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GPS Adjustments Setup using a PPK Data File

By Joe Burnett

Recently, a user came to us with some data from 2016 that had originally been collected in Stand Alone GPS Mode. However, they had also collected the raw GNSS data from their GPS unit and were now able to post-process it and turn it into PPK (Post-processed Kinematic) format data.

IMPORTANT: The most important step of this procedure—the collection of the raw GNSS data from the GPS—is *not* a function that is performed by HYPACK®. It must be set up and collected, independently, through the GPS and post-processed with the GPS's proprietary software, like Trimble Business Center. Additionally, the GPS has to have the option/ability to collect the raw GNSS data.

If you have these two (2) options, then, you can apply the PPK file's data in the HYPACK® 64-bit SINGLE BEAM EDITOR (SBMAX64) or 64-bit HYSWEEP® EDITOR (MBMAX64), to improve the horizontal positioning data to RTK (Real Time Kinematic) accuracy, and produce and apply RTK quality Vertical Tide data to your soundings.

Now that you have collected both your raw HYPACK® and GNSS data, you will need to post-process the GNSS data from the GPS, in its proprietary software.

NOTE: You do *not* have to create the PPK file, prior to editing the spikes from your data. The application of the PPK data can be done after the spikes have been removed, as long as, the edited files are saved to the *.HS2x edited format.

The important step in the post-processing of the GNSS data, is to output the final PPK file in a format that can be read by the HYPACK® and HYSWEEP® editors, preferably in *.CSV or *.TXT format.

There are only 5 Fields that need to be stored in these files:

- Date, Time, Ellipsoid Height, Latitude, Longitude

OR

- Date, Time, Ellipsoid Height, Easting (X), Northing (Y)

NOTE: The order of the data in the Fields does not matter, as it can be sorted out in the HYPACK® and HYSWEEP® Editors.

IMPORTANT: To properly apply the data in the HYPACK® and HYSWEEP® Editors, the time data *must* be in HH:MM:SS.SS format, and the Latitude / Longitude data *must* be in Decimal Degrees format.

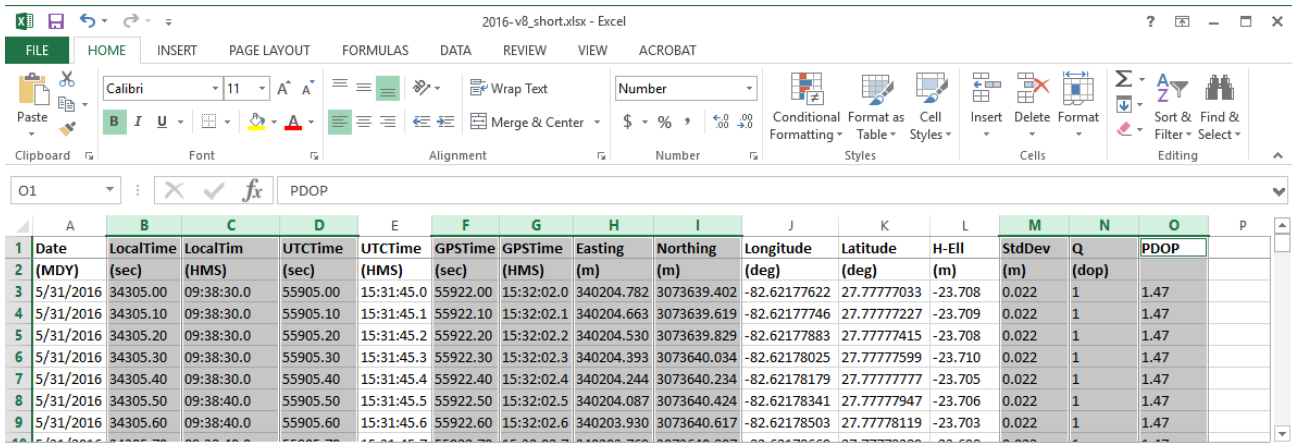
CONVERTING YOUR PPK.XLSX TO CSV

Since our user was unfamiliar with the format that was needed by HYPACK®, they saved their PPK data in Excel *.XLSX format. This was not a problem, but did require a few extra steps to get the file ready for application within the HYPACK® and HYSWEEP® Editors.

