KSC RTK-GPS Master Protocols

University of Florida
Geomorphology Lab
2009-2014

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Preparations Before Departing Gainesville

Conditions and Contacts at KSC-CCAFB

1. Check the launch schedule (http://www.nasa.gov/missions/highlights/schedule.html)
2. Check the weather for period of the survey (http://www.wunderground.com/weather-forecast/US/FL/Cape_Canaveral.html)
3. Check the tides
4. Establish personnel for the trip
5. Contact Angela Czupta (IHA, angela.j.czupta@nasa.gov) to establish badging for all UF personnel. Alternatively, we can contact Debbie Richard (321-861-3669, debra.a.richard@nasa.gov)
6. Sign out the van (#3238 or #411, as of Summer 2013 #411 has been outfitted with towing capabilities)
7. Fill out Travel Authorization Requests for all UF personnel
8. Book lodging at the Wakulla Suites in Cocoa Beach (http://wakullasuites.com)
9. Email the following people to alert them of our visit and field work:
    a. NASA: Don Dankert, John Shaffer, Lynne Phillips
    b. IHA: Jane Provancha, Shannon Gann, Doug Scheidt, Eric Reyier, Carlton Hall, Ron Schaub
    c. Air Force: Angy Chambers
    d. USFWS: Jim Lyon, Steven Trull
    e. UF: John Jaeger, Rich MacKenzie, Dow Van Arnum, Kyle Sexton (or whoever is surveying with us).
10. Check with Dow about any repairs/issues resulting from the previous survey.

Charging the Batteries

Batteries for the controllers: These plug in with adapters to the wall unit.

Large (Car) battery with adapter for wall plug.

Batteries for the GPS antennas: Little plastic tray chargers.

Cowbell battery for the base station GPS antenna: Uses a specific charger

"Large" 12 Volt battery for base station radio transmission: Labeled "Battery Charger".

Equipment Pack List

To do list: Label the yellow boxes, antennas, and controllers with rover numbers, controller numbers.

Box 1 (Base Station): TSC # 25327, Base Antenna # 47520, Tape Measure, clamp, 1 yellow wire, 3 black wires, 0.25 m yellow pole

Box 2 (Right Rover): TSC # 25413, Base Antenna # 49046, 1 black wire, 1 yellow wire, silver antenna, clamp

Box 3 (Left Rover): TSC # 25664, Base Antenna # 47802, 1 black wire, 1 yellow wire, silver antenna

Box 4: Radio (HPB450), small silver rod, large black rod, grey Y wire, black cable, blue velcro, yellow bag

Batteries: Cowbell Battery, Car Battery, 6 Small Black Antenna Batteries

Other: 2 Backpacks each with a pole, Yellow Trimble Bags, 3 rover tripods, Base Station Tripod, Large Orange Radio Tripod, Bag with yellow radio extension pole and metal disk, Wheeleez for GPS trailer with high speed bearings.

Traveling to and Entering KSC

Van Info

We take UF Geological Sciences van 3238, a white Chevy Model XXX. However, while the field campers are using the van during the summer, Dow has enabled 411 for our use.

It is useful to take both sets of van keys, so more than one person can access a locked van while surveying. One of the sets of keys has the fob (the plastic dongle that allows us to get gas at the UF Motor Pool).

Be sure to take a clipboard and fill out the "Dept. of Geological Sciences State Vehicle Sign Out Form", which documents the mileage incurred on the trip. This form should be turned in to Carrie Williams upon returning to the department.

Driving Directions

The most commonly traveled route is approximately 150 miles: Take 441 south from Gainesville, across Paynes Prairie, through Micanopy and MacIntosh. Continue south until the Kangaroo Station (and Sweet Bay Market ?) on left. Take left onto NE 70th St., which bends and becomes SE 70th Ave. before it Ts into Route 40. Left (East) on Florida State Route 40 for about 60 miles. South on I-95 to exit 215 (2ns Titusville exit), where you take Florida State Route 50 for a mile or so, then right onto Florida State Route 405. Follow 405 across the causeway (over the Banana River) and to the NASA Badging Station on the right.

An alternate route is to go through Orlando (I-75 to Florida's Turnpike), but this requires nearly $10 in tolls each way.

Badging

Everyone must be badged into KSC. This requires a call to our IHA contact (Angela Czupta) ahead of time, and 2 forms of picture ID to be presented upon arrival. These temporary badges are usually issued for no more than a few days.

The Badging Station at KSC is open M-F 6am-3pm.

Staging on the Day Prior to the Survey

Upon arriving at KSC, typically the afternoon before the actual survey, it is helpful to "stage" for the survey, which includes gathering equipment and doing some initial set-up to save time the following morning. Staging takes place at two locations: (1) the southern boundary of KSC, where the Texas Trailer is unhooked and left overnight, (2) the base station, which is either Budroe or Ward.

Gathering Equipment Onsite

1. The first step is to pick up one full tank of gas (for the Mule) and a communication radio from the IHA field office (formerly at that BOSU, now at building k6-1896, near the VAB). When doing this, remember to sign in on their white board, to let the IHA field personnel know that we are doing the survey.
2. Drive to the Cape Canaveral Lighthouse location, where the Mule and trailer are stored, which is about 15 miles away, via the coastal route. The storage site will move to the new IHA field lab (near K6-1896) sometime in 2013.
3. Check the tire pressure on the Mule, load it into the trailer, if it's not already, put it in gear, put on the parking brake, leave the key in the ignition, and you might want to tie it down with straps to the rings on the floor of the Texas Trailer.
4. Drive the van with the trailer attached, to the southern boundary of KSC (northern boundary of CCAFS) and unload the GPS trailer and the Mule (formerly the Ranger).

Texas Trailer Info

This trailer was purchased at the beginning of the project (2009) by PNA's startup funds.

Its primary purpose is to keep the "Mule" Kawasaki ATV (formerly the Polaris Ranger) dry, safe, transportable, etc.

The Texas Trailer also houses the GPS trailer (actually 2 of them, blue and green) in a disassembled configuration.

Note: As of Feb. 2013, we need to repair the side door open hold ball latch on Texas trailer.

