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EZSurv™
Precise Point Positioning (PPP)

October 10th 2012

2012 - Training documents

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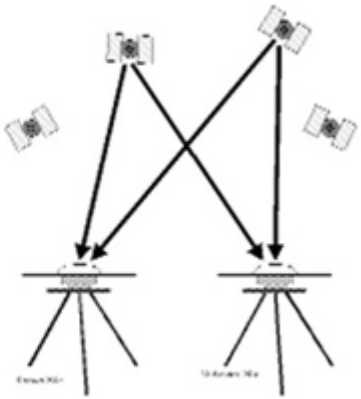
About PPP

- Precise point positioning (PPP) is a method that ***performs precise position determination using a single GPS receiver.***
- This positioning approach arose from the advent of widely available ***precise GPS orbit and clock data products*** with centimeter accuracy.
- Combining precise satellite positions and clocks with a dual-frequency GPS receiver, PPP is able to provide position solutions at centimeter (static) to decimeter level (kinematic), which is appealing to many applications such as airborne mapping.

PPP versus RTK

- PPP is different from double-difference RTK positioning which requires access to observations from one or more base stations with known coordinates.
- The real ***benefit of PPP is in open environment*** where the GNSS signal is not frequently block (creating frequent loss of lock). PPP re-initialisation is longer than RTK re-initialisation (so frequent obstruction is not benefic when using PPP)



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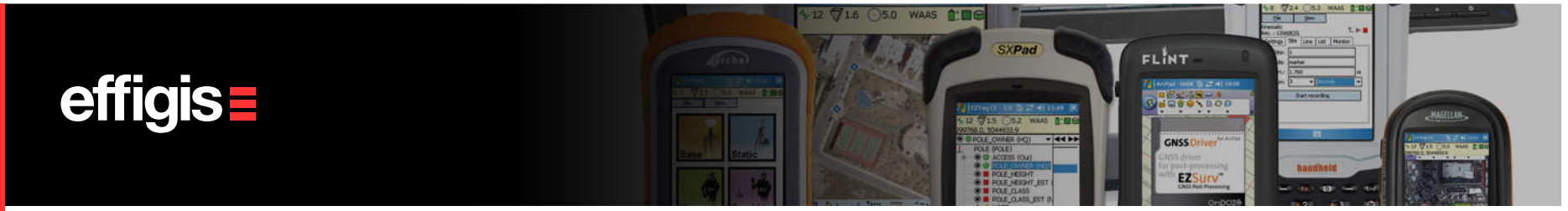
EZSurv™ and PPP

- EZSurv™ support static PPP as well as kinematic PPP
- GPS and Glonass precise orbits and clocks can be imported for PPP
- The process is similar to differential processing

Mode	Reference	Remote	Results
Diffential	Base/Static	Static	Baseline
Diffential	Base/Static	Rover	Trajectory
PPP	**Orbits/Clocks**	**Static**	**PPP-Static**
PPP	**Orbits/Clocks**	**Rover**	**PPP-Kinematic**

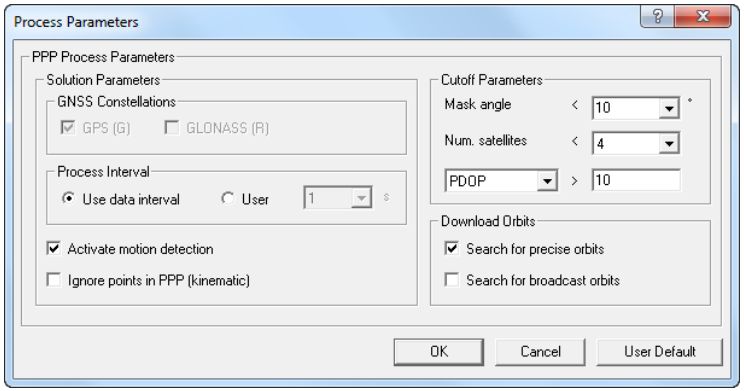
- Rather than searching for Base Station data into providers Data Base, we search for precise orbits and clocks into Research Center Data Base (Natural Resources Canada, International GNSS Services, Center for Orbit Determination Europe, Information and Analysis Center)