Here's how we accomplished the conversion:

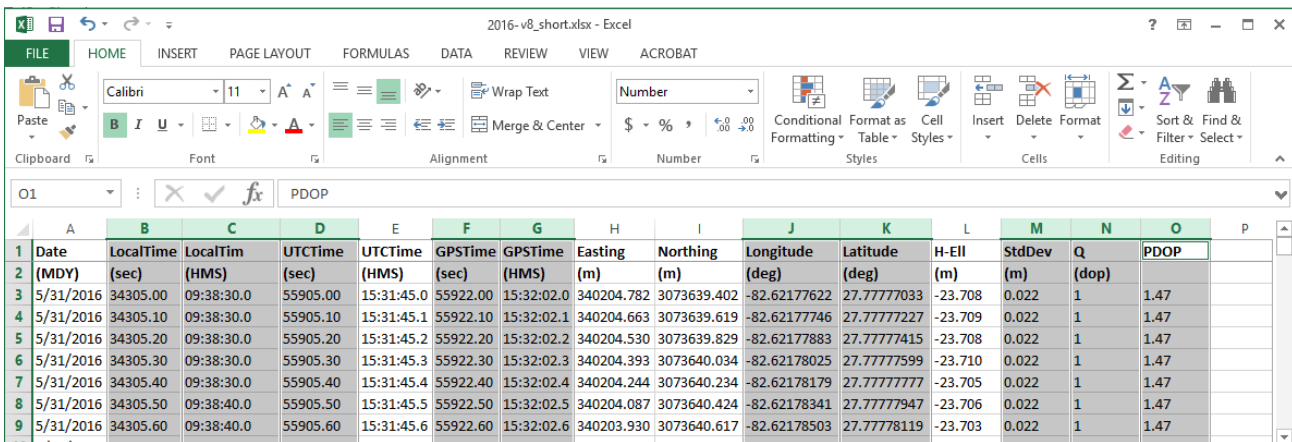
1. **Open the *.XLSX file in Excel.**
2. **Delete the columns with unneeded data.**
3. **Make a note of the order of the data in each of the remaining fields then delete the column heading (non-data) rows.**

FIGURE 1. Date, Time, Longitude, Latitude, Ellipsoid Height (in this example).



1	Date	LocalTime	LocalTim	UTCtime	UTCTime	GPSTime	GPSTime	Easting	Northing	Longitude	Latitude	H-Ell	StdDev	Q	PDOP
2	(MDY)	(sec)	(HMS)	(sec)	(HMS)	(sec)	(HMS)	(m)	(m)	(deg)	(deg)	(m)	(m)	(dop)	
3	5/31/2016	34305.00	09:38:30.0	55905.00	15:31:45.0	55922.00	15:32:02.0	340204.782	3073639.402	-82.62177622	27.77777033	-23.708	0.022	1	1.47
4	5/31/2016	34305.10	09:38:30.0	55905.10	15:31:45.1	55922.10	15:32:02.1	340204.663	3073639.619	-82.62177746	27.77777227	-23.709	0.022	1	1.47
5	5/31/2016	34305.20	09:38:30.0	55905.20	15:31:45.2	55922.20	15:32:02.2	340204.530	3073639.829	-82.62177883	27.77777415	-23.708	0.022	1	1.47
6	5/31/2016	34305.30	09:38:30.0	55905.30	15:31:45.3	55922.30	15:32:02.3	340204.393	3073640.034	-82.62178025	27.77777599	-23.710	0.022	1	1.47
7	5/31/2016	34305.40	09:38:30.0	55905.40	15:31:45.4	55922.40	15:32:02.4	340204.244	3073640.234	-82.62178179	27.77777777	-23.705	0.022	1	1.47
8	5/31/2016	34305.50	09:38:40.0	55905.50	15:31:45.5	55922.50	15:32:02.5	340204.087	3073640.424	-82.62178341	27.77777947	-23.706	0.022	1	1.47
9	5/31/2016	34305.60	09:38:40.0	55905.60	15:31:45.6	55922.60	15:32:02.6	340203.930	3073640.617	-82.62178503	27.77778119	-23.703	0.022	1	1.47

FIGURE 2. Date, Time, Easting (X), Northing (Y), Ellipsoid Height (in this example)



1	Date	LocalTime	LocalTim	UTCtime	UTCTime	GPSTime	GPSTime	Easting	Northing	Longitude	Latitude	H-Ell	StdDev	Q	PDOP
2	(MDY)	(sec)	(HMS)	(sec)	(HMS)	(sec)	(HMS)	(m)	(m)	(deg)	(deg)	(m)	(m)	(dop)	
3	5/31/2016	34305.00	09:38:30.0	55905.00	15:31:45.0	55922.00	15:32:02.0	340204.782	3073639.402	-82.62177622	27.77777033	-23.708	0.022	1	1.47
4	5/31/2016	34305.10	09:38:30.0	55905.10	15:31:45.1	55922.10	15:32:02.1	340204.663	3073639.619	-82.62177746	27.77777227	-23.709	0.022	1	1.47
5	5/31/2016	34305.20	09:38:30.0	55905.20	15:31:45.2	55922.20	15:32:02.2	340204.530	3073639.829	-82.62177883	27.77777415	-23.708	0.022	1	1.47
6	5/31/2016	34305.30	09:38:30.0	55905.30	15:31:45.3	55922.30	15:32:02.3	340204.393	3073640.034	-82.62178025	27.77777599	-23.710	0.022	1	1.47
7	5/31/2016	34305.40	09:38:30.0	55905.40	15:31:45.4	55922.40	15:32:02.4	340204.244	3073640.234	-82.62178179	27.77777777	-23.705	0.022	1	1.47
8	5/31/2016	34305.50	09:38:40.0	55905.50	15:31:45.5	55922.50	15:32:02.5	340204.087	3073640.424	-82.62178341	27.77777947	-23.706	0.022	1	1.47
9	5/31/2016	34305.60	09:38:40.0	55905.60	15:31:45.6	55922.60	15:32:02.6	340203.930	3073640.617	-82.62178503	27.77778119	-23.703	0.022	1	1.47

FIGURE 3. Sample file with the PPK data only.