Assemble the GPS Trailer at the Southern Boundary

1. Unload the Kawasaki UTV, so we can unload the blue, wooden GPS trailer.
2. Assemble the blue wooden GPS trailer by inserting the axel-perpendicular arm into the central opening on the axle parallel trailer piece, forming a T connection.
3. Connect and adjust the turnbuckles of the stabilizing cables.
4. If wheel replacements are necessary, the wheel axle carriage bolts, and nuts, require a 19 mm wrench.
5. Thread the black cables (radio communication) and yellow cables (controller communication) through the PVC sections on the GPS trailer.

6. Mount the 1m-long, kevlar antenna poles to the back “wings” of the trailer, then secure the poles with carriage bolts that require ½” wrenches, which are in the plastic bag hanging on inside of white Texas trailers trailer.
7. Use twist ties to secure the wrapped cables up the 1-m long Kevlar poles on the “wings” of the GPS trailer.
8. Line up the GPS antennas facing forward, but don't leave the survey antennas on the polls overnight – they are just too valuable. Be sure to note the numbers on the antennas and which one is right and left.
9. Secure another set of Kevlar poles with cable ties and duct tape to the rear of the cage of the Kawasaki UTV. Affix the 1m-long antennas on top of 1m-long Kevlar poles and connect them at their base with an L shaped connector to the black (radio communication) co-ax cable.

Stage the Base Station GPS at Budroe

The GPS base station tripod has a 2-meter pole that extends from the center with an attachable pointed screw to align over a known point. Extend legs of the tripod to a full 2 meters (fixed height). Insert the pin for safety lock.

Set up GPS base station antenna tripod with three legs first, not using the brass screw leg. Get it level with the two grip lever legs, then tighten the brass screw leg to stabilize.

Put individual sand bags hanging from the black knobs of the three legs of the GPS base station antenna tripod.

Do NOT leave the gps antenna at Budroe overnight, only the tripod and sand bags.

Stage the Base Station Radio at Budroe

Choose a spot for the radio tripod that is within “reach” of the GPS base station tripod, i.e. the radio tripod should be less than 10 feet away from the GPS tripod, because they will be connected with wires.

The antenna and associated pieces are in the skinny yellow bag. (The little antenna in the box is an extra).

Assemble the ‘superlong’ radio antenna with the two grey kevlar base poles and lay it on its side for overnight storage.

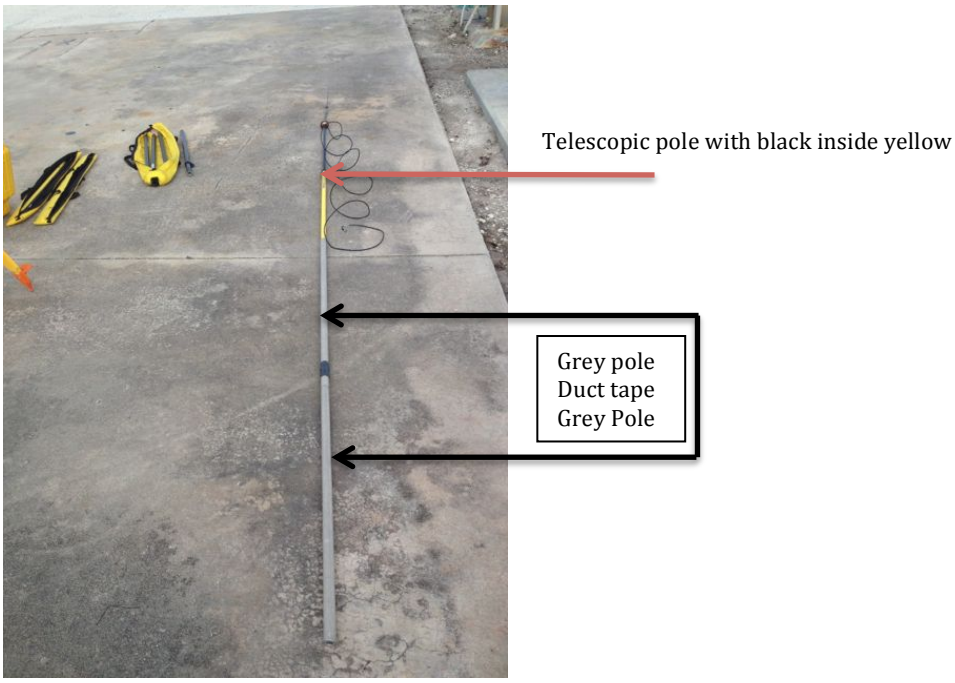
Hang bucket of sand from radio tripod to stabilize in the wind. Use a bowline and a taught-line hitch.

Survey Day – Activate the Base Station

Set up and Start the Base Station Radio

The radio works with 'line of sight' technology so make sure it is always in your line of sight. The large heavy (12 V) battery powers the radio. Don't loose the small circular disk.

1. From the radio box, add the UFO (thick disc with attached cable) onto the top of the telescopic rod (black and yellow), which is affixed to the connected light grey kevlar poles. To the top of the UFO, add the thin top-most radio antenna.



2. Put little disc on top of radio tripod (Orange and yellow), then put a short (1 foot-long) yellow Kevlar pole on top of heavy steel disc/washer and secure to top of radio tripod.
3. Attach long 6 m antenna pole to top of little yellow short Kevlar pole on top of radio tripod. Wrap cable around long Kevlar pull a few times before plugging into radio.
4. Hang radio to side of station and install antenna making sure all pieces are fully extended.
5. Attach coaxial cable from antenna to coaxial slot on left back side of radio.
6. Wrap loose cables around the tripod.
7. Connect cable to 'y' wire at base station.
8. Turn switch on back of radio to 'high'
9. Lightly press the channel button and align it to the same number (0). If you see the receive light blinking you must switch your channel because that indicates someone else in the area is operation on the same frequency.
10. Make sure TX is blinking on the radio before you leave the base station.

Program and Start the Base Station GPS

1. Put battery into base station antenna.
2. Affix (screw onto the threads) the base station GPS antenna to the short (0.25 m-long) yellow Kevlar rod from the base station carrying case.
3. Attach the short yellow Kevlar rod to the brass fixture that slides into the top of the GPS tripod. Slide it onto the top of the tripod. Tighten the brass screw to affix.
4. Connect the "single leg" of the Y-cable to the bottom of the GPS antenna. Be careful when connecting the pinned cable ends. Always align red dots before pushing cables together. The connection ***pins are delicate*** and can easily be damaged if the cable connections are misaligned during attachment.