To be done only once

Set PPP Process Parameters

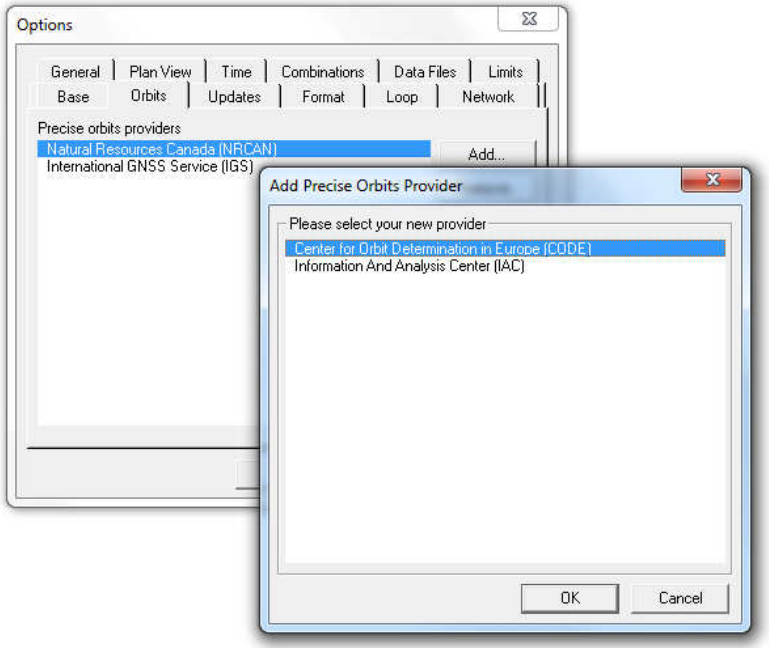
- First, set the PPP mode (**Edit > Processing Mode>precise Point Positioning (PPP)**
- Select **Edit > Process Parameters…**
- Parameters are similar to differential parameters at few exceptions
  - ❑ Constellation (GPS or GPS&GLONASS)
  - ❑ Process interval
  - ❑ Cut-off Parameters
  - ❑ Precise orbits
  - ❑ Etc.

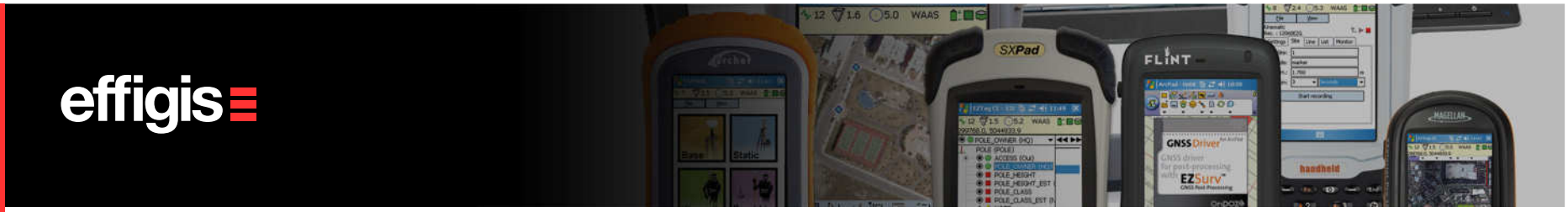


To be done only once

Configuring Orbit Providers

- Select **Options...** from the **Tools** menu.
- Select the **Orbit** tab. Click **Add...** to add a Precise Data Products Provder. Select a provider from the list and click **OK**.
- Click **Properties...** to reach the Provider Web Site to get more info on their Precise Data Products.
- Precise Data Products can also be used in diffenetial (to improve long baseline accuracy)

