9 Palms Laboratory
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Title: GPS Data Collection - Trimble
Number: SP 0009
Release Date: 09/20/02
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DOCUMENT TYPE:	Sampling Procedure
TITLE:	GPS Data Collection using Trimble for Point Features
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Revision History

Version	Date	Revision Highlights
1.0	09/20/02	Original version
1.1	09/30/02	First Revision
1.2	01/20/03	Second Revision

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METHOD #:   SP 0009
TITLE: GPS Data Collection - Trimble
INSTRUMENTATION: Trimble Pro XRS

1. Scope and Application

1.1   The following procedures describe the collection of Reference and Environmental longitudinal and latitudinal field data.

1.2   These procedures are not intended for tracking and marking a directional route.

2. Summary of Method

2.1   Complete field reconnaissance.
2.2   Assemble and configure all equipment.
2.3   Plan project.
2.4   Collect data.
2.5   Process data.
2.6   Export data.

3. Comments

3.1   Using this method, data accuracy is sub-meter and can be better than within 50 cm of actual location. This level of accuracy requires that the following settings be preserved:
3.1.1   PDOP must be less than 6.
3.1.2   Five or more satellites must be in view.
3.1.3   SNR must be greater than 6.
3.1.4   Elevation mask must be greater than or equal to 15 degrees.
3.2   In order to select the best time of day to collect measurements, it is recommended that the almanac be updated regularly (at least monthly). This is done by simply placing the assembled Trimble Receiver pack and logger outside for about ten minutes with the logger turned on. It will record a current almanac from the satellite provider. Refer to section *5.2.2.11* for transferring almanac data to Pathfinder office software during the planning phase.

4. Apparatus

4.1   Trimble Pro XRS data collector
4.1.1   GPS Receiver

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4.1.2 Antenna

4.1.3 Data Logger

4.1.4 Range poles

4.1.5 Trimble rechargeable batteries

4.1.6   Hip pack/ Backpack

4.1.7   Antenna cable

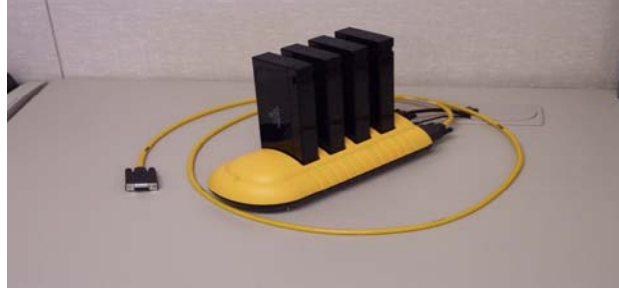*4.1.8*   Dual battery cable

4.1.9   TSC1 Power/Data cable

4.1.10 Trimble Battery Charger

4.1.11 Assembled GPS unit

4.2   GPS Software
   4.2.1   Trimble Asset Surveyor v5.20
   4.2.2   Trimble GPS Pathfinder Office v2.80
4.3   Internet Access for Differential Correction Data
   4.3.1   National Geodetic Survey
               Cors, Pinon CA
               http://www.ngs.noaa.gov/cors/corsdata.html
   4.3.2   PKZip software for unzipping differential correction data that are downloaded from the
               Internet (Section *4.3.1*).
4.4   Satellite service provider for Real-Time data collection.
   4.4.1   Current Omnistar subscription expires on 8/01/03.
   4.4.2   To renew call ASC Scientific
               2075 Corte del Nogal, Suite G
               Carlsbad, CA 92009
               Telephone: 760-431-2655
4.5   Database Software
   4.5.1   Current software is Oracle 9i
   4.5.2   Interface with ArcSDE from ESRI

