager and find the point you just added to the traverse
   a) The new points can be used anywhere in any number of traverses, surfaces, drawings, etc.

## Terminology

1) Geodetic – lat/lng, ellipsoid, PLSS, True Bearing
2) Grid – coordinates, planar, Stake Plane, drafting
3) COGO – most can do either Grid or Geodetic
4) Traverse – Grid or Geodetic (never both)
5) Drawing – Grid or Geodetic (can mix both with advanced traverse settings only)

## Establishing a basis of bearing

1) GPS control points
   a) Start a new Traverse
   b) Explain OP Sequence
   c) Recall 2 existing points OP/BS
2) Manually entered solar observations
   a) Recall 1 existing point and BS reference azimuth (solar, gyro)

## Importing field traverse data from a data collector

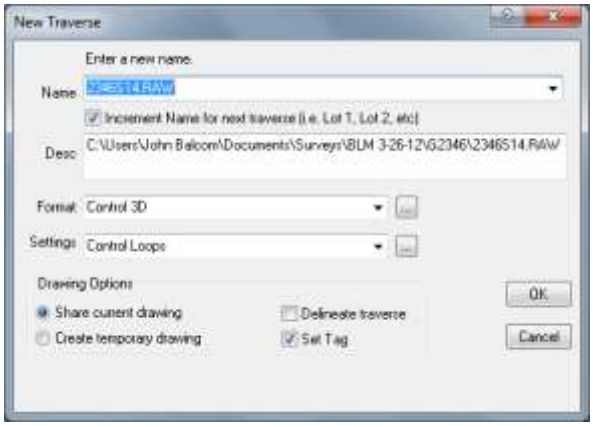
Enter directly into TPC or stored - from supported file types (TDS* .raw/*.job or Trimble Access *.job)

1) Open G2346-1.trv and save it as G2346.trv
2) Choose ***File | Import…***
3) Select ***TDS Raw*** from the ***Type*** list
***4)*** Click the settings button ***[…]***
   ***a) Rotate/Translate***
   ***b) Details***
   ***c) Combine BS, OP, FS***
5) Use ***Browse*** to open ***2346S14.raw***
6) ***Import*** it and ***Close*** the Import dialog.
7) Open the Message View to see the Details Report
   a) Get familiar with this report
   b) Print out a copy for your records

c) Points 3 and 1 have coordinates but have been renamed to 3:1 and 1:1 and translated/rotated to points 3 and 1.
d) COGO points are translated/rotated also.

## Understanding traverses

1) Open G2346-2.trv and save it as G2346.trv
2) Open the ***2346sec14.raw*** traverse and display the New Traverse dialog.
   a) You get this dialog just one time – the first time you open a traverse.
   b) Check the ***Format***. Some DC files start with Grid bearing/distance
   c) Check the ***Settings***.
   d) Tag the traverse to inspect it visually
   e) Open the Traverse View and set it to Single Row per Point
3) Explain Traverse View sequence FS/FS/FS
   a) Check last SS vs FS
4) Explain 'Display Raw Data' toggle
   a) Show extraneous records
   b) Let TPC if you encounter any issues with these
5) Show how status bar tracks BS, OP, FS for angles and distances




## Formatting Traverses

Let's create traverse formats we can use later on.

1) Open the ***2346sec14.raw*** traverse and choose ***View | Format View***. Left click the ***Format*** tab.
2) Create a '***PLSS Record'*** format
   a) Recall the ***Deed*** format.
   b) Replace ***BHYXD*** with ***DBHyx***
   c) Turn on ***Single Row per Point***
   d) Save this format
      i) Choose ***Save Format***
      ii) Replace ***Custom…*** with ***PLSS Record*** and choose ***OK***
3) Create a 'PLSS Control 2D' format
   a) Recall the ***Control 2D format***.
   b) Replace ***YX*** with ***yx***
   c) Turn on ***Single Row per Point***
   d) Save this format
      i) Choose ***Save Format***
      ii) Replace Custom… with ***PLSS Control 2D*** and choose ***OK***
4) You now have 2 new formats you can use anytime

## Computing Traverses

1) The traverse is currently computed as Grid, just like in the DC
   a) Create a Random Inverse summary for 8,8:1 and 2,2:1, setting the dialog types to match the traverse's grid types
2) Change the traverse format to Ground distance at project elevation and recompute
   a) Choose ***View | Format View*** or press [F9] or use the toolbar button
   b) Left click the ***Advanced*** tab and select the ***Distance*** type
   c) Create a Random Inverse summary for 8,8:1 and 2,2:1, setting the dialog types to match the traverse type
3) Select PLSS Distance and Direction types and recompute
   a) Choose ***View | Format View*** or press [F9] or use the toolbar button
   b) Left click the ***Advanced*** tab and select the PLSS ***Distance*** and ***Direction*** types
   c) Create a Random Inverse summary for 8,8:1 and 2,2:1, setting the dialog types to match the traverse

Ultimately, TPC uses the raw data (angles and distances) for its least squares adjustment and in essence adjusts coordinates. But for checking closures, accounting for ground distance in the raw computations probably makes sense.