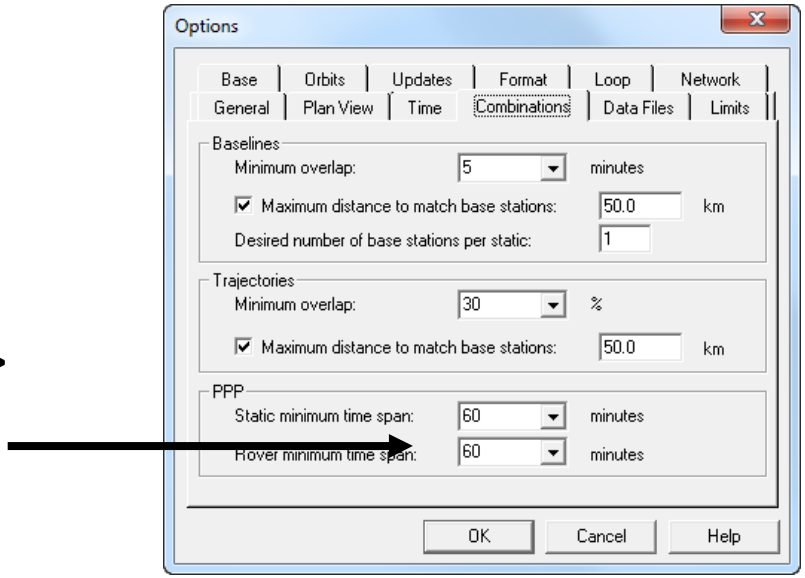




To be done only once

Configuring PPP Parameters

- EZSurv™ generates automatically all PPP-Static or PPP-Kinematic using field metadata («start and end time» of each observation file, as well as their status, static or Rover)
- Select the **Combinations** tab from **Tools > Options**. In the **PPP** section, set the minimum time span for your static and Rover (typically longer than 60 minutes)



To be done only once

Mapping System/datum and PPP

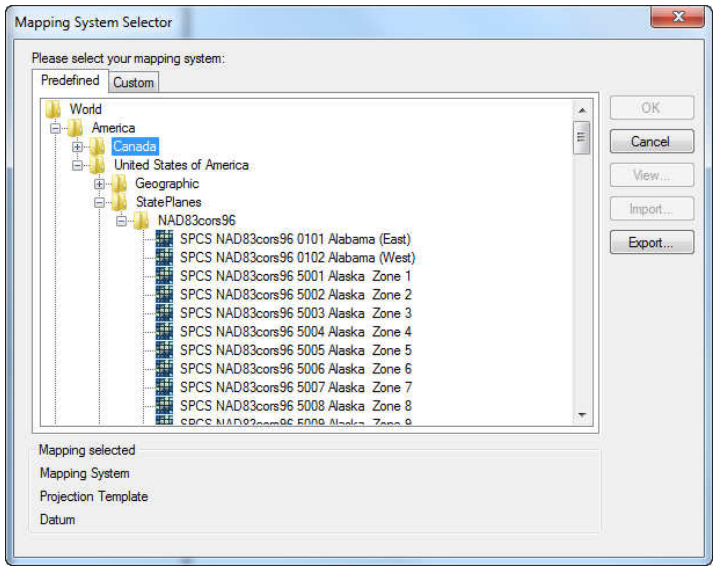
- PPP reference system are defined by the Orbits Reference System.
- Typically research Center are using an IRTF definition (ITRF2000, ITRF2005, etc.)
- EZSurv™ manages automatically *«Reference System Transformation»* (with 15 parameters) in order to ease the user experience *(this true only for the modern geodetic reference systems, those having a known relation with an ITRF reference frame)*
- At the user level, there is nothing to do, the user simply select its Mapping System as usual

See the «Mapping Systems» training Module.

To be done only once

Set your Mapping System/datum

- Set your mapping coordinates using the **Mapping Systems** dialog, under **Tools > Mapping Systems > Selector** from the main menu.
- From this dialog, you can select an existing mapping system. You can create new ones using **Tools > Mapping Systems > Editor**, these new mapping systems will be available under the **Custom** Tab of the **Tools > Mapping Systems > Selector**