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5. Procedure

5.1   Perform field reconnaissance

    5.1.1   Study site characteristics

        5.1.1.1   Identify all features that can potentially be georeferenced using GPS.

        5.1.1.2   Identify obstructions that may interfere with data collection.

        5.1.1.3   Establish potential order of collecting GPS data from identified features.

    5.1.2   Communicate with all others who will be involved in data collection or processing.

        5.1.2.1   Determine which features and attributes must be collected to achieve the desired end result of the project.

        5.1.2.2   At least one feature must be collected per project, in addition to a fixed reference point.

5.2   Configure and assemble GPS equipment.

    5.2.1   Charge Trimble batteries at least one day prior to the anticipated date of data collection.

        5.2.1.1   Plug the Trimble battery charger into the wall, using the power cord provided by Trimble (Section *4.1.10*).

        5.2.1.2   Insert the batteries into the Trimble battery charger.

            5.2.1.2.1   The batteries should be positioned so that the end with the metal tabs is down.

            5.2.1.2.2   When the batteries are inserted correctly, the small colored light below each battery will turn on.

        5.2.1.3   The batteries have finished charging when the small colored lights on the battery charger are green.

            5.2.1.3.1   A solid orange light means the batteries are not charged.

            5.2.1.3.2   A flashing orange light indicates a battery that is partially, but not fully, charged.

        5.2.1.4   Charge the Trimble data logger

            5.2.1.4.1   Connect the data logger (Section *4.1.3*) to the battery charger (Section *4.1.10*).

                5.2.1.4.1.1   Use the TSC1 Power/Data cable (Section *4.1.9)* to connect the data logger to the battery charger.

                5.2.1.4.1.2   Do not unplug the battery charger from the wall outlet.

            5.2.1.4.2   The data logger recharges fully in about three hours.

        5.2.1.5   Assemble GPS equipment.

            5.2.1.5.1   Connect the range poles (Section *4.1.4*).

                5.2.1.5.1.1   Screw one end of the assembled range pole into the base of the Antenna (Section *4.1.2*).

                5.2.1.5.1.2   Screw the other end of the range pole to the top of the backpack (Section *4.1.6*).

            5.2.1.5.2   Secure the GPS Receiver into the backpack main compartment.

            5.2.1.5.3   Connect the Antenna Cable (Section *4.1.7*) to the GPS Receiver (Section *4.1.1*).

            5.2.1.5.4   Route the free end of the Antenna Cable to outside the top of the backpack and connect it to the Antenna.

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5.2.1.5.5   Insert charged batteries (Section *5.7.1.3*) into battery pockets located in the main backpack compartment on each side of the GPS Receiver.

5.2.1.5.6   Connect the dual battery cable (Section *4.1.8*) to port B of the GPS Receiver using the female pin connector.

5.2.1.5.7   Connect the GPS Receiver to two batteries using battery clips on the dual battery cable.

5.2.1.5.8   Connect the data/receiver connector of the dual battery cable to receiver connector of the TSC1 Power/Data cable (Section *4.1.9*).

5.2.1.5.9   Connect the TSC1 Power cable to the Data Logger.

5.2.1.6   Test assembled GPS connections

5.2.1.6.1   Turn data logger on.

5.2.1.6.2   After booting up, the data logger should show a message saying "Connecting to GPS."

5.2.1.6.3   Within a minute or two, the number of satellites and PDOP should replace this message.

5.2.1.6.4   During this time the satellites are sending information to the receiver and updates the *Almanac* within 15 minutes.

5.2.1.7   Check and/or adjust Asset Surveyor configuration.

5.2.1.7.1   Using the arrow keys on the data logger, select *Configuration* from the main menu.

5.2.1.7.2   Press the *Enter* key to scroll through each configuration option and ensure that each option conforms to the needs of the planned data collection.

5.2.1.7.2.1   Select *GPS Rover option* and press *Enter.*

5.2.1.7.2.2   Select *Position Filters* option and press *Enter*.

5.2.1.7.2.2.1   Position Mode   = Auto2D/3D

5.2.1.7.2.2.2   Elevation Mask = 15˚

5.2.1.7.2.2.3   SNR Mask   = 6

5.2.1.7.2.2.4   PDOP Mask   = 6

5.2.1.7.2.2.5   PDOP Switch   = 6

5.2.1.7.2.3   Press *Esc* to return to the GPS Rover menu.

5.2.1.7.2.4   For real-time differential correction, move arrow down to select *Real-time input* and press *Enter*.

5.2.1.7.2.4.1   Under *Preferred Correction Source,* move *Up/Down Arrow* to *Choice 1*.

5.2.1.7.2.4.1.1   Press *Left/Right Arrow* to enter *Choice 1* menu.

5.2.1.7.2.4.1.2   Using the *Up/Down Arrow*, highlight the *Integrated satellite* option.

5.2.1.7.2.4.1.3   Press *Enter*.

5.2.1.7.2.4.1.4   Select *Use uncorrected GPS* option for *Choice 2*

5.2.1.7.2.4.2   Under *General real-time settings, s*et the *Correction age limit* to 50s.

5.2.1.7.2.5   For uncorrected GPS measurements, select *Use uncorrected GPS* for *Choice 1*.

5.2.1.7.2.5.1   Post processing of uncorrected GPA measurements is needed to obtain greater accuracy.

5.2.1.7.2.5.2   Data are post-processed with base station files from the National Geodetic Survey website (Section *4.3.1*) as described in section *7*.