## Doing quick closure checks with inverses

1) Select points ***17*** and ***6*** in the Traverse View and do a Random Inverse.
2) Select points ***18*** and ***4*** and do a Random Inverse

3) Open the Point Manager and sort on the description to display the = points together
   a) Do a Random Inverse for any of these pairs
      i) Select two points using left click and Ctrl + left click then Random Inverse
      ii) Select one point, Random Inverse then enter the other point

## Checking closure of a loop

Use the closure view to check the closure of a loop in the raw traverse. This traverse combines several loops, but you could have imported each TDS RAW file separately and had separate traverses for each loop.

1) Open the ***2346sec14.raw*** traverse and select point ***3:1*** at the top of the traverse.
2) Expand the view so you can see points ***17*** and ***18*** at the bottom
   a) Left-click and drag the top and/or bottom of the Traverse View window to make it larger.
3) Choose ***Tools | Closure View*** or press [F6]
4) Choose ***Edit | Closure settings***
   a) Closure type – set to ***Closed Point-to-Point***
   b) Closing Points - ***From 3:1***, ***To 17***, ***Correct 6***
   c) Closing Angle
      i) Enter ***196°20'07"*** from point ***18***
      ii) Enter ***6..4*** for ***Correct*** field
5) The Closure View now displays closure error
6) Choose ***View | Include Closure Data***
   a) You can customize the view

## Editing imported traverse data

As a rule, you DON'T edit the DC raw file when using TPC. You import the file as is, and edit the data in the Traverse View.

1) editing field crew input errors
2) editing point names and descriptions
3) entering redundant observations with = sign
4) entering redundant observations with OBS type

## Cleaning up the raw traverse

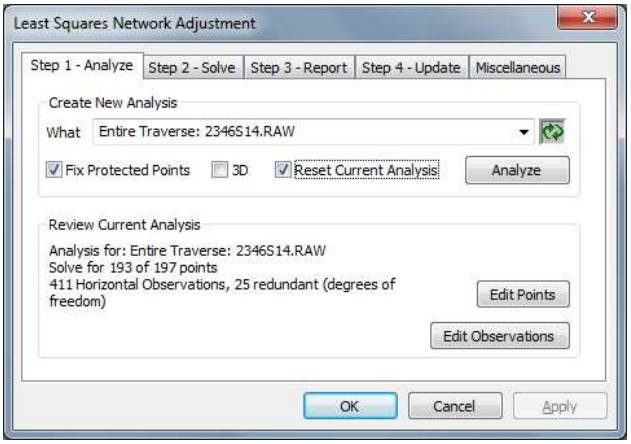
This traverse contains a redundant 'zinger' angle observation. Let's remove it.

1) Choose ***View | Display Raw Data*** or press [Shift]+[F9]
2) Scroll almost half-way down the Traverse View until you find this sequence
   a) 105
   b) 1:1 OBS <- delete this
   c) 105 <- delete this
   d) 104 BS
3) Press [Page Down] twice and notice the blank areas around points 102, 101, 103, 104, 3:1, 1:1
   a) We mention them here because they are extra DC records that TPC doesn't need
   b) You can remove them or leave them
   c) The LS routines don't use them because there is no raw data (angles and distances)

## Computing intermediate LS

We are ready now to do an intermediate LS analysis and report standard errors of adjusted points, residuals and detect any blunders.

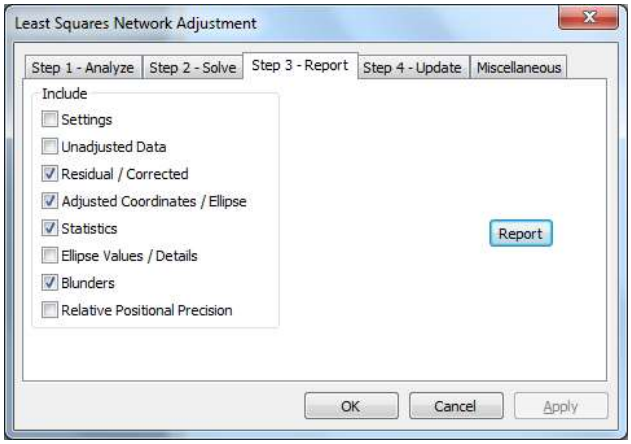
***1)*** From the desktop, choose ***Tools | Least Squares Network Analysis***
   a) We can do LS from a traverse closure view, but we are most likely to do them here because we can select multiple traverses (the LS network)
2) Miscellaneous
   a) Make sure ***Redundant Observation*** is =
   b) From ***A Priori Values*** are set to ***Total Station*** or add your own PLSS
***3) Step 1 – Analyze***
   a) Select the ***2346S14.raw*** traverse from the ***What*** list
   b) Choose ***Reset Current Analysis***
   c) Choose ***Analyze***




***4) Step 2 – Solve***
   a) Turn on Include ***Robustness*** and choose ***Solve***

***5) Step 3 – Report***

a) Match the settings below and choose ***Report***




b) Read the report
   i) Statistics
   ii) Standard errors of points
   iii) Residuals
   iv) Blunders

6) Identify and remove blunders and poor precisions (re-measure if necessary)
7) We have not yet adjusted the survey points. We are just looking around at this residuals.