5. Attach cow-bell battery to one arm of the Y-cable.
6. Connect the other arm of the Y-cable to the dark gray cable that connects to the radio unit hanging on the upper portion of the leg on the radio tripod.

7. Press the green button on the GPS antenna to turn it on.
8. Turn on the TSC (Yellow handheld controller) by pressing the green power button on the lower left.
9. Choose 'Survey Controller' application – the opening window looks like this:

10. Select 'Files' -> 'New Job' (each survey is a new job), and name the new job file with the correct naming protocol (ex. Matanzas01162009, cpcnv121129).

Yr Mo Day

11. Set the coordinate system to UTM. ~~Use state plane east and leave the measurement on meters.~~
12. Always leave COGO settings at 'ground' (?)
13. ~~Make sure that the blue tooth connection is enabled, by selecting Configuration -> 'controller' -> bluetooth' -> see '520' serial number on Base -> Hit configure (check both boxes) -> Hit 'OK' and 'Accept' ->~~ Hit 'Accept', in the lower right
14. Hit 'Survey'-> 'usgs' -> 'Start Base Receiver' ->
15. Click question mark to set height (2.25 meters) need Photo
16. @ 'Start Base' screen -> enter pt_name: 'base' -> hit drop down arrow hit 'Key In'
17. Enter the Base Station coordinates, key it in (if not, the GPS can do it for you – not sure what this means). Base station coordinates:

    wardN=3160983.372; wardE=541695.464; wardZ=8.067;
    wardAstN=3160990.730; wardAstE=541695.795; wardAstZ=8.044;
    budroeN=3163916.159; budroeE=540170.512; budroeZ=6.288;
    budroeAstN=3163922.560; budroeAstE=540166.326; budroeAstZ=6.255;

18. Hit 'enter' -> 'store' start. This 'timer' clock on the TSC display should begin ticking. Clamp the TSC to the leg of the GPS tripod.

Survey Day - Set Up the Rovers

This section describes the procedure for setting up the rover TSC controllers. Remember:

TSC #25664 (a.k.a. _r64) works with Antenna #47802 on the left-side (facing forward)
TSC #25413 (a.k.a. _r13) works with Antenna #49046 on the right-side (facing forward)
TSC #25327 (a.k.a. _b) works with Antenna #47520 on the base station

Set up the Rover Antennae

When setting up Rover antennae, put batteries in them before turning them on.

Be sure to measure rover heights with cloth measuring tape from ground level to base of antenna. With blue trailer they usually are 142 to 142.5 cm. with Greenie meanie trailer, the height is 139 to 139.5 cm.

Programming the Rover Controllers

Connect the TSC2 to the yellow cable, whose other end is threaded through the GPS trailer PVC guides and connected to the GPS antenna.

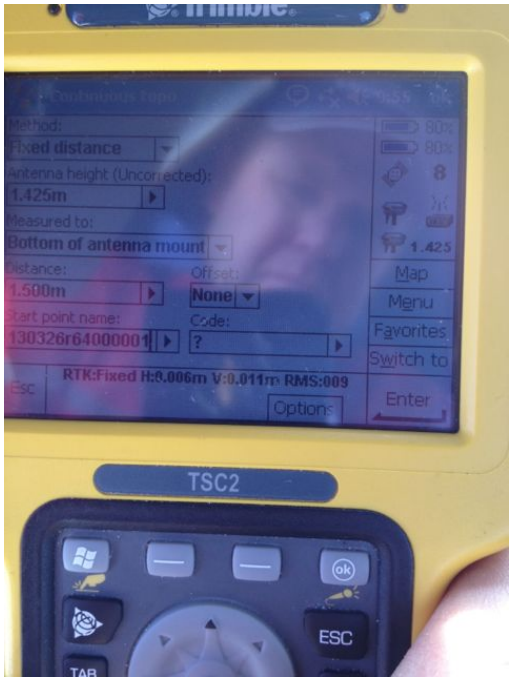
Turn on the rover TSC2 (controller) by pressing the green button on the lower left of the keyboard panel.

Select the ‘Survey Controller’ application.

Click Files -> Start ‘New Job’ and name it ‘cpcnv130522r64’ (example is for the left controller for the May 2013 survey). Hit ‘~~Accept~~’ ‘Enter’ .

Select Survey from the main menu, then ‘Start Survey’, then ‘USGS Continuous topo’, ‘Start Survey’

Choose the method ‘Fixed Distance’, set heights of surveyor or the height of the bottom of the antenna mount to the ground surface.



Start point name:
130624r13000001

Code: ‘beach’

Label the yellow Trimble cases with antenna numbers and controller numbers. Also make sure the antennas and controllers are labeled.

Look at the middle green light on rover antennas, if it is flashing, it means it's communicating at that flash rate with the base station.

On the survey, we are using a pigtail on 49046 (r64 is the code for the TSC associated with this rover) as the radiocommunication to the base station. But the other antenna, it's connected to the long pole radio affixed to the back of the cage.

Left rover job name is cpcnvDate_r64. Right rover job name is cpcnvDate_r13.

Get more produce bags from publix. These are zip-tied over the rover gps antennas and used to protect them from salt spray during the survey.

Survey Day - Collect the Elevation Data

Before accessing the beach, call both NASA security (phone #) and CCAFS security (phone #) to make them aware of our presence on the beach. We typically provide them with name, UF affiliation, vehicle type, approximate duration of beach occupation, and contact phone number.

Each "lap" consists of one upreach (10km) longshore pass and one downreach (10km) longshore pass. We aim to get 3 laps completed during each survey, which means (3 laps x 2 passes/lap x 2 rover lines/pass) 12 longshore lines are collected during each survey.

It is remarkably helpful to avoid "crossing" the longshore lines, when conducting the survey. At times it is unavoidable, but it will save a TON of time if you avoid crossing lines whenever possible. The time savings appears during the GIS processing stage in which the containment polygon is built from the outer limits of the survey.

Go through a briefing of how to handle various wildlife encounters, with USFWS biologist, Steven Trull. He has good instructions for how to minimize disturbance of turtles, plovers, etc.

Cleaning the Equipment

After every survey, the GPS equipment must be cleaned thoroughly to prevent rust and ensure that the equipment lasts as long as possible. The sand and saltwater are extremely harsh on the equipment and preventative action must be taken.