5.2.1.7.2.6   Select *Coordinate system* option from Configuration menu and press *Enter*

5.2.1.7.2.6.1   System= *Latitude/Longitude*

5.2.1.7.2.6.2   Datum= *WGS 1984(World Geodetic Survey of 1984)*

5.2.1.7.2.6.3   Altitude units= *Meters (m)*

5.2.1.7.2.7   Select *Units and display* option from and press *Enter*

5.2.1.7.2.7.1   Distance=*Meters*

5.2.1.7.2.7.2   Area= *Square meters*

5.2.1.7.2.7.3   Velocity= *Meters/Second*

5.2.1.7.2.7.4   Angles= *Degrees*

5.2.1.7.2.7.5   Angle format= *DD°MM′SS.ss″*

5.2.1.7.2.7.6   Order= *North/East*

5.2.1.7.2.7.7   North reference= *True*

5.2.1.7.2.7.8   Magnetic declination= *Auto*

5.2.1.7.2.7.9   Press *Enter*

5.3   Plan project.

5.3.1   Open GPS Pathfinder Office.

5.3.2   Select an existing project or create a new project

5.3.2.1   When creating a new project folder, set the following parameters:

5.3.2.1.1   Project Name

5.3.2.1.1.1   The name should indicate title of project, followed by the next sequential project number.

5.3.2.1.1.2   The next project number can be determined by looking in the GPS Logbook .

5.3.2.1.1.3   An example of a project name is *Irrigation Project.0001*.

5.3.2.1.2   Comments, Date and Time are not required since at the time of collection this information will be recorded as determined during the create of the data dictionary.