## Using another import option

1) Open G2346-1.trv and save it as G2346.trv
2) befOpen the Message View, right-click and ***Clear View***.
3) Choose ***File | Import***
4) Select ***TDS Raw*** from the ***Type*** list
***5)*** Click the button ***[…]***
   ***a) Overwrite Imported Coordinates***
   ***b) Details***
   ***c) Combine BS, OP, FS***
6) ***Browse*** to ***2346S14.raw*** and ***Import*** it.
7) ***Close*** the Import dialog.
8) Details in Message View
   a) Starting points report geodetic positions used as basis of bearing and completely ignoring DC coordinates.
   b) COGO points are imported with DC coordinates, so are not rotated/translated

9) Traverse View
   a) In the Traverse manager, open the ***2346S14.raw*** traverse.
   b) Notice the OBS records for 2, 8, etc. These are appropriate for LS but there is really not a way to use them otherwise.
   c) Also notice that in the first loop, TPC 'jumps' to GPS point 2 in the chain of control points. So the error at 17=6 will be off by that jump at 2. Again, this does not affect LS.

## Creating individual loops

1) Open G2346-3.trv and save as G2346.trv
***2)*** Create individual traverses for each loop in this traverse using ***Tools | Add Selected Points to Traverse.***
3) Talk about segregating via import files
4) Untag the original traverse, tag the loops and delineate the first loop in the drawing. Delineate the others.
5) Open the Closure View for the first traverse and edit the closure settings to get closure error.
6) Note: Angular Error currently only works with Grid computations.

## Adding Retrace traverse

We have recovered all 4 quarter corners, the east section corners and 2 line trees on the east section line.

1) Open G2346-4.trv and save as G2346.trv
2) Add a ***Sec 14 Retrace*** traverse and recall existing (found monuments)
   a) Use ***Tools | Draw This Traverse Only*** to see the points as you recall them
   b) Recall a point by typing it in the ***Point*** column and pressing [Enter] twice.
   c) Recall points 30, 4801, 61, 1821, 199, 110, 12.
   d) Add point 30 to close the traverse, but press the [up arrow] so that TPC doesn't automatically add another traverse point. If it does, just delete the extra point so that the traverse ends with point 30.
3) Re-name the GCDB points
   a) Add the ***Description*** column.
      i) Press [F9], click the ***Format*** tab and add the letter ***D*** to the ***Display Sequence***.
   b) Re-label point 30

i) Highlight point ***30*** in the ***Point*** column and enter ***600400***. You just did a global change so it is now 600400 everywhere in the survey.

ii) Add ***#61*** TR to the Description to keep track of the original point number

(1) Highlight the current description and press [Space] to edit the description, then insert ***#61*** before ***TR.***

c) Change the rest of the points

i) 61 = 600440
199 = 600500, 110 = 540500
12 = 540400, 137 = 500440

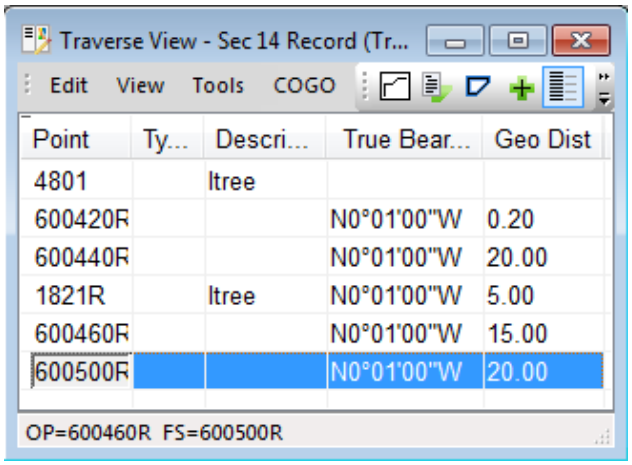
***d)*** Choose ***View | Refresh View***

***e)*** Print the traverse with ***Tools | Print***

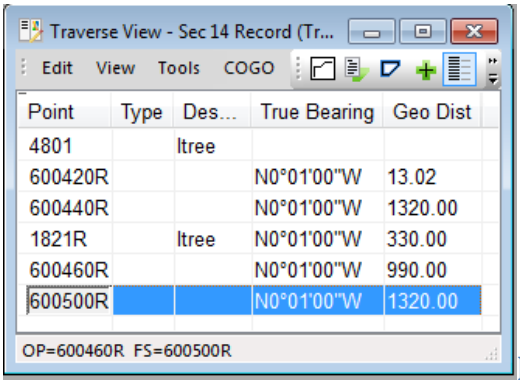
We now have a visual of what monuments we found.