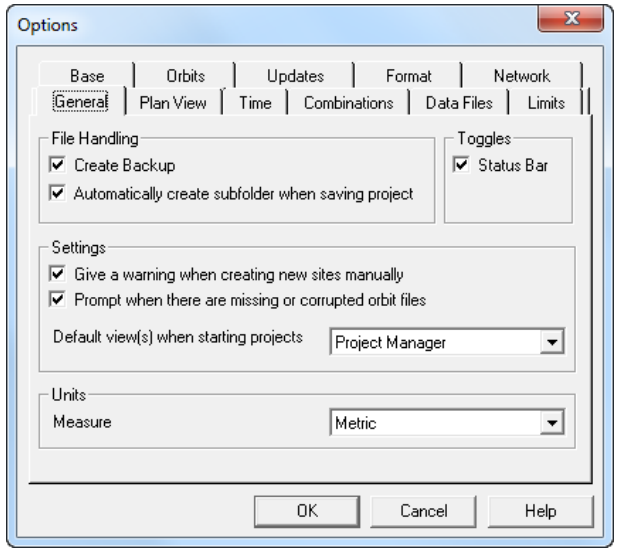


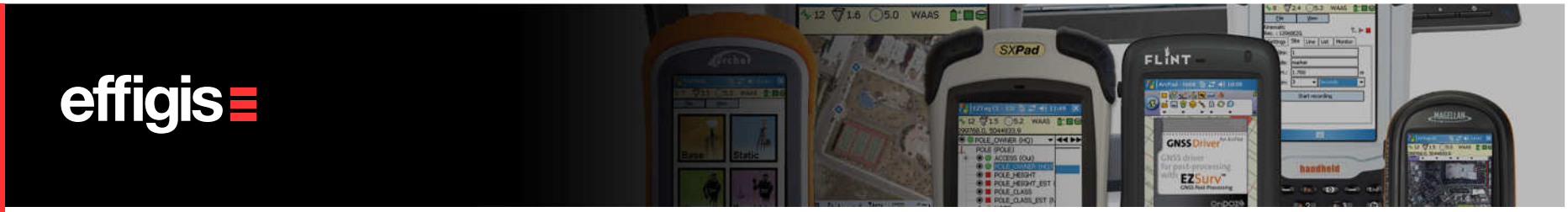
See the «Mapping Systems» training Module.

To be done only once

Configuring Unit of Measure

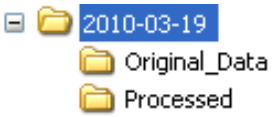
- Usually, this has to be done once if the user always uses the same reference system.
- Select the **General** tab from the **Tools > Options**. In the *Units* section, select your unit of measure (International Feet, Metric or US Survey Feet).



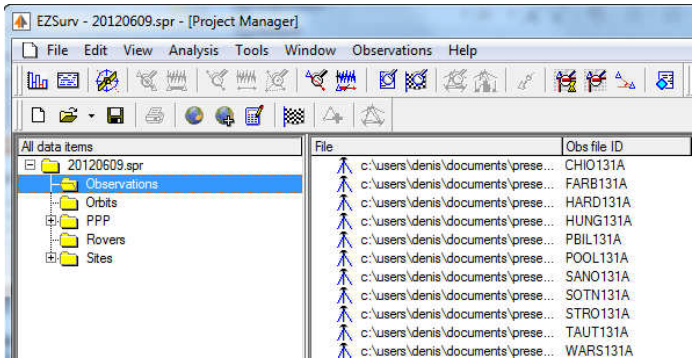


Importing Observation Files

- It is suggested to manage data collection on a daily basis. Each daily folder should contain a subfolder for the original data files collected on the field and another one for the post-processing project files.



- Select **Observations > Import…** or simply drag and drop your files into the observations folder
- ***<u>If needed set your antenna model</u>***



View/Project Manager

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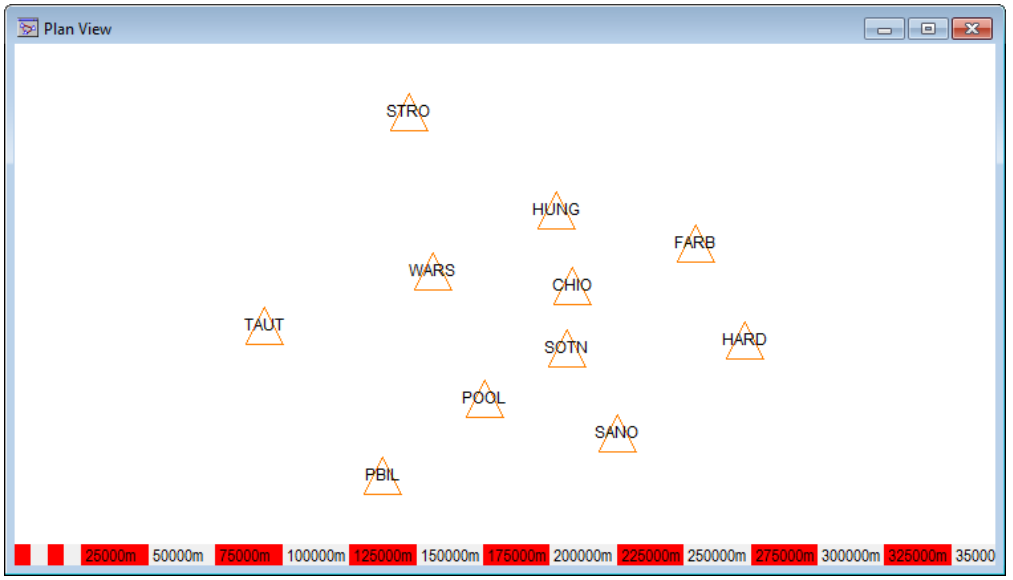
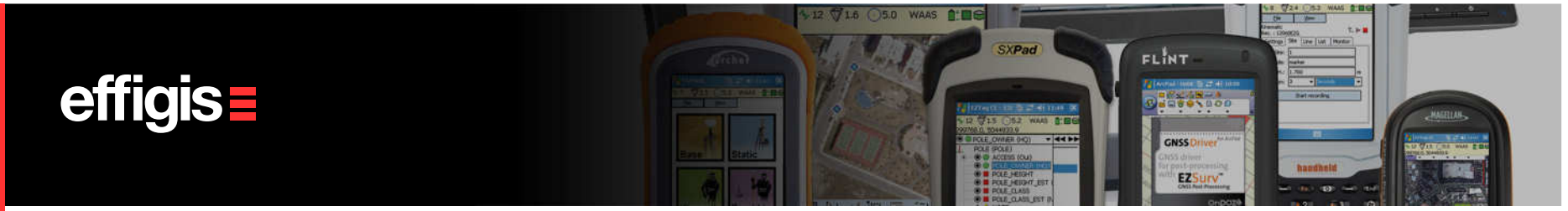
View your Data in a PlanView