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5.3.2.1.3 Project Folder

    5.3.2.1.3.1 All Pathfinder project folders should created be in the directory C:\Pfdata.

    5.3.2.1.3.2 The folder name is the project name (Section *5.2.2.1.1*)

    5.3.2.1.3.3 Example project folder: *C:\Pfdata\ Irrigation Project.0001*

5.3.2.1.4 Backup Folder

    5.3.2.1.4.1 Use default

    5.3.2.1.4.2 *C:\Pfdata\ Irrigation Project.0001\backup*

5.3.2.1.5 Export Folder

    5.3.2.1.5.1 Use default

    5.3.2.1.5.2 *C:\Pfdata\ Irrigation Project.0001\export*

5.3.2.1.6 Base File Folder

    5.3.2.1.6.1 Use default

    5.3.2.1.6.2 *C:\Pfdata\ Irrigation Project.0001\base*

5.3.3 Define Units and Coordinate System

  5.3.3.1 In the main menu bar of Pathfinder Office, select the *Options*

    5.3.3.1.1 Select *Units* from the drop-down menu

    5.3.3.1.2 Confirm appropriate Unit measurements from drop down menus.

      5.3.3.1.2.1 Distance= *meters*

      5.3.3.1.2.2 Area= *Square meters*

      5.3.3.1.2.3 Velocity= *meters per second*

      5.3.3.1.2.4 Offset= *meters*

      5.3.3.1.2.5 Offset distance Format= *Horizontal and Vertical Distance*

      5.3.3.1.2.6 Precisions= *meters*

      5.3.3.1.2.7 Confidence= *99% Precisions*

      5.3.3.1.2.8 North Reference=*True*

      5.3.3.1.2.9 Offset= *meters*

    5.3.3.1.3 Left-click *OK* button to return to main menu window

    5.3.3.1.4 Select *Coordinate System* from *Options* drop-down menu

    5.3.3.1.5 For *Select by*, left-click next to *coordinate system and zone* and confirm the following:

      5.3.3.1.5.1 System= *Latitude/Longitude*

      5.3.3.1.5.2 Datum= *WGS 1984(World Geodetic Survey of 1984)*

      5.3.3.1.5.3 Altitude units= *Meters (m)*

    5.3.3.1.6 Altitude measure from= *Mean Sea Level*

      5.3.3.1.6.1 For the Geoid Model, select *other* and then choose *DMA 10x10(Global)* from drop-down menu.

    5.3.3.1.7 Left-click *Ok* button to return to main menu

5.3.4   Create data dictionary

5.3.4.1   In the main menu bar of Pathfinder Office, select the *Utilities* drop-down menu.

5.3.4.1.1   Select *Data Dictionary Editor*.

5.3.4.1.2   Create a name for the data dictionary.

5.3.4.1.2.1   Name the data dictionary by date of project collection.

5.3.4.1.2.2   The name for the data dictionary should comply with the following format: YYYY-MM-DD

5.3.4.1.2.2.1   YYYY   = year

5.3.4.1.2.2.2   MM   = Month

5.3.4.1.2.2.3   DD   = Day

5.3.4.1.2.3   Do not include spaces in the file name.

5.3.4.1.2.4   The file extension assigned automatically to data dictionary files is *.ddf*. Example: 2002-18-08.ddf

5.3.4.1.3   Add point features to the data dictionary (A point feature is defined as a physical object or location for which GPS information is to be collected.)

5.3.4.1.3.1   Left-click the *New Feature* button or press F3.

5.3.4.1.3.1.1   Under the *Properties* tab

5.3.4.1.3.1.1.1   Name the feature.

5.3.4.1.3.1.1.2   Define the feature as a *point*.

5.3.4.1.3.2   Left-click on the *Default* settings tab.

5.3.4.1.3.2.1   Adjust *Logging Interval* time to 1 second.

5.3.4.1.3.2.2   Adjust *Minimum Positions* setting to 10.

5.3.4.1.3.3   Left-click the *OK* button.

5.3.4.1.3.4   Repeat steps *5.2.3.1.3.1* through *5.2.3.1.3.3* until all desired features have been entered.

5.3.4.1.4   Assign attributes to each feature (An attribute is a piece of descriptive information about the chosen feature).

5.3.4.1.4.1   Select a feature for which you want to define attributes by left-clicking on the *feature name*.

5.3.4.1.4.1.1   Left-click on the *New Attribute* button and select one of the following attribute types at a time for each feature:
- ✓ Menu
- ✓ Numeric
- ✓ Text
- ✓ Date
- ✓ Time

5.3.4.1.4.1.2   Do **not** define an attribute as file name or separator.

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5.3.4.1.4.1.3   Left-click on the *Add* button.

5.3.4.1.4.2   Set the following parameters in the *New Attribute* window for the selected attribute type:

5.3.4.1.4.2.1   Attribute name

5.3.4.1.4.2.2   Comments

5.3.4.1.4.2.3   Length

5.3.4.1.4.2.4   Default

5.3.4.1.4.2.5   Field Entry

5.3.4.1.4.2.5.1   On Creation
- ✓ Normal
- ✓ Required
- ✓ Not Permitted

5.3.4.1.4.2.5.2   On Update
- ✓ Normal
- ✓ Required
- ✓ Not Permitted

5.3.4.1.4.2.6   Auto Incrementing
- ✓ No
- ✓ Increment

5.3.4.1.4.2.7   Left-click the *OK* button

5.3.4.1.4.3   To assign additional attributes to the selected feature, repeat steps **5.3.4.1.4.1.1** to **5.3.4.1.4.2.7**

5.3.4.1.5   To assign attributes to other features, repeat steps **5.3.4.1.4.1** to **5.3.4.1.4.3.**

5.3.4.1.6   From data dictionary main menu bar, left click on the *File* option and select the *Save As* option from the dropdown menu.

5.3.4.1.6.1   Create new subfolder in the current project folder with the date of data collection as the name of the folder using the following format: YYYY-MM-DD.

5.3.4.1.6.2   Press *Save* to save the data dictionary into the new subfolder.

5.3.4.2   Print the data dictionary to take out into the field to write notes on as needed and exit the *Data Dictionary Editor*. See **Appendix A** for a sample printout.

5.4   Transfer data dictionary to the GPS unit.

5.4.1   Connect the data logger to the computer.

5.4.1.1   Attach a 9-pin serial cable to the computer port on the battery charger.

5.4.1.2   Connect the other end of the serial cable to COM2 serial port on the computer.

5.4.1.3   Connect the data logger to the battery charger (Section **5.7.1.4.1**).

5.4.2   Turn on the data logger.

5.4.3   After the data logger has finished booting up, press *ESC* to abort connection attempt to GPS satellites.

5.4.4   Using the arrow keys on the data logger, select *File Manager* from the data logger main menu and press the *Enter* key on the data logger.