	A	B	C	D	E	F
1	5/31/2016	15:31:45.0	340204.782	3073639.402	-23.708	
2	5/31/2016	15:31:45.1	340204.663	3073639.619	-23.709	
3	5/31/2016	15:31:45.2	340204.530	3073639.829	-23.708	
4	5/31/2016	15:31:45.3	340204.393	3073640.034	-23.710	
5	5/31/2016	15:31:45.4	340204.244	3073640.234	-23.705	
6	5/31/2016	15:31:45.5	340204.087	3073640.424	-23.706	
7	5/31/2016	15:31:45.6	340203.930	3073640.617	-23.703	
8	5/31/2016	15:31:45.7	340203.769	3073640.807	-23.698	
9	5/31/2016	15:31:45.8	340203.608	3073640.998	-23.698	

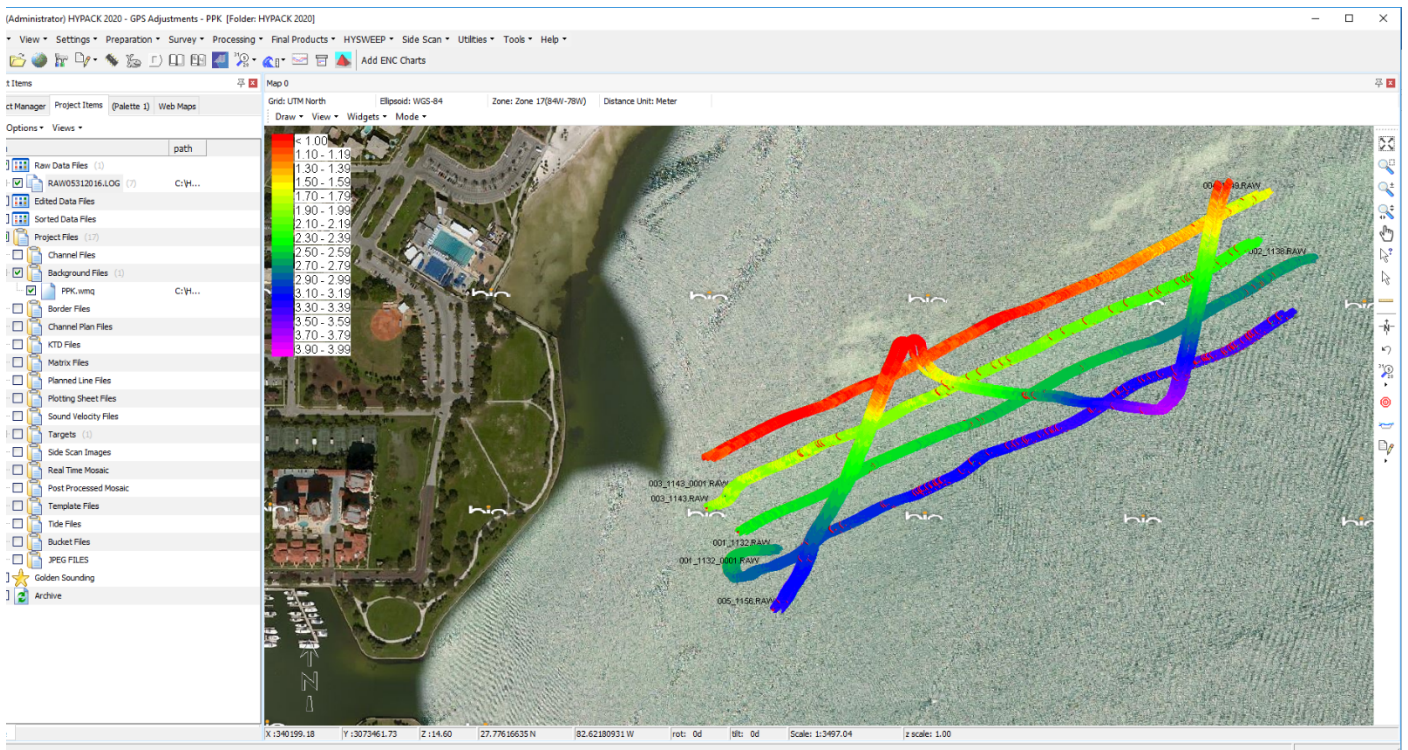
4. Save the data to a *.TXT or *.CSV format file.