When surveying is complete, take all equipment apart and rinse thoroughly with fresh water. After rinsing, dry as well as possible. Pack it up in its proper place and bring back to UF.

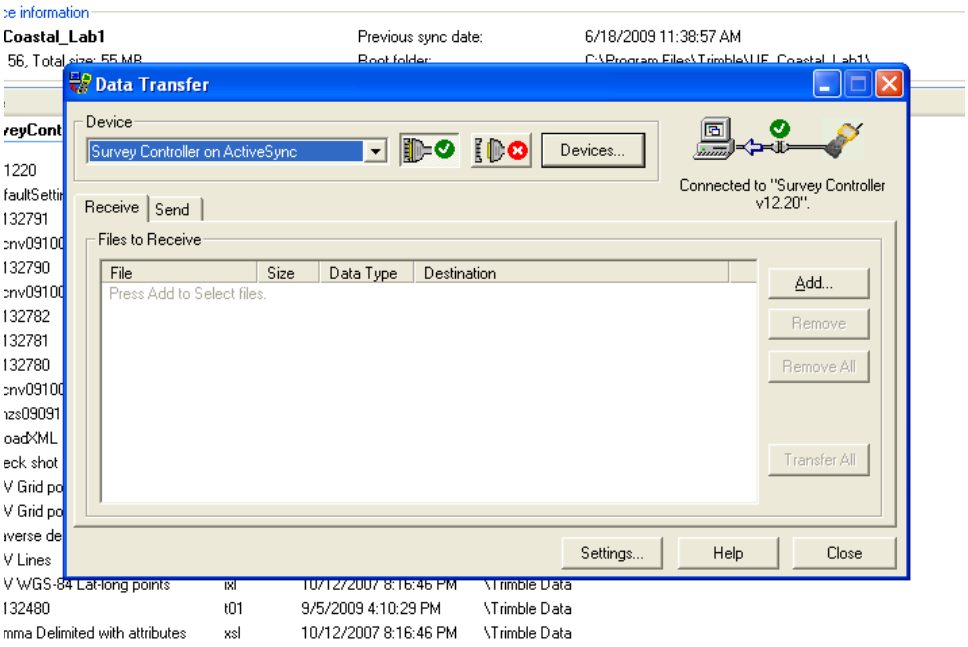
When you get back to UF, unload equipment and take it all apart again and use "air blower thing" to get any remaining sand out of the equipment. Put isopropyl alcohol on all metal surfaces to make sure there is no residue on them. After everything is dry, put "lubricant" on all joints and metal areas.

Data Processing Quality Control

Downloading Trimble Job Files to Computer

This section describes the procedure of offloading data from the Trimble Survey Controllers onto a PC. This should be done soon after the survey is completed.

1. Log on to either (1) the windows desktop PC in the Jaeger SedLab (165 WM, username: AdamsP), (2) the GeomorphToshiba Ultrabook, or the PC in 120 WM.
2. Create folders on geomorph server that will hold the specific rover and base station data, currently:
    a. Base Station: /Observations/GPS_Offloads/CpCnv_Surveys/12_08_30(survey date)/25327/,
    b. Left Rover: / Observations/GPS_Offloads/CpCnv_Surveys/12_08_30(survey date)/25664/,
    c. Right Rover: / Observations/GPS_Offloads/CpCnv_Surveys/12_08_30(survey date)/25413/
3. Connect the controller (TSC) to the computer with a USB cable – the controller will automatically "wake up."
4. Open the Trimble Data Transfer Utility, which should be accessible from a shortcut on the desktop of the computer. Once the utility opens select the Device 'Survey Controller on ActiveSync', from the drawdown menu in the upper left of the window, and click the green check mark button.



5. Click the "Add" button, which should open the "Open" dialogue box. Select the file(s) you wish to transfer, transfer files one at a time ~~to 2 separate locations (as a redundant backup)~~:

a. the newly created folders in 'Surveys':
   /Observations/GPS_Offloads/CpCnv_Surveys /12_08_30(survey date)/25327/,
   /Observations/GPS_Offloads/CpCnv_Surveys /12_08_30 (survey date)/25664/,
   /Observations/GPS_Offloads/CpCnv_Surveys /12_08_30 (survey date)/25413/
b. the "master" folder containing all survey data
   /Observations/CpCnv/GPS/GPSMaster/TSC_25664/
c. IMPORTANT: click the browse to set the file path used to transfer data, if you do not do this the files will be transferred to a ~Temp file and will be difficult to find.
d. Note: Each 'upload' will create 4 files: Data Collector File, Task Scheduler File, .DAT file, .T02 file

*Repeat Steps 3, 4 & 5 above for each of the 3 controllers: Note: For the CpCnv work, we typically have a base station file (from controller 25327, antenna #47520), a left rover (_r64, 25664, antenna #47802), and a right rover (_r13, 25413, antenna #49046)

So, to summarize: 3 controllers upload 1 job file each per survey, ~~to 2 separate (duplicate) locations~~ – so ~~6~~ 3 files uploaded per survey, which unpack to make ~~24~~ 12 unpacked uploaded files (~~2 sets of duplicates of~~ 12 files each).

Note: to use the Trimble Business Center software, currently, we have ONLY one dongle to unlock access to the software and it is currently plugged into the Windows desktop machine in the ~~Jaeger SedLab, room 165~~., Room 120 WM.