5.4.4.1   Select *File Transfer* and press *Enter*.

> ***5.4.4.2*** In GPS Pathfinder Office, select *Utilities* from the main menu bar.
>> ***5.4.4.2.1*** Select *Data Transfer* option.
>> ***5.4.4.2.2*** Wait for the computer to acknowledge the connection (indicated by a green check icon).
>> ***5.4.4.2.3*** Select the *Send* tab.
>> ***5.4.4.2.4*** Left-click the *Add* button.
>> ***5.4.4.2.5*** Select *Data Dictionary* option from the drop down menu.
>> ***5.4.4.2.6*** Browse to find the data dictionary or dictionaries to be transferred.
>> ***5.4.4.2.7*** Select the data dictionary or dictionaries to be transferred, and left-click the *Open* button.
>> ***5.4.4.2.8*** Left-click the *Transfer All* button.

5.5 Transfer the *Almanac* from the GPS to the Pathfinder Office
> ***5.5.1*** Connect the data logger to the computer (Section ***5.4.1***).
> ***5.5.2*** Turn on the data logger.
> ***5.5.3*** After the data logger has finished booting up, press *ESC* to abort connection attempt to GPS satellites.
> ***5.5.4*** Using the arrow keys on the data logger, select *File Manager* from the data logger main menu and press the *Enter* key on the data logger.
>> ***5.5.4.1*** Select *File Transfer* and press *Enter*.
>> ***5.5.4.2*** In GPS Pathfinder Office, select *Utilities* from the main menu bar.
>>> ***5.5.4.2.1*** Select *Data Transfer* option.
>>> ***5.5.4.2.2*** Wait for the computer to acknowledge the connection (indicated by a green check icon).
>>> ***5.5.4.2.3*** Under the *Receive* tab, left-click the *Add* button.
>>> ***5.5.4.2.4*** Select *Almanac* from the drop-down menu.
>>> ***5.5.4.2.5*** Left-click the *Transfer All* button.
>>>> ***5.5.4.2.5.1*** It will ask whether to replace an already existing almanac or not.
>>>> ***5.5.4.2.5.2*** Selecting *Yes* will update the current almanac.

5.6 Determine satellite availability
> ***5.6.1*** In GPS Pathfinder Office, select *Utilities* from the main menu bar.
>> ***5.6.1.1*** From the *Utilities* drop-down menu, select *Quick Plan* option.
>> ***5.6.1.2*** Select the date that corresponds with the date of data collection.
>> ***5.6.1.3*** Left-click the *OK* button.
>> ***5.6.1.4*** Select the city that is closest to the planned site of data collection.
>>> ***5.6.1.4.1*** For projects that are located in the lower Coachella Valley, the nearest city listed would be *Thermal*.
>>> ***5.6.1.4.2*** For projects that are located in the upper Coachella Valley, the nearest city listed would be *Palm Springs*.
>> ***5.6.1.5*** Left-click the *OK* button, and a *Plan Session* window opens.
>>> ***5.6.1.5.1*** Select the *Graphs* option from the menu bar of the window.
>>> ***5.6.1.5.2*** From the *Graphs* drop-down menu, select *Number SVs and PDOP* option to reveal a graph of the number of available satellites and

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PDOP values, which are based on updated *Almanac* from section *5.3.5*.

    5.6.1.5.2.1 Bars colored purple and dark blue indicate higher satellite availability.

    5.6.1.5.2.2 Bars colored green and yellow indicate low satellite availability.

  5.6.1.5.3 The optimal times for collecting data is when PDOP values are less than six (6) and the number of satellites available is equal to or greater than five (5).

  5.6.1.5.4 Data should only be collected during optimal times of day.

5.8 Collect GPS data.

  5.8.1 Select a fixed reference point for quality assurance.

  5.8.2 Collect reference point data prior to going to the data collection sites.

    5.8.2.1 The selected reference point should have a clear view of the satellites.

    5.8.2.2 Turn data logger on.

    5.8.2.3 Wait for data logger to boot up and locate satellites.

    5.8.2.4 From the data logger main menu, select *Data Collection* using the *Up/Down* or *Left/Right Arrow* keys.

    5.8.2.5 Press the *Enter* key.

    5.8.2.6 From the *Data Collection* menu, select *Create New File*, and press *Enter*.

    5.8.2.7 From the *Create New File* menu, use the *Up/Down Arrow* to highlight the data dictionary option and press the *Right Arrow*.

    5.8.2.8 Select the data dictionary that was transferred in section *5.3.4.1.6* using the *Up/Down Arrow* and then press *Enter*.