APPLYING THE PPK DATA IN THE 64-BIT SINGLE BEAM EDITOR

After you have post-processed PPK data file, you can now apply the PPK data to your HYPACK® / HYSWEEP® SURVEY collected data.

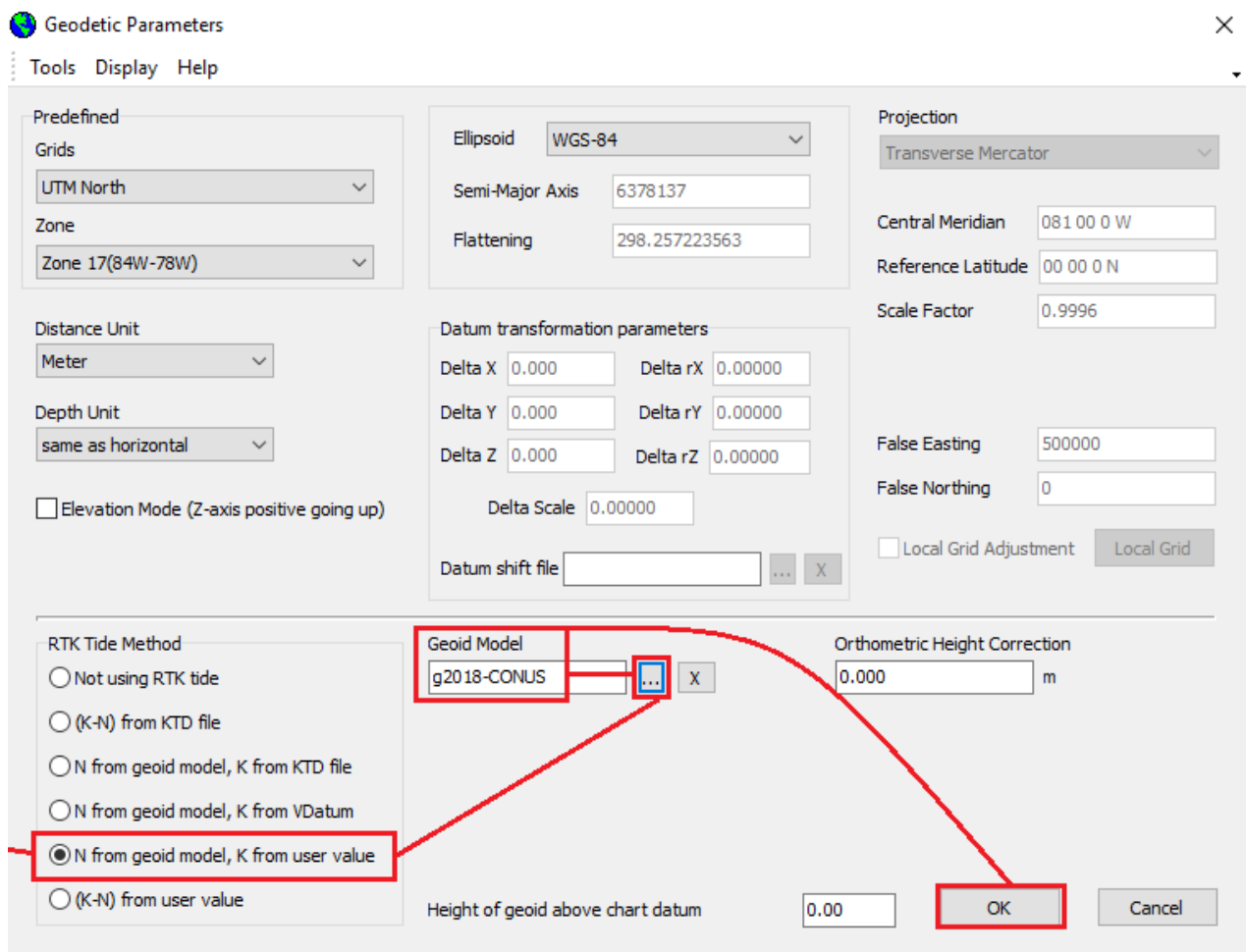
In the following example, we will demonstrate how this is done in SBMAX64:

1. Open your Project in HYPACK®.



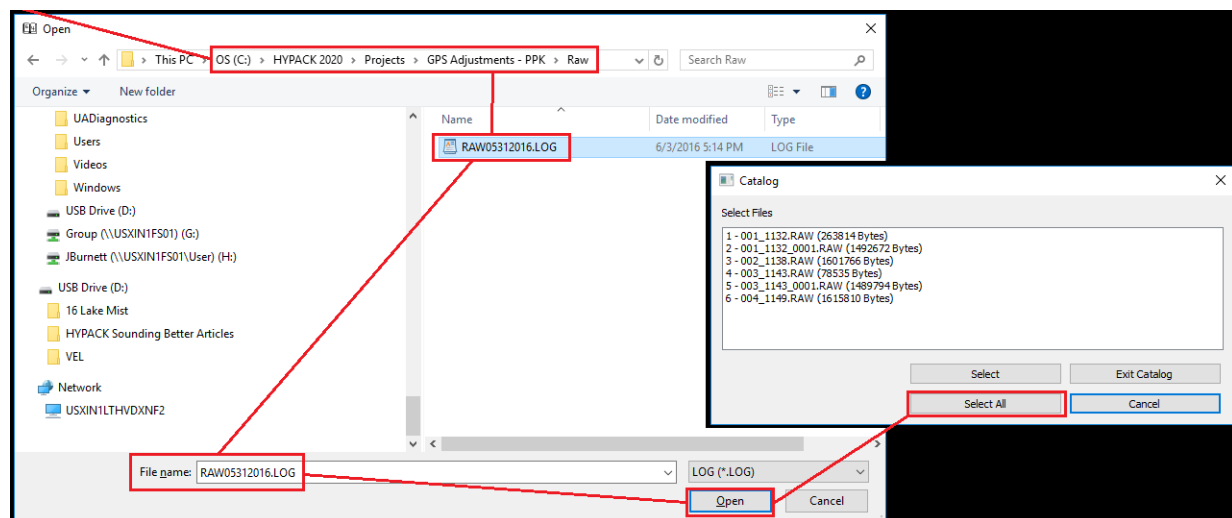
2. **Modify your Geodetic Parameters to accommodate for RTK updating.** Select PREPARATION - GEODETIC PARAMETERS and configure it as follows:

FIGURE 4. *Configuring your Geodesy for PPK*



3. **Open SBMAX64 and load your files.** Select FILE-OPEN and select your raw data.

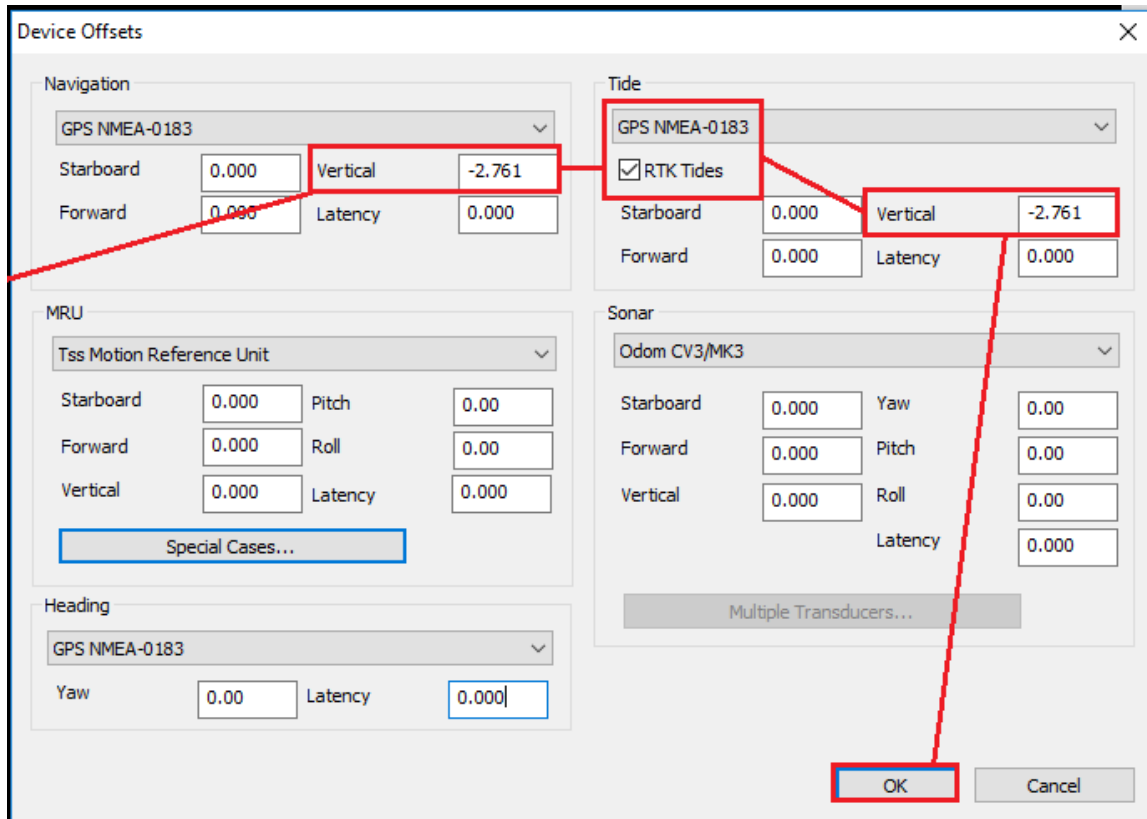
FIGURE 5. *Loading a Catalog of Raw Files*



4. **Modify the Read Parameters:**

- a. Select the Devices Tab, click [Edit].
- b. Modify the Tide Device.
- c. Select your GPS Device.
- d. Modify any offsets as needed, specifically, the vertical offset of your GPS device.
- e. If you have a motion sensor that provided pitch and roll data, select the RTK Tides option to compensate for any changes in the vertical offset of the GPS antenna in the pitch and roll calculations.
- f. Click [OK].