## Adding Record traverse

From SE sec. cor. (600400) N 0° 01'W,
19.80 CH (1306.80 ft.) to southerly line tree (pt. #4801)
20.00 CH (1320.00 ft.) to S 1/16 cor. (600420)
40.00 CH (2640.00 ft.) to E 1/4 cor. (600440)
45.00 CH (2970.00 ft.) to northerly line tree (pt. #1821)
60.00 CH (3960.00 ft.) to N 1/16 cor. (600460)
80.00 CH (5280.00 ft.) to NE sec. cor. (600500)

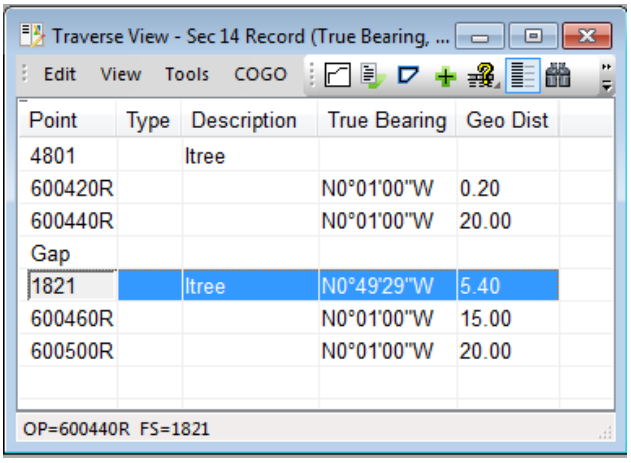



1) Open G2346-5.trv and save it as G2346.trv
2) Add a ***Sec 14 Record*** traverse and enter record (GLO) data for east line.
   a) Format the traverse for chains
      ***i) View | Format View | Advanced | Units***
   b) We don' t need to enter the whole line, just the record data needed for single proportioning of 600420 and 600460
   c) Enter the first bearing ***400.01***, but after that, press [Space bar] then [Enter] to re-use bearing.
   d) These are all new points, so we should NOT see the ***Recall Existing Point*** dialog.
   e) Add an ***R*** to the end of each point label after 4801.
3) Change the ***Units*** back to feet
   a) Display raw data to see the chains you entered
   b) Change units back to chains




## Mixing record data and existing points

1) create record data ONLY where needed
2) use any existing corners to reduce SP errors
3) 4801 and 1821 are both existing monuments, so let's use them both
   a) Highlight ***1821R***, type ***1821*** and press [Enter] twice
   b) Choose ***Edit | Create Gap in Drawing***
4) We ignore the Bearing/Dist at 1821 because it's just an inverse between record and existing



## Tools for finding points

1) Point Manager – sorted by point number, desc, coordinates, etc.
2) Drawing View – right click and choose Edit Traverse.
3) Find command – available in most Traverse View, Drawing View, Point Manager.

## Finding points - example

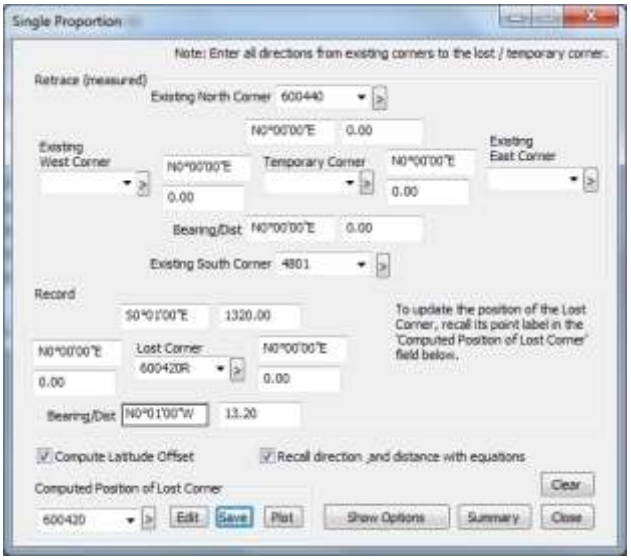
1) Open G2346-6.trv and save it as G2346.trv
2) Tag the ***2346S14.raw*** traverse
   a) Open the Traverses manager and check the box [x] next to the traverse name
3) In the Drawing View, use the ***Find Point*** command to find point 291 (600460). Zoom in 10X
4) Use ***View | Window Extents*** to refine the search area to the N16th corner and it's accessories.
   a) Repeat this as needed to get in close
5) Make sure Zoom Points is turned on so we can drag-n-drop point labels
6) Use Traverse Settings to delineate data
   a) Angle Control points (+)45°
   b) Angle Sideshots (-)45°
   c) Change Sideshot color to dark green and dashed lines
7) Drag the point labels away from the corner so you can see all of them clearly. Keep them close.
8) Try to drag a point symbol away from the point. What happens?
9) Use the tool tips (place the cursor over the label) to identify the points and their descriptions.
10) Right click a line ending at point 234 and choose ***Edit Traverse***.
11) Right click point ***189*** and choose ***Edit Traverse***
    a) Now you can see the point in the context of the control loop
12) Right click point 189 in the Traverse View and choose ***Delineate Point in Drawing***
    a) Notice the point label gets outlined in green
    b) Select point ***208*** in the traverse, then look for the delineated point 208 in the drawing
    c) Select point ***209*** in the traverse. Notice how the drawing view centers point 209 for you.
    d) Notice the Drawing View [+] button that toggles this on/off
    e) Play around with this