Converting Trimble Job Files to .txt Files (Trimble Business Center Software)

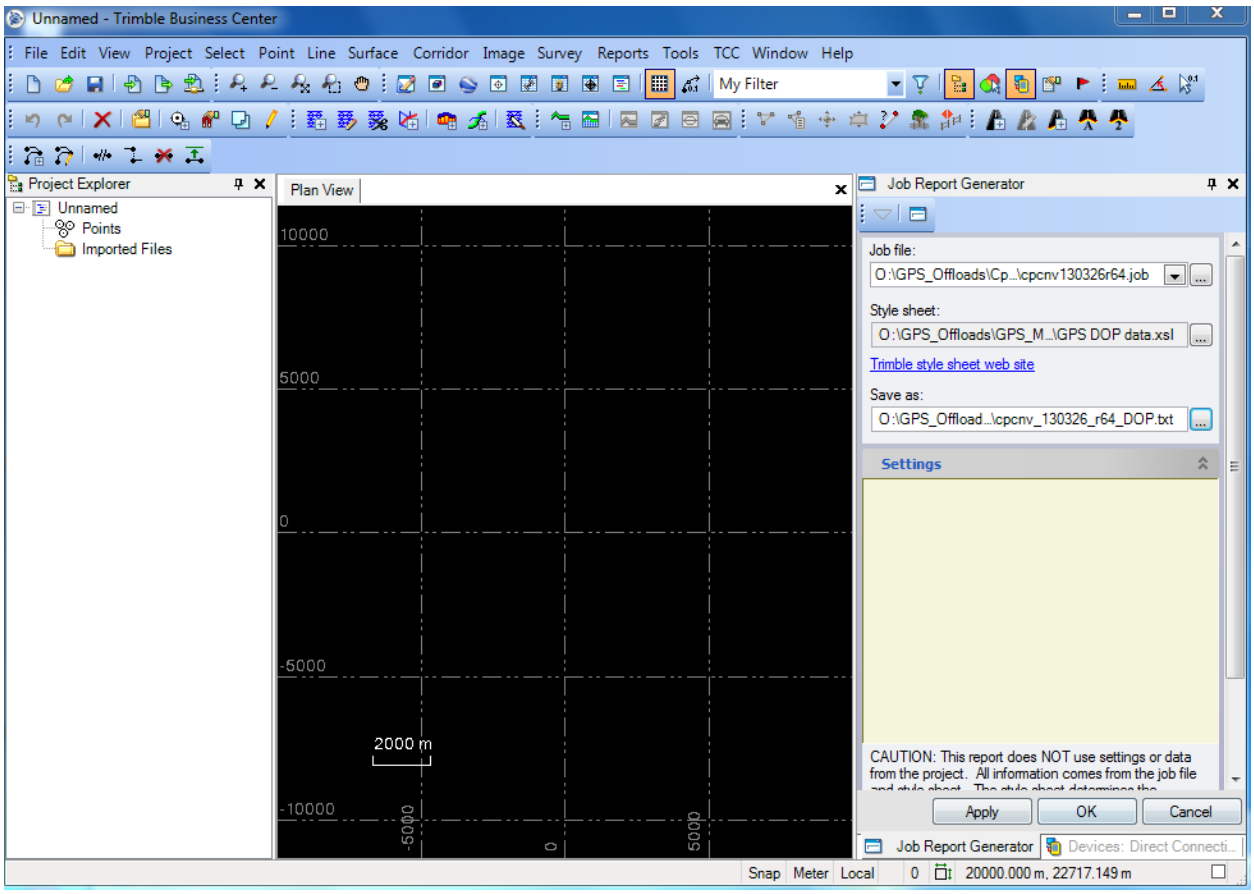
For each rover (right _r13, and left _r64) create DOP .txt files, and save them in the rover directories, for example, from the March 2013 survey:

'/Volumes/Observations/GPS_Offloads/CpCnv_Surveys/13_03_26/25413'
'/Volumes/Observations/GPS_Offloads/CpCnv_Surveys/13_03_26/25464'

Create a PTS file

Create a DOP file

Must use "old" Trimble BC 2.40 software, which is only available on computer in 165 WM. Need to figure out how to make job report generator work on TBC 3.01.



Removing Imprecise Data and Saving to '_Bch.xls' File (MS Excel = 20 min. to ~1 hour)

In MS Excel, import the PTS and DOP files into two separate, .xlsx workbooks. In the 'import' procedure, be sure to use spaces and commas as delimiters, to ensure that each column of data is preserved.

These two, resulting, .xlsx files will be combined, with the correct header convention, into a single _Bch.xlsx file, which acts as a basic, unQC-ed, starting point file.

For each rover, combine the two .xlsx files (PTS and DOP), by copying the contents of the DOP file to a series of columns on the right hand side of the data in the PTS file. Be sure that the rows line up. In other words, does the last data point from the copied DOP cells line up in the same row with the last data point of the PTS columns. Ultimately, we will be preserving only the Point ID numbers and the time of data collection from the DOP cells.

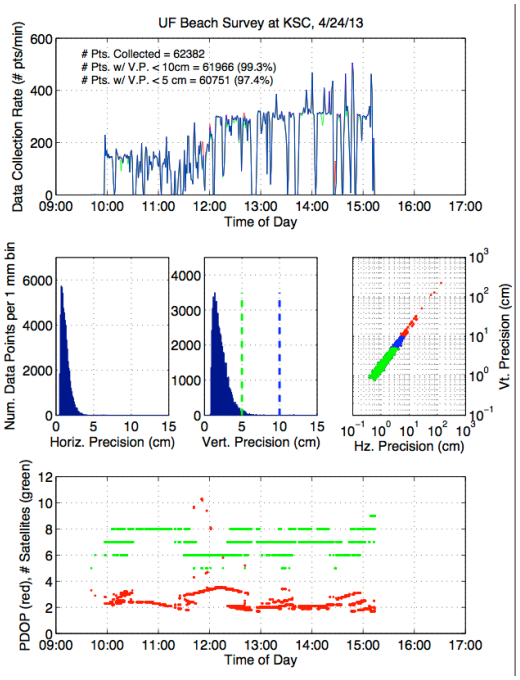
Now combine the two rover-specific, _Bch files, into one _Bch file that contains all un-QC-ed data from that specific survey date.

1. Copy the r64_Bch.xlsx file contents onto the bottom (concatenate vertically) of the r64_Bch.xlsx data.

2. Insert a left-most column that will be labeled 'ID' and fill down the sequential ID numbers – need to 'paste-special' this step because of confusion that gets introduced in a subsequent sorting step.
3. Insert a header column across the top of the data that matches the agreed-upon header convention.
4. Hunt down major errors in data collection and fix them (TBD) so that the rows and columns match dimensions.
5. Save As a _Bch.xlsx file in the directory above the individual rover directories.
6. Save As a _Bch.csv (comma separated values) file in the same directory which will be read in by MATLAB for processing.