All your data (static and kinematic) can be seen in a Plan View from the main menu View/Plan (**View > Plan View)**

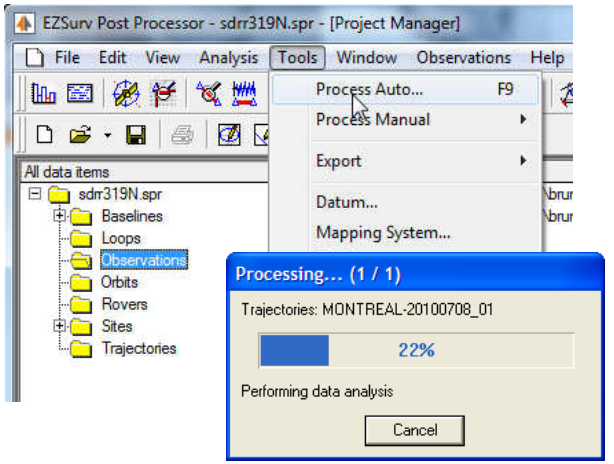




Processing PPP Files

Select **Process Auto...** from the **Tools** menu to start the GNSS post-processing (or press **F9** on the keyboard). The following steps are performed automatically:

> scan for Precise orbits/clocks.
> merge orbits/clocks (if required)
> define PPP-Static and/or PPP-Kinematic
> post-process the data.



Precise orbit and clock final products might take about 2-3 weeks before to be published. Some rapid products might be faster to get 1-3 days depending the Research Center.

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Processing PPP Files

The **Process Summary** is displayed once the GNSS post-processing is completed.