## Creating a 'Search Area' traverse

1) Add a new traverse to the Traverse Manager
2) Choose ***Edit | Insert Existing Points…***
   a) Select Proximity
   b) Enter ***From***: 208, ***Distance***: 100 then ***OK***
   c) Delete the temporary point at the end
3) Insert point 208 at the top of the traverse
   a) Select the first point in the traverse and press the [Insert]
4) Make all the other points side shots
   a) Select them and press [F10]
5) Choose ***Tools | Draw Just This Traverse***
6) Double click any drawing entity (symbol, line, label) and select the settings you want
   a) Change ***Side Shot*** color to dark green
   b) Set point label size
   c) Annotate lines if you want
7) Play around with the ***Zoom*** and ***Find*** tools

## Computing 600420 via SP

1) Open G2346-6.trv and save it as G2346.trv
2) Open the ***Sec 14 Retrace*** traverse.
3) We start the record at 4801 in order to do the SP comp at the correct geodetic position
4) Pick the existing corners
   a) In the ***Retrace*** traverse, select points 4801 and 600440 and choose ***COGO | Single Proportion***. Notice the corners that got populated in the SP dialog
   b) In the ***Record*** traverse, highlight 600420R and choose ***COGO | Single Proportion***. Notice the fields that got populated in the SP dialog.



5) In the SP dialog, choose ***Summary***. Notice the inverses between the existing corners and the computed Lost Corner.
6) Save computed corner 600420 and add SP to its description
   a) Enter 600420 in the ***Computed Position of Lost Corner*** field.
   b) Choose ***Edit*** and enter ***SP*** for the ***Description*** then ***OK***.
   c) Choose ***Save*** and tell TPC it's ***OK*** to save this point.
   d) Close the SP dialog.
7) Insert 600420 into the ***Retrace*** traverse
   a) Highlight point ***600440*** and press [Insert]
   b) Type ***600420*** and press [Enter] twice
8) Zoom in on point 600420 in drawing

## Computing 600420 manually

Let's take a look at entering the data for 600420 directly into the SP dialog.

1) Open G2346-6.trv and save it as G2346.trv
2) From the TPC Desktop, choose ***COGO | Single Proportion*** and ***Clear*** the dialog.
3) Drag the SP dialog off of the drawing and use the [>] keys to select 600440 and 4801 from the drawing.
4) Enter the Record data
   ***a)*** Turn off ***[X] Recall direction and distance with equations***
   b) Enter ***600440R*** as the Lost Corner
   c) Notice at the top of the dialog it says that all bearings are TO the lost corner.
   d) Enter ***200.01*** and ***1320*** above Lost Corner
   e) Enter ***400.01*** and ***13.2*** below Lost Corner
5) Choose ***Summary*** and compare your computation with the previous one.

TPC does not retain the record data you just entered to compute 600420. That's why we prefer the previous traverse method.

## Computing 600460 via SP

Repeat the steps above for 600460

1) Start by clearing the SP dialog
2) Pick the existing corners
   a) In the ***Retrace*** traverse, select points ***1821*** and ***600500*** and choose ***COGO | Single Proportion***.
   b) In the ***Record*** traverse, highlight ***600460R*** and choose ***COGO | Single Proportion***.
3) In the SP dialog, choose ***Summary***. Notice the inverses between the existing corners and the computed Lost Corner.
4) Save computed corner 600460 and add SP to its description
   a) Enter ***600460*** in the ***Computed Position of Lost Corner*** field.
   b) Choose ***Edit*** and enter ***SP*** for the ***Description*** then ***OK***.
   c) Choose ***Save*** and tell TPC it's ***OK*** to save this point.
   d) Close the SP dialog.
5) Insert 600460 into the ***Retrace*** traverse
   a) Highlight point ***600500*** and press [Insert]
   b) Type ***600460*** and press [Enter] twice
6) Notice how TPC now includes 600460 in the drawing
7) Stand up and give yourself a pat on the back

## Include the west 1/4 in your drawing

We want to be able to see the west 1/4 as we computed the center section.