    5.8.2.9 Record the default filename under the first reference point listed on the data dictionary printout created in Section *5.3.4.2.*

    5.8.2.10 Press the *Enter* key to display the *Start Feature* menu.

    5.8.2.11 From the *Start Feature* menu, select the first reference feature.

    5.8.2.12 Press the *Enter* key only after placing the Trimble antenna directly adjacent to the point feature of interest.

    5.8.2.13 Remain stationary until the *configured minimum positions* (Section *5.3.3.1.3.2.2*) of 10 seconds have been logged.

    5.8.2.14 Press *Enter* to save the reference one feature data.

    5.8.2.15 Press *ESC* and enter *Yes* to exit data collection.

    5.8.2.16 Press the *Power* button to turn off the data logger.

  5.8.3 Travel to data collection sites listed in the data dictionary and collect feature point data at each site.

    5.8.3.1 At each site, the point feature should have a clear view of the satellites.

    5.8.3.2 Turn data logger on.

    5.8.3.3 Wait for data logger to boot up and locate satellites.

    5.8.3.4 From the data logger main menu, select *Data Collection* using the *Up/Down* or *Left/Right Arrow* keys.

    5.8.3.5 Press the *Enter* key.

5.8.3.6   From the *Data Collection* menu, select *Create New File*, and press *Enter*.

5.8.3.7   From the *Create New File* menu, use the *Up/Down Arrow* to highlight the data dictionary option and press the *Right Arrow*.

5.8.3.8   Select the data dictionary that was transferred in section *5.4.4.1.2* using the *Up/Down Arrow* and then press *Enter*.

5.8.3.9   Record the default filename under the point feature listed on the data dictionary printout created in Section *5.4.4.2.*

5.8.3.10 Press the *Enter* key to display the *Start Feature* menu.

5.8.3.11 From the *Start Feature* menu, select the first reference feature.

5.8.3.12 Press the *Enter* key only after placing the Trimble antenna directly adjacent to the point feature of interest.

5.8.3.13 Remain stationary for at least 10 seconds.

5.8.3.14 Press *Enter* to save the point feature data.

5.8.3.15 Press *ESC* and enter *Yes* to exit data collection.

5.8.3.16 Press the *Power* button to turn off the data logger.

5.8.4   Repeat section *5.8.3.10* for each feature listed in the data dictionary.

5.8.5   After collecting data from the last point feature listed in the data dictionary, return to location of the reference point feature (Section *5.8.2*) and collect new GPS data using the procedure in Section *5.8*).

6. Process data

6.1   Transfer datafiles from data logger to PC.

6.1.1   Connect the data logger to the computer (Section *5.4.1*).

6.1.2   Open GPS Pathfinder Office on the computer.

6.1.3   Select the same project that the data dictionary was created in (Section *5.3.2.1.1*).

6.1.4   Turn on the data logger.

6.1.5   Press *ESC* since the data logger is not connected to the receiver.

6.1.6   On the data logger main menu, select *File Manager* and press *Enter*.

6.1.7   From the *File Manager* menu, select *File Transfer*, and press *Enter*. NOTE: The message "connecting to PC" should be displayed.

6.1.8   Left-click the *Utilities* option on the Pathfinder Office main menu bar.

6.1.9   From the *Utilities* drop-down menu, select the *Data Transfer* option and wait for successful connection to the data logger (Section *5.4.4.2.2*).

6.1.10 Select the *Receive* tab in the Data Transfer window.

6.1.11 Left-click the *Add* button.

6.1.12 Select *Data File* and highlight all data files that were recorded on the data dictionary printout while in the field (Section *5.8.2.9*).

6.1.13 Left-click the *Open* button.

6.1.14 Left-click the *Transfer All* button.

6.1.15 Once the file transfer is complete, left-click the *OK* button to affirm transfer completion.

6.1.16 Press the *Close* button to exit the Data Transfer window.

6.2   Perform differential data correction

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6.2.1   On the Pathfinder Office menu bar, select *Utilities*.

6.2.2   Select the *Differential Correction* option. NOTE: Differential correction may also be run by left-clicking the target or bullseye-shaped symbol on the left hand margin of the Pathfinder window.

6.2.3   Select the datafiles to be corrected.

6.2.4   Choose the base files.

    6.2.4.1   Choose the base station provider by left-clicking the *Internet Search* button.

        6.2.4.1.1   Highlight the base station provider nearest to the data collection site. NOTE: Cors in Pinon, CA (Section *4.3.1*) is the nearest base station provider for the Lower Coachella Valley.