FIGURE 6. *Configuring the Editor to Calculate RTK Tide*



5. If you have a Motion Sensor, select the Processing Tab, enable the Avoid Double Heave option and click [OK].

NOTE: The editor will now use the Heave data to normalize the RTK Tide data.

6. **Once the data files load into the Editor, open the Spreadsheet window.** (Click [Spreadsheet].)
- Notice that *all* of the Tide Corr. values are the same. They are now equivalent to the Vertical Offset of the GPS Antenna, as they should be.

FIGURE 7. SBMAX Spreadsheet

Spreadsheet - Depth

Hide Panel Fill Column Fill Selection Swap Depth 1,2 Export

Display Options

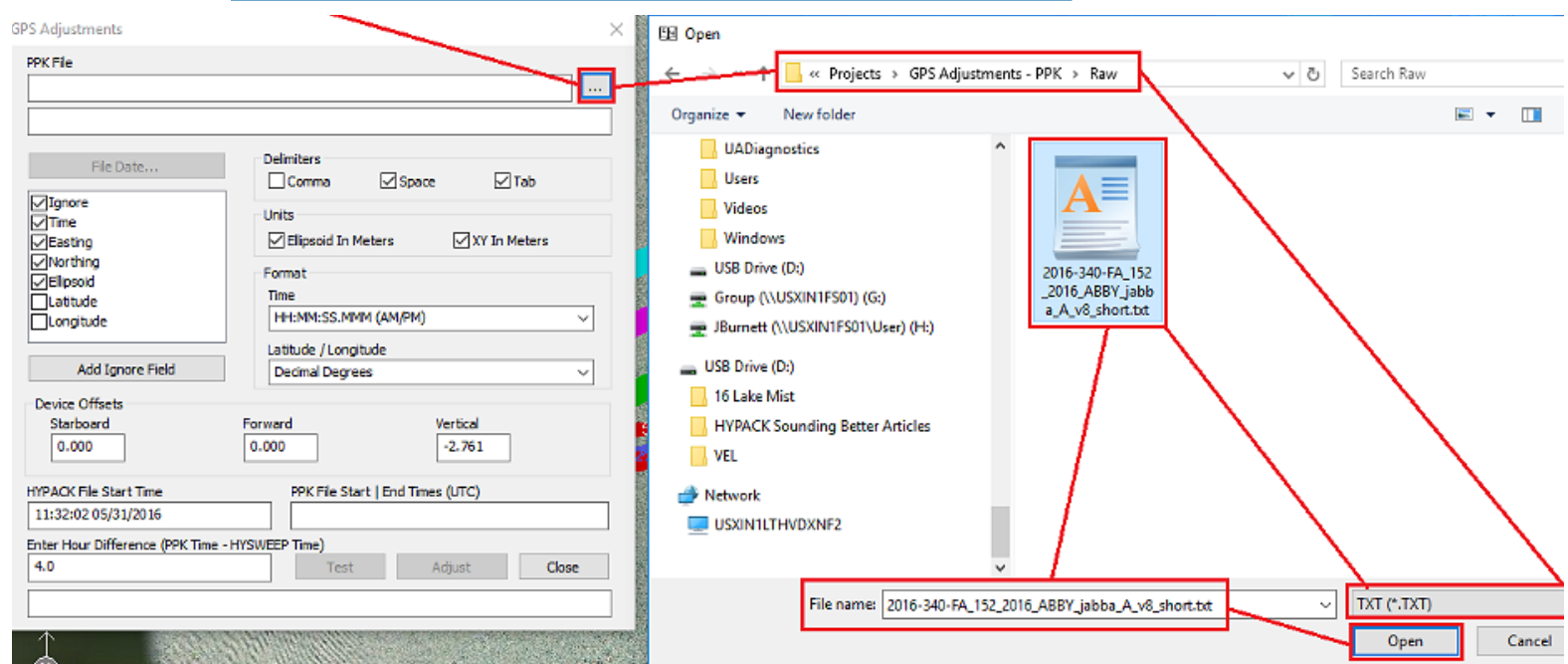
- COG
- Corr. Depth 2
- Date
- DBL
- DOL
- Dop
- Draft Corr
- Epoch
- Event
- GPS Elevation
- GPS Latitude