1) Open the ***Sec 14 Retrace*** traverse
2) Select the point below ***600440*** and press [Insert]
3) Press [F10] to make the inserted point a side shot
4) Type ***500440*** and press [Enter] twice
5) Do ***Zoom Extents*** on the drawing
6) Change the ***Side Shot*** colors if you want

## Computing geodetic C1/4

We'll compute a geodetic Bearing-Bearing intersect for the center 1/4 (540440G). Actually, this is not a geodetic computation involving two geodesics (great circles) but a PLSS computation on the latitudinal arc between the east-west quarter corners. They are not the same.

1) Open G2346-6.trv and save it as G2346.trv
2) From any view choose ***COGO | Intersect.*** Starting in TPC Desktop 2014 R1, you will see PLSS bearings and distances. So notice that the top of the dialog says True Bearing and Geo Dist.
3) Enter N-S line (Point 1)
   a) ***From***: use [>] to select point 540500
   b) ***Bearing***: enter ***540500..540400***.
4) Enter E-W line
   a) ***Beginning of line***: use [>] to select 600440
   b) ***End of line***: use [>] to select 500440.

   c) TPC has turned on ***[x] Latitude Arc.***
   d) Notice that field 1 in Computed Intersections turns from gray to white, indicated it has been computed.
5) Save the computed intersect
   a) In ***Computed Intersections***, field ***1***, enter ***540440G***.
   b) Choose ***Edit*** and enter ***DP*** for the ***Description***, then ***OK***
   c) Choose ***Save*** and say ***Yes***.
   d) Close the Intersection dialog.
6) Add it to the retrace traverse between the north and south corners
   a) Highlight ***540400*** and press [Insert]
   b) Enter ***540440G*** and press [Enter] twice.
7) Explore the new center quarter in the drawing

## Compute 540440P planar

***1)*** From the TPC Desktop, choose ***COGO | Intersect***
   a) Opening any COGO dialog from the desktop re-opens the previous dialog without changing / inserting any new data. So the dialog still holds the geodetic center quarter
2) Reset the dialog to do a Grid intersect
   a) Click Show Options and choose Grid Distance and Grid Bearing. TPC turns off ***[ ] Latitude Arc***.
   b) Choose Hide Options.
3) Enter N-S line (Point 1)
   a) ***From***: use [>] to select point 540500
   b) ***Bearing***: enter ***540500..540400***.
4) Enter E-W line
   a) ***Beginning of line***: use [>] to select 600440
   b) ***End of line***: use [>] to select 500440.
5) Save the planar intersection
   a) In field ***1***, enter 540440P
   b) Choose ***Save***
   c) Choose ***Plot***.
      i) The Plot button adds the point to a special Point Plot traverse so you can see it in the drawing. We use this to verify COGO points without the need to add them to a traverse.

## Exploring the difference between planar and geodetic

1) Use ***Zoom Window*** and ***Window Extents*** to show the separation between the two center quarters
   a) Note: we just drew a grid line between the coordinates of the east and west quarter corners, so 540440P lies on the grid line and 540440G lies below it. How this line is drawn is a drafting issue and does not affect the computation of the center quarter.
2) COGO | Random Inverse from drawing view
   a) Right click ***540440G*** and choose ***Select***. TPC changes it to gray
   b) Right click ***540440P*** and choose ***COGO | Random Inverse***.
   c) Is this what you expected for an offset?
   d) You could right click any other point and choose ***COGO | Random Inverse*** and TPC would display it's inverse to 540440G. This is just another quick way to get information about your survey.
3) To remove point 540440P from the drawing, right click it and choose ***Untag Traverse***.

## Computing CN16 and CS16

We compute these at mid points and can think of this as a single proportion with 50% going to each side

1) Do ***Zoom Extents*** on the drawing so you can see all your retraced section
2) Insert 540460
   a) Highlight ***540440G*** and press [Insert]
   b) Label the new point ***540460***
3) Insert 540420
   a) Highlight ***540500*** and press [Insert]
   b) Label the new point ***540420***

Because this traverse is showing True Bearing and Geo Dist, the mid points are inserted geodetically. If the traverse had been showing grid bearing and distance, the mid points would have been inserted as grid.

## Computing single proportion through multiple corners

What if multiple corners are missing in a direction? Let's say we didn't find 600440 and want to generate a search area for it.

1) Open G2346-7.trv and save it as G2346.trv
2) Select ***4810*** and ***1821*** as the existing corners in the ***Retrace*** traverse and choose ***COOG | Single Proportion***.