        6.2.4.1.2   If none of the listed base station providers are nearest to the data collection site, update the existing list by left-clicking the *New* button.

            6.2.4.1.2.1   From the new provider window, select *from current list* option and press *OK*.

            6.2.4.1.2.2   Highlight the base station that is closest to the data collection site and press *OK* to return to the new provider window.

            6.2.4.1.2.3   Press *OK* to return to the *Differential Correction* window.

6.2.5   Assign the Output Folder as the subfolder created in Section *5.3.3.1.6.*

6.2.6   Ensure that the *Smart Code and Carrier Phase Processing* button is selected.

6.2.7   Left-click the OK button to open *Confirm Internet Setup* window.

6.2.8   Left-click *Yes* button to copy files from the Internet.

6.2.9   When file copy is complete, then the *Confirm Selected Base File* window is displayed.

6.2.10   Press *OK* to return to the *Differential Correction* window.

6.2.11   Press *OK* to differentially correct the datafiles.

6.2.12   When differential correction is complete, press the *more detail* button to display the Differential Correction Log in Microsoft Windows Notepad.

    6.2.12.1   The log is saved as a text file in the Output folder (Section *6.2.5*).

    6.2.12.2   Ensure that the uncorrected datafiles with extension *.ssf* and corrected datafiles with extension *.cor* have been saved in the assigned Output folder

    6.2.12.3   Print the Differential Correction Log (See **Appendix B** for Sample of Differential Correction Log output).

6.2.13   Choose an Export Setup

    6.2.13.1   Select *Sample ArcView Shapefile Setup* from drop-down menu

    6.2.13.2   Select files to export

    6.2.13.3   Select Output Folder for where export data will be stored for retrieval.

        6.2.13.3.1 Left-click the Browse button.

        6.2.13.3.2 Navigate to *C:GISserver/GISdata/GIS/WGS1984*

        6.2.13.3.3 Click *ok* to return to export window.

    6.2.13.4   Left-click *Properties* button to set up Export parameters.

        6.2.13.4.1 From the six tabs displayed, left-click *Data* tab.

        6.2.13.4.1.1 Select Features- Position and Attributes from Type of data box.

        6.2.13.4.1.2 Retain Export all features form drop-down menu.

     6.2.13.4.2 Left-click *Output* tab.

        6.2.13.4.2.1 For Output files, click mouse arrow to fill in circle next to *Combine all input and output to project export files.*

        6.2.13.4.2.2 For System file format, select *Windows files*

     6.2.13.4.3 Left-click *Attributes* tab

        6.2.13.4.3.1 Fill in the circle next to *Attribute Value* from the 'Export Menu Attributes as' box to select it.

        6.2.13.4.3.2 From the General Attributes box, Select each feature type by *left-clicking each box* next to each feature type.

        6.2.13.4.3.3 Follow same procedure for Point Feature box

     6.2.13.4.4 Left-click *Units* tab

        6.2.13.4.4.1 Select *Use Export Units*.

          6.3.6.2.4.1.1 Distance=*Meters*

          6.3.6.2.4.1.2 Area= *Square meters*

          6.3.6.2.4.1.3 Velocity= *Meters/Second*

        6.2.13.4.4.2 Select *DD MM SS.sss* for Latitude/Longitude Options.

     6.2.13.4.5 Left-click *Position filter* tab.

        6.2.13.4.5.1 Select *Use Export Units*

     6.2.13.4.6 Left-click *Coordinate System* tab.

        6.2.13.4.6.1 Select *Use current display coordinate system*.

        6.2.13.4.6.2 Choose Export Coordinate as *XYZ*.

     6.2.13.4.7 Left-click *OK* to return to Export window.

   6.2.13.5 Left-click *OK* button to start export process

   6.2.13.6 *Close* Export Completed window when it appears.

  6.2.14 Open ArcCatalog and preview shapefile tables that were exported.

  6.2.15 Convert new shapefile to a Geodatabase following Geodatabase SOP

7. **Maintenance**

  7.1 Store inside Tribal EPA GIS Office when not in use.

   7.1.1 Keep logger and batteries charging while not in use

   7.1.2 Keep Clean

    7.1.2.1 Use damp paper towel or cloth to clean logger of dust after each data collection session after logger is turned off and charging.

8. **Bibliography**

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Fax 760-398-0046	

8.2   Trimble Mapping Systems: General Reference. Revision A, March 2001

8.3   Trimble Product Training: Land Survey/Mapping and GIS Systems, GPS Mapping for GIS with Asset Surveyor: Classroom Manual, Revision B, 1998.