QC Stage 1: Remove the data whose vertical precision exceeds 10 cm:

QC Stage 2: Remove the data whose vertical precision exceeds 5 cm:



Prepare the Data Collection (sub-)Report (MATLAB Script)

.m file is called dgpsCpCnvMonthlyReport_DCR.m – simply change the 6-character date string (date_str) and let it rip. It takes about 2 minutes to process the data collection results, making a .mat file, which is saved to the desktop, as well as preparing a .pdf plot (also saved to the desktop), which shows the data collection rate time series, histograms of the horizontal and vertical precision, and some other goodies (satellite and PDOP histories).

Build the Containment Polygon and Tin (Arc Map)

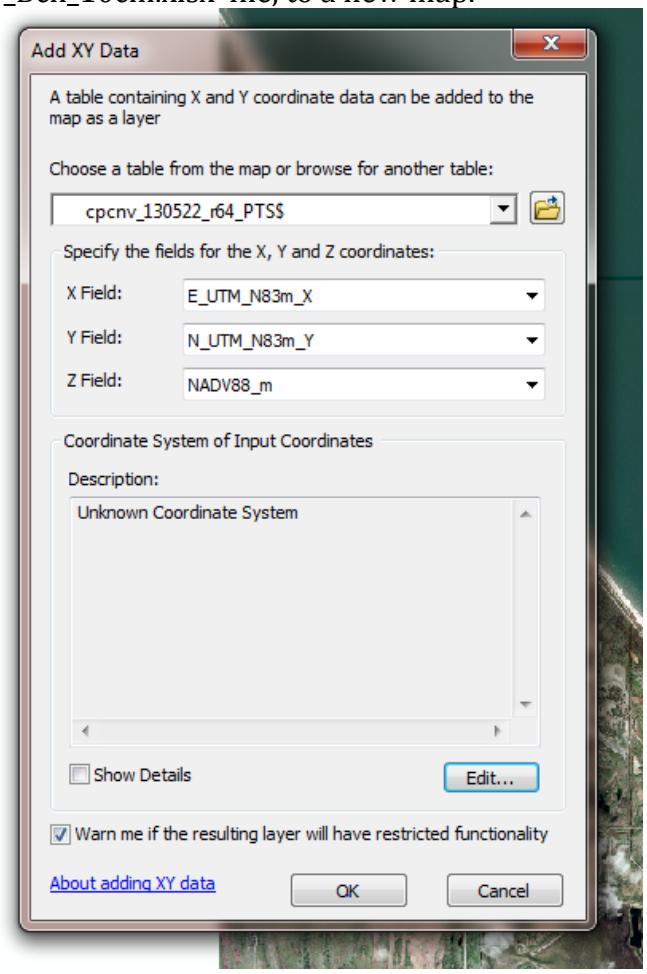
There are several steps that constitute the cleaning (QA/QC) of the data, and building the DEM. Many of these steps are associated with obtaining the polygon, which spatially encompasses all (verified) data points obtained during the survey. The steps (01-11) below are described to match the Arc-directories on the O://drive (the geomorph server).

Make the '.mxd' file and add the data from MS Excel (Step 01)

Open a new map in ArcMap 10.1. Begin by saving the whole map as .mxd file to the /Observations/GPS_Processing/GIS_Work/MXD_files/ directory, with the name CpCnv_130424.mxd. This makes it easy to open up, all at once, the individual data files (image, pts, polygons, etc.) associated with a particular survey's processing procedure.

Add data -> 2007repro2.tif (a small air photo to use as a guide template for working).

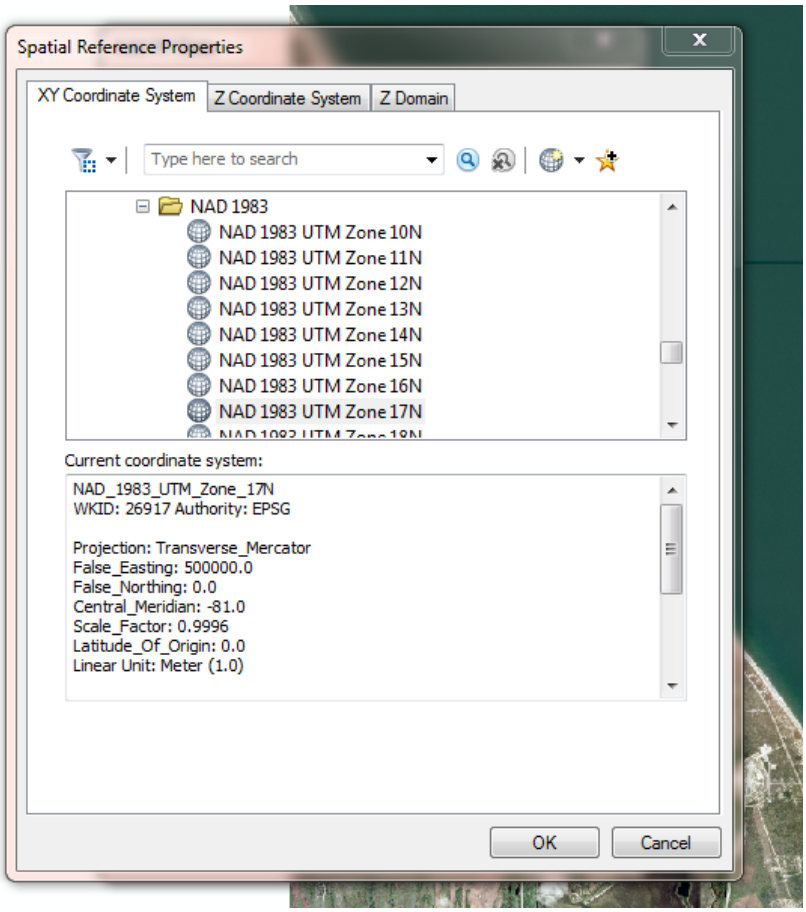
Add XY data, from the '_Bch_10cm.xlsx' file, to a new map.



When prompted,

under the XY coordinate system tab, select Projected Coordinate Systems -> UTM -> NAD 1983 -> NAD 1983 UTM Zone 17N projection

under the Z coordinate system tab, select Vertical Coordinate Systems -> North America -> NAVD 1988 (check on the details of this).