Last Process Summary

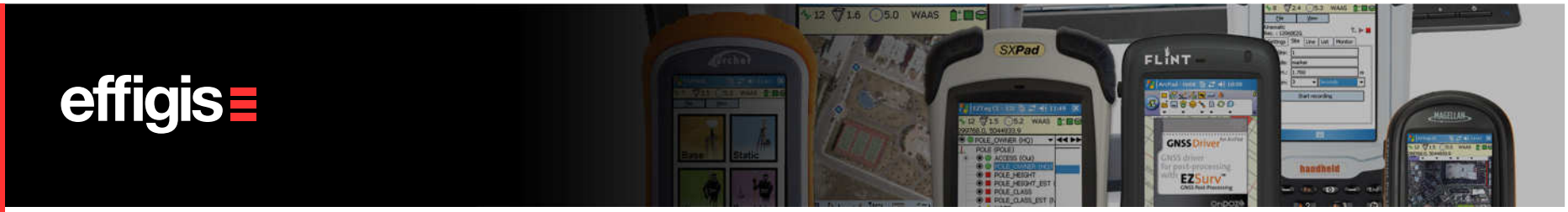
Last Processed

```
LAST PROCESS SUMMARY
EZSurv 2.91

-----------------------------------------------------------------------------------------------------------------
|  Project              |  C:\Users\denis\Documents\Presentation\2012\Pentax\Data\Network2\EZSurv (2)\20120609.spr  |
|  Processing Date      |  2012/06/10 20:32:36.47 (UTC)                                                           |
|  Mapping System       |  UTM_ETRS89_Auto                                                                        |
|  Projection Template  |  Universal Transverse Mercator, Automatic (UTM-A)                                       |
|  Datum                |  European Terrestrial Reference System - 1989                                           |
|  Geoid Model          |  EGM2008 [EGM2008 Und_min2.5x2]                                                         |
-----------------------------------------------------------------------------------------------------------------

PRECISE POINT POSITIONING (PPP)

-------------------------------------------------------------------------
|                    |  ____Number of epochs___  |  _________Number of sites_________  |
|  File      Type    |  Total  Solved  % Solved  |  Total  Float  PSR  Failed  Unproc  |
|-------------------------------------------------------------------------|
|  POOL131A  Static  |    480     480    100.00  |      1      1    0       0        0  |
|  SANO131A  Static  |    480     480    100.00  |      1      1    0       0        0  |
|  SOTN131A  Static  |    480     480    100.00  |      1      1    0       0        0  |
|  STRO131A  Static  |    480     480    100.00  |      1      1    0       0        0  |
|  TAUT131A  Static  |    480     480    100.00  |      1      1    0       0        0  |
|  CHIO131A  Static  |    480     480    100.00  |      1      1    0       0        0  |
|  FARB131A  Static  |    480     480    100.00  |      1      1    0       0        0  |
|  HARD131A  Static  |    480     480    100.00  |      1      1    0       0        0  |
|  HUNG131A  Static  |    480     480    100.00  |      1      1    0       0        0  |
|  PBIL131A  Static  |    480     480    100.00  |      1      1    0       0        0  |
-------------------------------------------------------------------------
```



Processing PPP Files

Post-Process PPP position are reported under **Analysis > Survey Sites > Post-Processed Coordinates…**

Sites from PPP

Site	Code	Solution	Position X (m)	Position Y (m)	Position EllHgt (m)	Position MSL (m)	Standard deviation X (m)	Standard deviation Y (m)	Standard deviation Hgt (m)
CHIO(01)	19194M001	L3 (iono-free)	609228.490	5667552.995	128.325	81.117	0.020	0.010	0.029
FARB(01)		L3 (iono-free)	655338.136	5683311.370	112.681	66.190	0.020	0.010	0.029
HARD(01)		L3 (iono-free)	673587.911	5647139.609	65.902	20.102	0.020	0.010	0.029
HUNG(01)		L3 (iono-free)	603364.773	5695832.540	183.247	135.378	0.020	0.010	0.029
PBIL(01)		L3 (iono-free)	538457.784	5596787.712	107.476	58.327	0.020	0.010	0.030
POOL(01)		L3 (iono-free)	576812.796	5625465.031	68.754	20.963	0.020	0.010	0.030
SANO(01)		L3 (iono-free)	626330.643	5612464.831	91.091	44.613	0.020	0.010	0.029
SOTN(01)	13274M001	L3 (iono-free)	607470.095	5644011.353	73.739	26.853	0.020	0.010	0.029
STRO(01)		L3 (iono-free)	548237.181	5732309.840	73.042	23.238	0.020	0.011	0.031
TAUT(01)		L3 (iono-free)	494479.141	5652429.728	80.545	29.278	0.020	0.011	0.030
WARS(01)		L3 (iono-free)	557166.505	5672921.097	177.571	128.597	0.020	0.010	0.028