Time
Tide Corr
Raw Depth 1
Heave Corr
Corr. Depth 1

	Time	Tide Corr	Raw Depth 1	Heave Corr	Corr. Depth 1
1	11:38:03.680	-2.76	*****	-0.07	*****
2	11:38:03.732	-2.76	*****	-0.07	*****
3	11:38:03.783	-2.76	2.80	-0.07	-0.03
4	11:38:03.985	-2.76	2.83	-0.06	0.01
5	11:38:04.033	-2.76	2.80	-0.06	-0.02
6	11:38:04.084	-2.76	2.80	-0.06	-0.02
7	11:38:04.135	-2.76	2.79	-0.06	-0.03
8	11:38:04.186	-2.76	2.77	-0.07	-0.06
9	11:38:04.237	-2.76	2.78	-0.07	-0.05
10	11:38:04.288	-2.76	2.78	-0.07	-0.05
11	11:38:04.338	-2.76	2.77	-0.07	-0.06
12	11:38:04.389	-2.76	2.82	-0.07	-0.01
13	11:38:04.440	-2.76	2.78	-0.07	-0.05
14	11:38:04.491	-2.76	2.79	-0.07	-0.04
15	11:38:04.542	-2.76	2.79	-0.07	-0.04
16	11:38:04.593	-2.76	2.80	-0.07	-0.03
17	11:38:04.642	-2.76	2.80	-0.07	-0.03
18	11:38:04.694	-2.76	2.79	-0.06	-0.03
19	11:38:04.745	-2.76	2.79	-0.06	-0.03

7. Close the Spreadsheet window.
8. Apply PPK Adjustment File.
 - a. Select Tools - GPS Adjustments.
 - b. Load the PPK Text File that you created. Click [...], change File Type to *.TXT or *.CSV (if needed) and select the file that contains your PPK data. Click [Open].

FIGURE 8. Loading your PPK Data

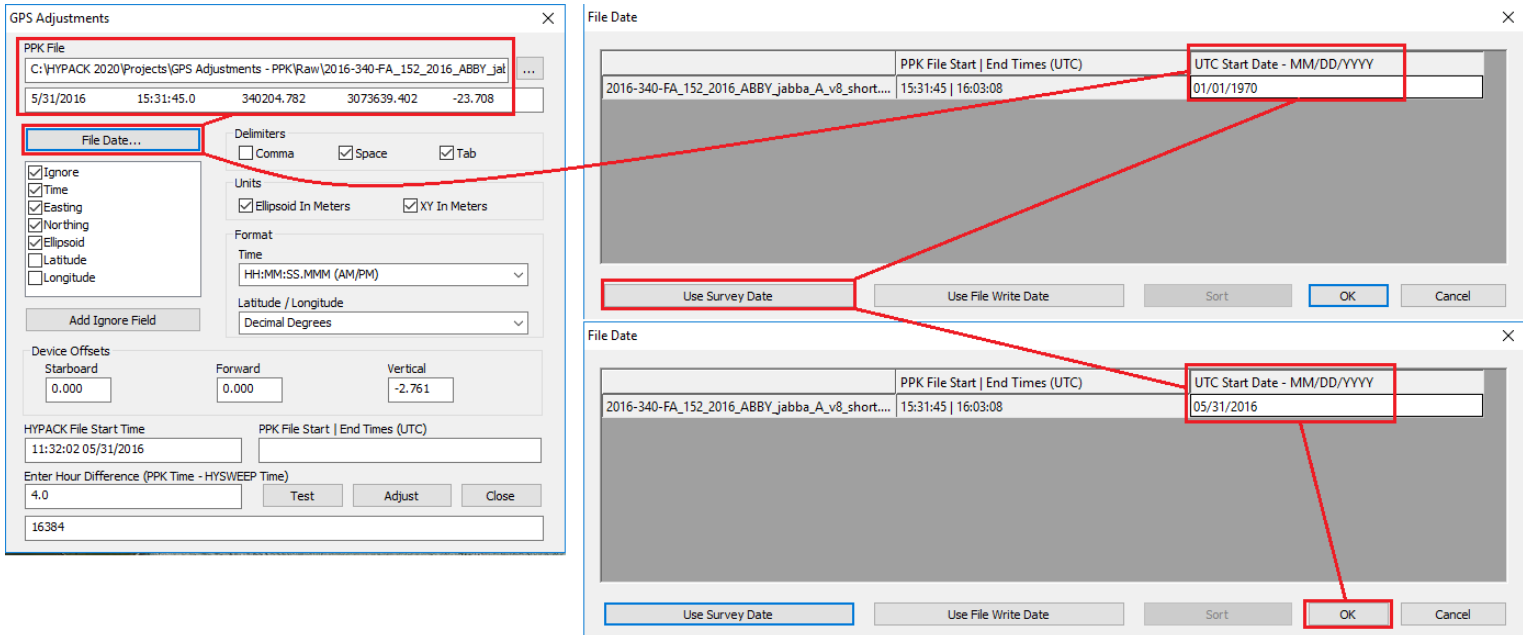


You will now see the path and file name appear, along with the format of the PPK file.

c. **Get the PPK date information:**

- Click [File Date].
- Verify that the correct survey date appears in the UTC Start Date box.
- If it does *not*, click [Use Survey Date]. the correct date will now populate the UTC Start Date box.
- Click [OK]. The date and time of the PPK file will now populate the PPK File Start box.