Make the 'Pts.shp' file (Step 02)

Export the data (by right clicking) to a shapefile and store it in the /Observations/GPS_Processing/GIS_Work/02_Point/ directory, as something named 'CpCnv_130424.shp'

Make the 'PtsEdit.shp' file (Step 03)

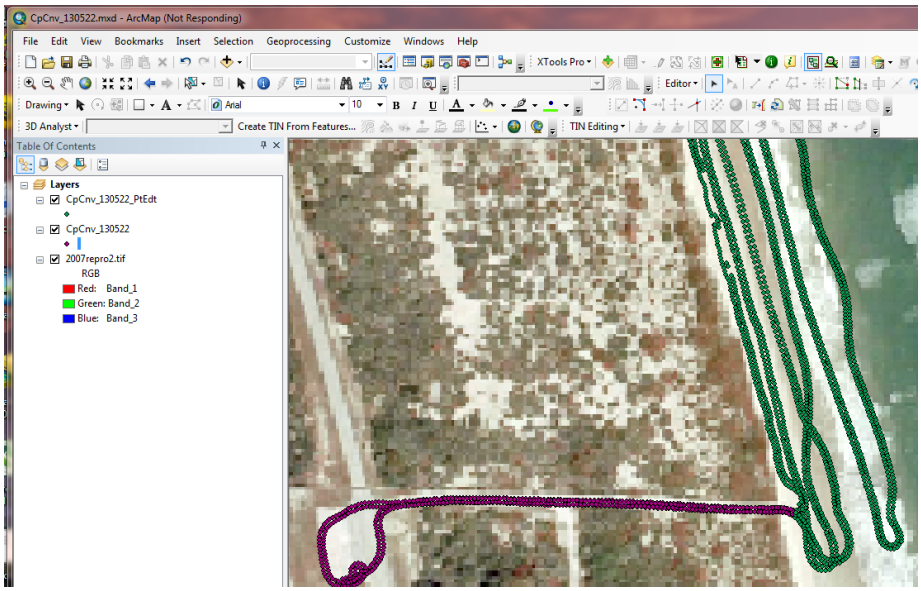
Export the data AGAIN, (by right clicking) to a shapefile and store it in the /Observations/GPS_Processing/GIS_Work/03_PointEdit/ directory, as something named 'CpCnv_130424_PtEdt.shp' – This is the file that will be edited and cleaned up.

Initial Point Removal from the 'PtsEdit.shp' file

Within the 'PtEdt.shp' file, remove the base station data point and the beach access path data points, by going to the Editor menu, and selecting 'Start Editing', then highlight points and delete them. (See Screenshot Figure) One can also outline a polygon and delete everything within the closed polygon. Be careful, when you select 'Save Edits', from the

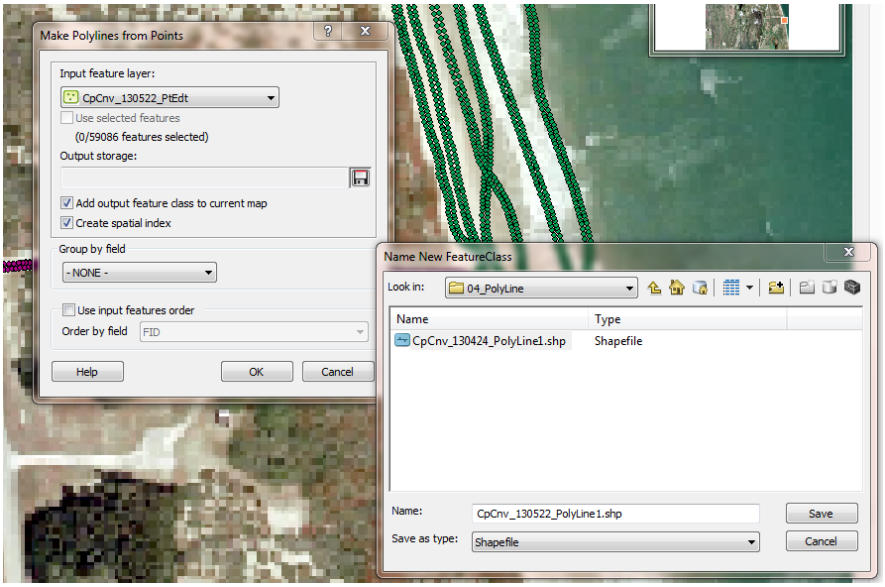
'Editor' menu, you will get the spinning wheel of death for a very long time. Be wise about ***when*** you 'Save Edits'.

Make the 'CpCnv_130424_PtEdt.shp' the active one, and go to the XtoolsPro menu. (Be sure that the 'Extensions' from Xtools Pro is checked (under the Customize -> Extensions) menu.



Make the 'PolyLine1.shp' file (04)

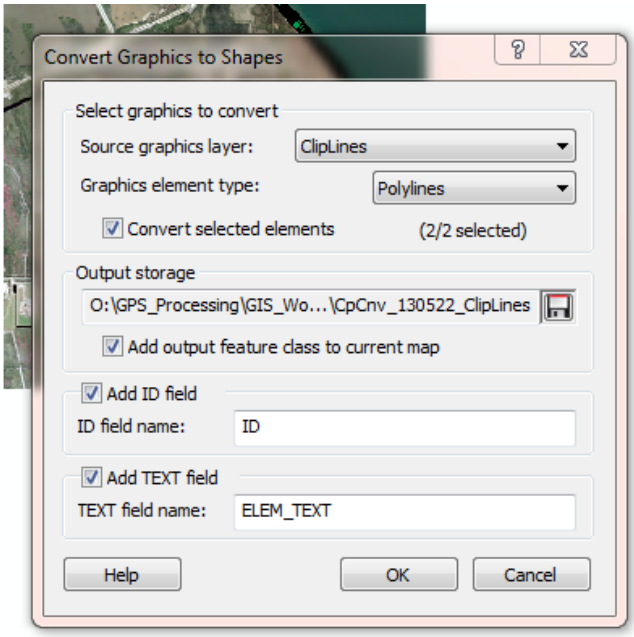
XtoolsPro -> Feature Conversion -> Make Polylines from Points. Save this file in /04_Polyline/ directory with the name 'CpCnv_130424_PolyLine1.shp'. Check the 'Use input features order' check box and 'Order by field' -> 'ID'. The sorting of rows portion of this step seems to take a while! (like > 5 min. and counting).