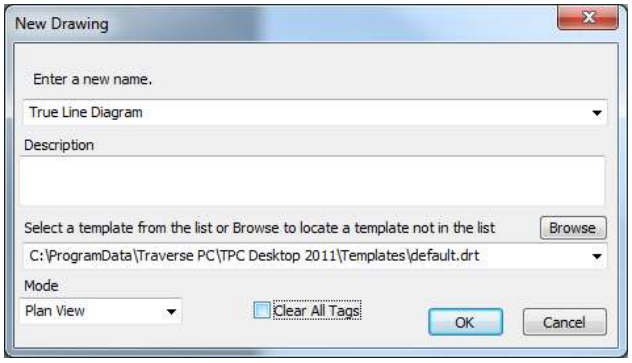
3) In the ***Record*** traverse, select points ***4810***, ***600440R*** and ***1821R*** and choose ***COGO | Single Proportion.***

The SP inverses across 4810..600440R and 600440R..1821R to generate the record data. So any number of record calls can be included in the record inverse. Think about how important this is on township and range lines.

## Creating a 'True Line' diagram

Let's take a quick detour into drafting. Whether your intention is to create a true line diagram or a finished plat, the steps here are the same.

1) Open G2346-7.trv and save it as G2346.trv
2) Open the Drawing Manager and talk about ***Drawing 1***.
   a) This is a working drawing – we just want to see what we are doing – visual reference
   b) Tag the ***Loop 6*** traverse
   c) Right click the diagonal line and choose ***Gap***.
   d) We use the Quick View tools to help us see where we are and what we did.
3) Create a new ***True Line Diagram*** drawing from the default template.
   a) Double click any blank line in the Drawings manager.
   b) Select the ***default.drt*** template
   c) In the Traverses manager, tag just the ***Sec 14 Retrace*** traverse.
   d) Zoom Extents as needed to center the drawing.
   e) Delete the title block and rearrange the scale bar and north arrow.




4) Connect the 16th corners – 40 lines
   a) In the ***Retrace*** traverse
   b) Insert 540420 as a side shot below 600420
   c) Insert 540460 as a side shot below 600460
   d) Replace 500440 SS with 540440 SS
   e) Insert 50044 as a side shot below 540440G

## Enhance the true line diagram

1) Double click any line or label to display the ***Traverse Settings*** dialog.
2) ***Control Points*** tab
   a) From the ***Symbol*** list, select ***Original corner previously remonumented***
   b) Select ***Distance*** and ***Direction*** options
   c) Find the ***Leader*** toggle and turn it on
   d) Set all the sizes to ***0.10***
   e) Choose ***Apply*** to see your changes
3) ***Side Shots*** tab
   a) From the ***Symbol*** list, select ***Corner established or reestablished this survey***
   b) Select ***Distance*** and ***Direction*** options
   c) Set all the sizes to ***0.10***
   d) Choose ***Apply*** to see your changes
4) ***OK*** the Traverse Settings dialog to close it
5) Drag-n-drop the line labels by the line trees
6) Drag-n-drop the 4801 and 600420 labels
7) Drag-n-drop any other labels where you want them
8) Find the scale in the tool bar at the top of the Drawing View. Pull down the scale list and choose ***1000 FT/IN***.
9) Set the Drawing Settings
   a) Choose ***Tools | Drawing Settings*** or right click any blank spot on the drawing and choose ***Drawing Settings***.
   b) Left click the Miscellaneous tab
      ***i) [x] Distance Units***
      ***ii) [x] Extra Spaces in Bearings***
      ***iii) [x] Bearing Periods***
      iv) Make sure ***Distance*** and ***Direction*** are set to PLSS options
      v) ***Ok*** to close

## Introducing smart drawing objects

TPC uses the term Smart Drawing Objects because drawing objects can update themselves

1) Right click the north arrow and choose ***Properties***.
2) Turn on the ***[x] Apply User Rotation*** and ***OK***
3) Rotate the drawing
   a) Choose ***Tools | Rotate Survey on Page***
   b) The survey rotates as you move the mouse.

c) Make the east-west lines horizontal more or less and left click
d) Notice how the north arrow rotated
e) Rotate the survey again, but this time, over rotate it and watch the north arrow.

4) To check the rotation amount, choose ***Tools | Drawing Settings | Miscellaneous***. Notice the ***Rotation*** field.

## Exporting coordinates to a data collector

1) Open G2346-8.trv and save it as G2346.trv
2) Write an ASCII coordinate file for the ***Sec 14 Retrace traverse***.
   a) Select the ***Sec 14 Retrace*** traverse in the Traverses manager
   b) From the desktop, choose ***File | Export***.
   c) Select ***ASCII*** from the ***Type*** list.
   d) Select ***[…]*** and enter ***P,Y,X,Z,D*** for the export format. You can save this format if you want.
   e) Choose ***Browse*** and change the file name to ***Retrace Coordinates*** and ***Save***
   ***f)*** From the ***What*** list, choose ***Entire Traverse: Sec 14 Retrace***
   g) Choose ***Export*** then ***Preview***
3) Write a TDS CR5 of all coordinates.
   a) Select ***TDS CR5*** from the ***Type*** list.
   b) The file name changed to G2346.cr5 because the type changed. Leave it there.
   ***c)*** From the ***What*** list, choose ***Entire Survey***
   d) Choose ***Export*** then ***Preview***

The ***What*** list is the key here. Select the data you want to export in a manager or view then find the selected items in the ***What*** list.