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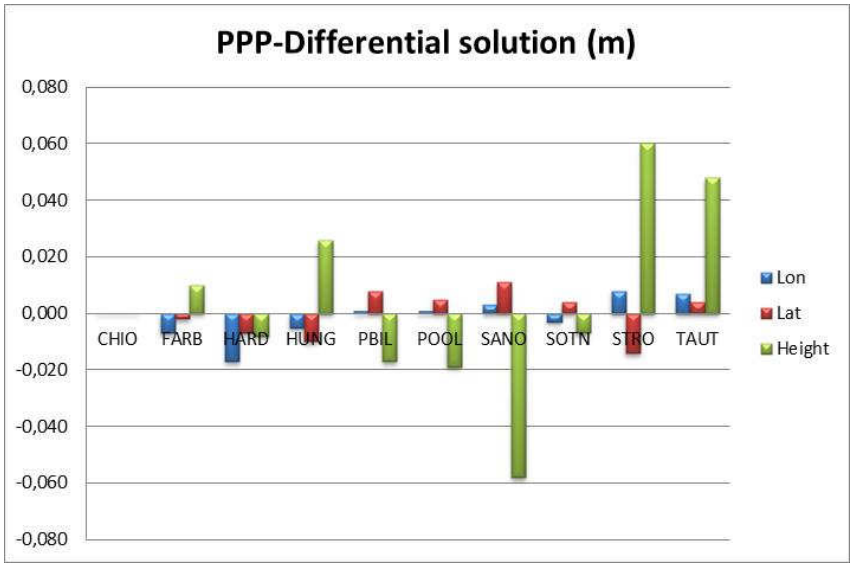
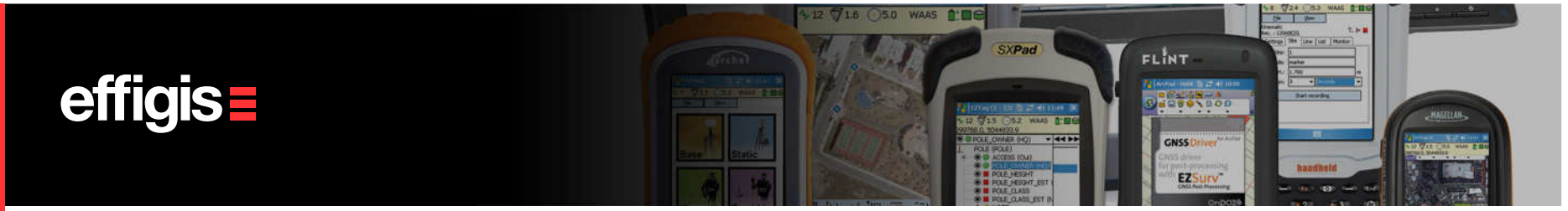
PPP Accuracy (real field test)

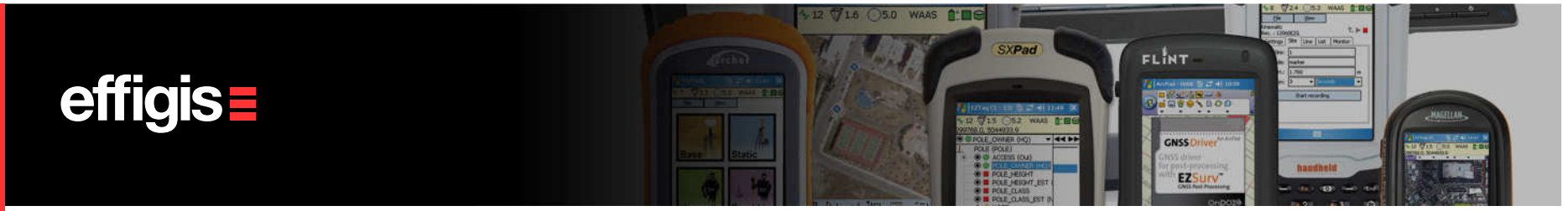


4 hours of static data recorded at 30 sec. interval



Kinematic Results - Export

- PPP results are exported as *sites in Baseline* (PPP-Static) and as *trajectory positions* (PPP-kinematic)
- It has the same options in **Tools > Export> ….**
- It could also be exported in a custom CSV format