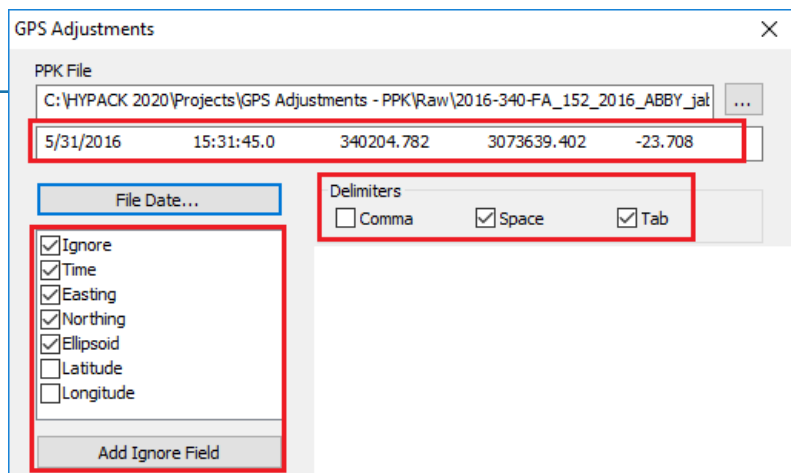
FIGURE 9.



IMPORTANT: Pay attention to the format of the PPK file, as it will assist you in setting up the next part of this window.

FIGURE 10. Describing your PPK File in the GPS Adjustments Routine

- Select the Delimiters for your file (Comma, Space, Tab).
- Order the fields from top to bottom, as they are from left to right, in the file. Remember, when creating the PPK File, you can save it with the Latitude and Longitude or the Easting (X) and Northing (Y) values.



NOTE: Currently, there is only one selection for each of these options; therefore, the PPK file must conform to these formats.

FIGURE 11. *Configuring the GPS Adjustments Read Parameters*

- f. Verify and enable the correct Units of the PPK data.
- g. Select the correct Time and Latitude / Longitude formats.

The Device Offsets for the Positioning / Tide Device are automatically populated from the Read Parameters window.

- h. Verify and modify the Device Offsets as needed.
- i. Enter the Hour Difference between your HYPACK® File Times and UTC Time.
- j. Click [Test] and verify that the field order is being read correctly. If it is not, modify the Field order configuration and test again until it is correct.

The screenshot shows the 'GPS Adjustments' dialog box. It contains the following sections:

- PPK File:** A text field showing the file path 'C:\HYPACK 2020\Projects\GPS Adjustments - PPK\Raw\2016-340-FA_152_2016_ABBY_jal' and a preview of the file's first line: '5/31/2016 15:31:45.0 340204.782 3073639.402 -23.708'.
- File Date...** A button to open the file's date and time.
- Ignore:** A list of fields to ignore: Time, Easting, Northing, Ellipsoid, Latitude, and Longitude. 'Time' is checked.
- Add Ignore Field:** A button to add more fields to the ignore list.
- Delimiters:** Checkboxes for Comma, Space, and Tab. 'Space' and 'Tab' are checked.
- Units:** A section with checkboxes for 'Ellipsoid In Meters' and 'XY In Meters'. Both are checked.
- Format:** A section with dropdown menus for 'Time' (set to 'HH:MM:SS.MMM (AM/PM)') and 'Latitude / Longitude' (set to 'Decimal Degrees').
- Device Offsets:** A section with input fields for 'Starboard' (0.000), 'Forward' (0.000), and 'Vertical' (-2.761).
- HYPACK File Start Time:** A text field showing '11:32:02 05/31/2016'.
- PPK File Start | End Times (UTC):** A text field showing '15:31:45 05/31/2016 | 16:03:08 05/31/2016'.
- Enter Hour Difference (PPK Time - HYSWEEP Time):** A text field showing '4.0'.
- Buttons:** 'Test', 'Adjust', and 'Close' buttons.
- Footer:** A text field showing '16384'.

FIGURE 12. Testing the Configuration

- k. Click [Adjust].
9. When the adjustment is complete, click [Close].
10. Re-open the Spreadsheet and Heave/Tide windows and verify that the Tide Corr. Values have modified.

FIGURE 13. Verifying Tide Adjustments