## Exporting geodetic positions to a file

1) Open G2346-8.trv and save it as G2346.trv
2) Write an ASCII geodetic ***file*** for all GCDB points, selecting them in the Points Manager.
   a) Select the ***GCDB*** points in the Point manager. Don't select the R or : points.
   b) From the desktop, choose ***File | Export***.
   c) Select ***ASCII*** from the ***Type*** list.
   d) Select ***[…]*** and enter ***P,T,-G,D*** for the export format (you can save this format if you want) then ***OK***.
   e) Choose ***Browse*** and change the file name to ***Retrace Geodetics*** and ***Save***
   ***f)*** From the ***What*** list, choose ***12 Selected items in Point Manager***
   g) Choose ***Export*** then ***Preview***

Note: You could have just exported the Sec 14 Retrace traverse again. That would have been easier than selecting the points in the Point manager.

## Traverse PC backups

1) TPC creates a backup each time you save a survey for the first time that session. It's extension is .trb.
2) Use ***File | Save As…*** to write off an archive copy. We suggest G2346 3-26-12.trv
3) Export an ASCII file with both coordinates and geodetic positions. Again, use filenames like G2346 3-26-12.asc.

## Performing final least squares adjustment

1) ?? who makes the final decision to accept the adjusted positions.
2) Network extension options
   a) Recompute – fixed
   b) Recompute - variable
   c) Densify network
3) Use the Adjust tab in the LS Network dialogs.
   a) Protect adjusted points
   b) Recompute sideshots

## Computing a double proportion

Let's use this example to talk about how we might batch corner computations so that we can update them as needed

1) Open T29SR8W.trv
2) Retrace vs Record traverses
   a) Use GCDB(R) for Record positions
   b) Put all retrace points in one traverse
   c) Put all record data in another
3) Do a DP using traverses
   a) Explain report
   b) Create 400200DP
4) Do a 3-point control for 400200
   a) Explain report
   b) Create 400200DP3

## Monument/set the corners

1) Create a traverse for stakeout notes
   a) 'Sec 14 corner moves'
2) Format traverse for geodetic distance at project elevation.
3) Use grid or geodetic direction type – the field angles are the same.
4) Recall and print alternative OP/BS combinations
   a) Occupy = 93, BS = 91 or 92, FS = 540420
   b) Occupy = 79, BS = 78 or 80, FS = 540440
   c) Occupy = 101, BS = 102 or 103, FS = 540460
   d) Occupy = 46, BS = 47 or 45, FS = 540420
   e) Occupy = 188, BS = 189 or 208, FS = 540420
5) Talk about why traverses are so important here
   a) What you have done is set up a corner move template
   b) You can add other corners to this traverse as needed
   c) You can add/remove/change OP/BS for any FS
   d) If any point changes, the angles and distances update automatically – so this is a dynamic report.
   e) You can print this out for the field
   f) You can add it to a report
   g) Some DC's also provide 'as staked' reports

## TPC's Reports

1) Save an existing report
2) Start a new report
3) Open an existing report
4) Copy / Paste / Editing / Spellcheck
5) Open in Word

## Computing offsets to a true line

Generate, print, and archive offset sheets for posting, tagging, and blazing true line segments

1) Open G2346-8.trv and save as G2346.trv
2) Tag the ***Loop 6*** and ***Sec 14 Retrace*** traverses and zoom in on the 540460-600460 16th line.
3) Use ***Zoom Points*** to make the point labels more readable.
4) Identify that we want offsets for 211 – 230 to the 16th line.
5) Right click 211 and choose ***Edit Traverese***. TPC opens the traverse view.
6) Select points 211-230 and create a new traverse called ***Post 540440-600440***
7) Open that traverse and choose ***COGO | Offset Inteval (Line Posting) PLSS***
   a) Offset ***Type***
   b) ***Side shots*** option.
   c) ***[x] Latitude Arc***
8) Create a report.
9) Talk about the traverse vs report.

## Delivering areas

Use the PLSS plat example

1) Show areas in Traverse Manager
   a) Write a CSV file
2) Show Traverse Report
   a) Select traverses for Sec 14 lots 1, 2, 3, 6, 7
   b) Do Traverse Summary only

## COGO computations

1) You already computed CN16 and CS16 at mid points. You can also do the following.
   a) Traverse View – sideshot
      i) Projected corners – NW, SW
   b) COGO – Distance-Offset
   c) COGO – Compute Coordinates