Draw the '_ClipLines.shp' file (05)

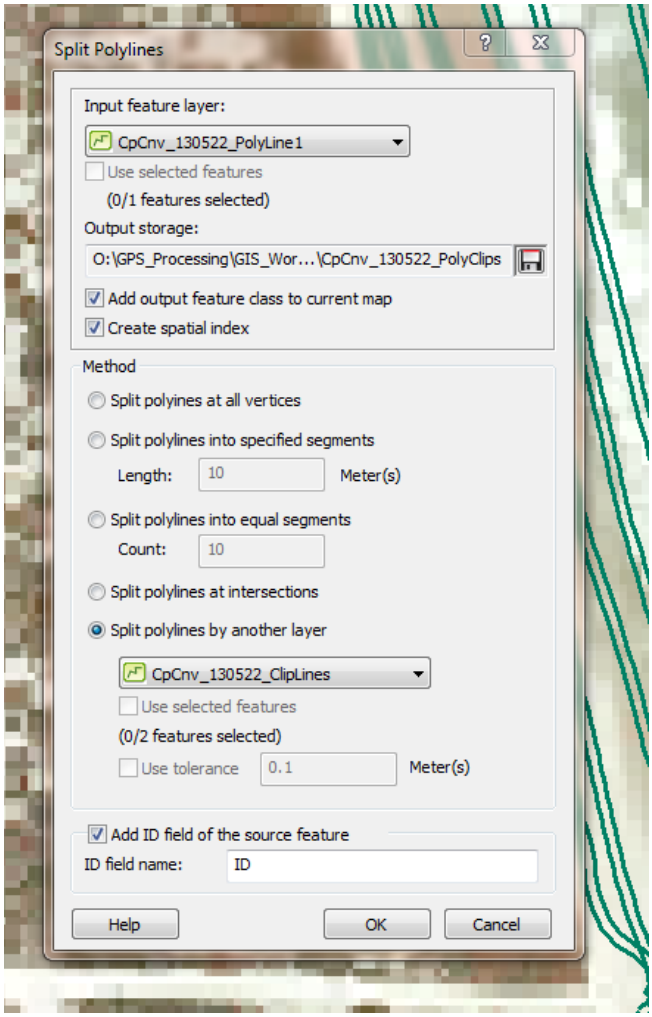
Use the Drawing toolbar to select 'Line' drawing tool. Draw 2 lines that cut across the data point tracks – one at the northern survey boundary (Eagle 4) and one at the southern survey boundary (CCAFS-KSC boundary/beach access path).

Select both of the short line segments and convert them to a one shape file, named '_ClipLines.shp' by going to XToolsPro -> Feature Conversions -> Convert Graphics to Shapes. (see Figure A2-12 in Rich's 'ReadMe.doc', for a screen shot of the dialogue box that appears during this step). Run the conversion and save the resulting shape file in the 05_ClipLines directory.



Split the Polylines to make '_PolyClips.shp' file (06)

Split the single continuous polyline into numerous line segments, wherever the cliplines intersect (at the northern and southern limits of the survey) or wherever the single continuous polyline crosses over itself. This is done by XToolsPro -> Feature Conversion -> Split Polylines. Choose the '_PolyLine1.shp' as the input feature, choose the Output Storage to be a file named '_PolyClips.shp' in /06_PolyClips/ directory, and select Method 'Splint Polylines by another layer' – that layer should be the '_ClipLines.shp' layer. Also Add ID field… name 'ID'.



Construct the Polygon Outline into a '_UnmrgdPolygon.shp' file (07)

Export the '_PolyClips' layer (right click menu in Table of Contents) to a '_UnmrgdPolygon.shp' file to be stored in '07_UnmrgdPolygons' directory. This layer will be heavily edited – all of the interior poly line segments will be deleted, so that only the outer frame remains. Might be helpful to overlay the previous month's '_Polygon' layer, just for comparison.

Delete the internal line segments, by Editor - > Start Editing, then clicking on segments and deleting them. Remember to save the edits periodically. This is a tricky step that can take up to an hour (more like up to 4 hours) – this is the step that demonstrates the importance of "not crossing lines" when driving the ATV on the beach! Be very careful with the uppermost dune polyline – dropouts can cause the polylines to connect over regions where we have no data. Also, the washover fans are extremely tricky – it's a good idea turn on the layer of PtsEdit, which will help keep track of where we have data.

Merge the Polygon (Polylines?) Outline into a '_MrgdPolygon.shp' file (08)

Export the '_UnmrgdPolygon' layer (right click menu in Table of Contents) to a '_MrgdPolygon.shp' file. The individual line segments will be merged piecewise into a complete enclosed polygon that outlines the full data set for this survey.

Right click on the MrgdPolygon layer and open the attribute table. With editor turned on, by selecting (shift +) more than one line segment, they will highlight in blue on the attribute table and on the map. Under the editor drawdown menu, select merge. This will merge the individual line segments into one line segment and the process can be continued until one complete (somewhat unconnected) polygon is all that remains in the attribute table.

Convert the Merged Polylines to a Final Polygon (09)

Once the merged polylines have been cleaned and edited to one, single polyline, with it's boundaries coinciding with the appropriate survey data boundaries, we create the actual polygon.

Select XToolsPro -> Feature Conversions -> Make Polygons from Polylines. See the screen shot figure A2-20 for details of dialogue box settings. Save the .shp file as CpCnv_130522_Final Polygon.shp in the directory /09_FinalPolygons

Make the Tin

Export the PtsEdit File to .txt, then open in Excel, and save as .csv

Exporting the Polygon to a .txt file (Step 11)

Run the following tool on the 'Final Polygon' shapefile: ArcToolBox -> Data Management Tools -> Features -> Feature Vertices To Points, and save as a 'FinalPolygonPts' shapefile into the 11_FinalPolygonPts directory

Then, run the following tool on the 'FinalPolygonPts' shapefile: ArcToolBox -> Data Management Tools -> Features -> Add XY Coordinates, and save as the same shapefile (it doesn't give you a choice).

Then right-click on the 'FinalPolygonPts' shapefile in the Table of Contents and Export to a text file, but name it as a .csv

Open the .csv in MS Excel, throw out the unnecessary columns and save it as a .txt file

Copy to the MacPro and this polygon should be good to go, readable by my .m functions that construct the DEM.

Construct the DEM (MATLAB)