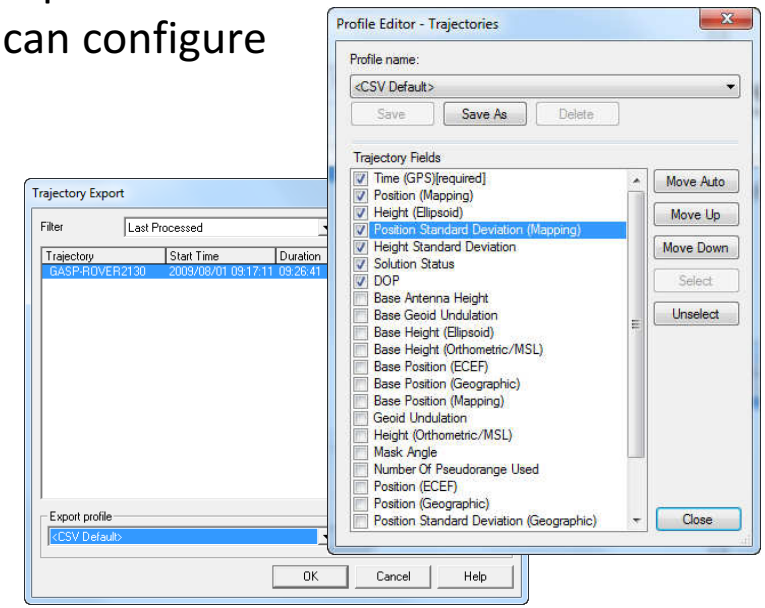


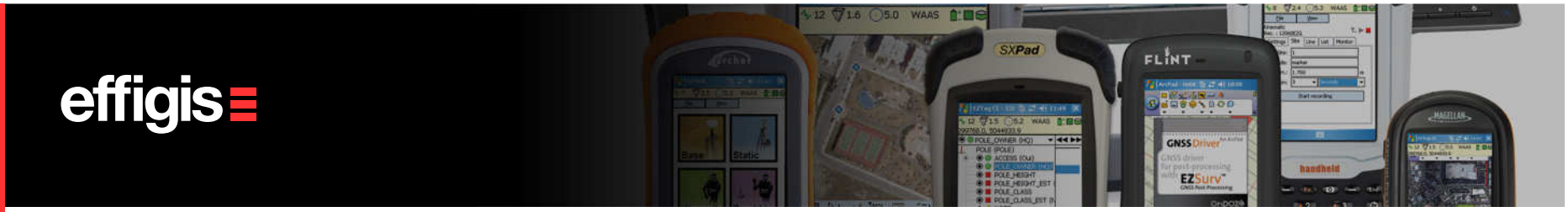
PPP Results – CSV Export

CSV export can be configured as you want. All parameters related to a trajectory can be exported. You can configure a CSV output and save it using a profile

Tools > Export > Trajectories…

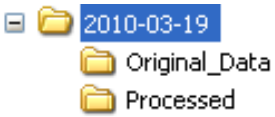
- Click … on to access the Profile Editor
- Then select your parameters, order them using the «Move up» and «Move down»
- Save it under a specific name



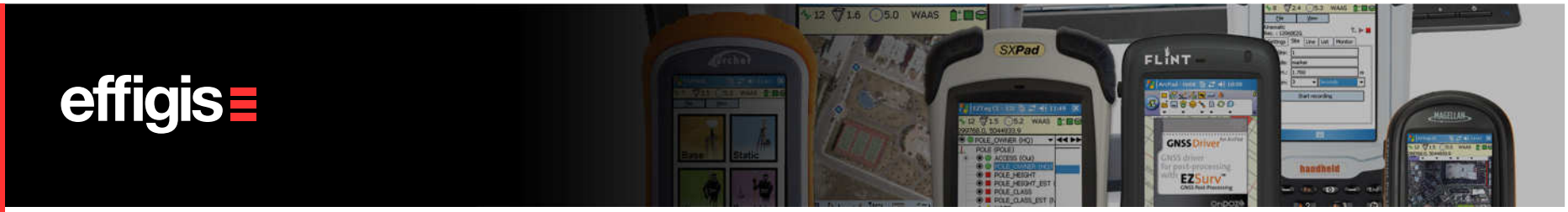


PPP – Saving your Project

- As previously mentioned, before saving your Post-Processor project, it is suggested to manage the survey files on a daily basis. Each daily folder should contain a subfolder for the GNSS observations and a subfolder to hold the post-processed project files. A Post-Processor project generates many files.



- Save your Post-Processor project (a location is proposed).
- The SPR file can be reopened any time to add more data, unless you move, delete some files of the project or you edit the folder path.
- To move your project to another folder or computer, create an archive. Select **File > Archive Project…**
- Select **File > Open Archived Project…** to reopen an archived project.



PPP Processing in Short

Few easy steps to get the job done

- Set PPP mode
- Import your PPP data
- Set your Precise orbit/clock products Provider Parameters for automatic download (or import your precise data manually)
- Launch the automatic processing (F9)
- Export your corrected Positions

Few settings to be done once

- The receiver antenna model
- Mapping system
- Unit of measure
- Process parameters
- PPP combination parameters (minimum time span)