8.4   Trimble Pro-XR/XRS Receiver Manual. Revision A, May 1998.

8.5   Trimble GPS Pathfinder Office: Getting Started Guide. Version 2.80, Revision A, March 2001.

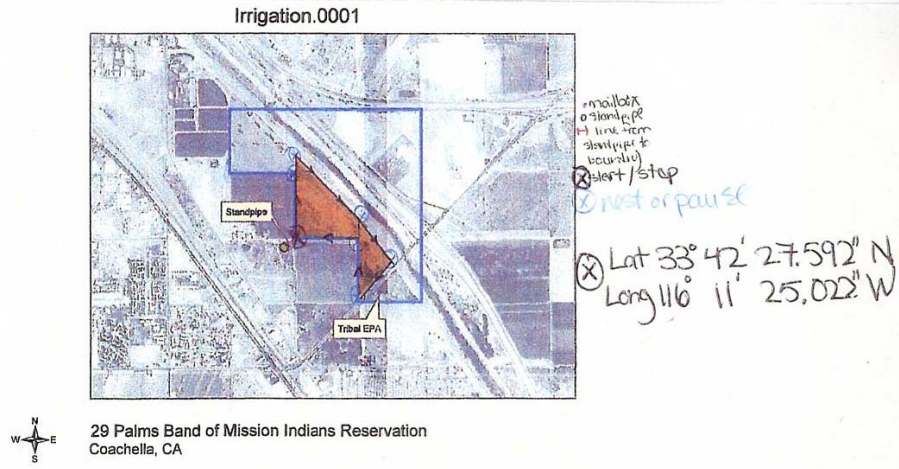*8.6*   TSC1 Asset Surveyor: software User Guide. Version 5.20, Revision A, March 2001

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APPENDIX A

Sample Data Dictionary (text)


```
C:\Pfdata\Irrigation.0001\2002-29-08.ddf                          8/29/200
2002-29-08
Project area info

Mailbox-1              Point Feature, Label 1 = Reference, Label 2 = collection:date
   Reference           Text, Maximum Length = 30, Stand backpack/reciever to mailbox post
                       Normal, Normal
   collection:date     Date, Auto generate Create, Year-Month-Day Format
                       Not Permitted, Not Permitted
   collection:time     Time, Auto generate Create, 24 Hour Format
                       Not Permitted, Not Permitted

Standpipe              Point Feature, Label 1 = Water source, Label 2 = collection:date
   Water source        Text, Maximum Length = 30, walk around pipe while measuring
                       Normal, Normal
   collection:date     Date, Auto generate Create, Year-Month-Day Format
                       Not Permitted, Not Permitted
   collection:time     Time, Auto generate Create, 24 Hour Format
                       Not Permitted, Not Permitted

Stndpip2boundry        Line Feature, Label 1 = distance, Label 2 = collection:date
                       walk in most direct to reservation bndry
   distance            Text, Maximum Length = 30
                       Normal, Normal
   collection:date     Date, Auto generate Create, Year-Month-Day Format
                       Not Permitted, Not Permitted
   collection:time     Time, Auto generate Create, 24 Hour Format
                       Not Permitted, Not Permitted

projectarea            Area Feature, Label 1 = landarea to irrigate, Label 2 = collection:date
                       nest or pause at corners follow map
   landarea to irrigate    Text, Maximum Length = 30
                       Normal, Normal
   collection:date     Date, Auto generate Create, Year-Month-Day Format
                       Not Permitted, Not Permitted
   collection:time     Time, Auto generate Create, 24 Hour Format
                       Not Permitted, Not Permitted

Mailbox-2              Point Feature, Label 1 = reference-2, Label 2 = collection:date
   reference-2         Text, Maximum Length = 30, follow same directions as before
                       Normal, Normal
   collection:date     Date, Auto generate Create, Year-Month-Day Format
                       Not Permitted, Not Permitted
   collection:time     Time, Auto generate Create, 24 Hour Format
                       Not Permitted, Not Permitted
```


Irrigation.0001

29 Palms Band of Mission Indians Reservation
Coachella, CA

APPENDIX B

Sample Differential Correction Information

Rover Files
Folder C:\gps project data\gps mailbox accuracy
Selected Files
R103121A.ssf
R110723A.ssf
R110919A.ssf
R111320A.ssf
R111320A.ssf
R111416A.ssf
R111423A.ssf
R111518A.ssf
R111522A.ssf
R111522A.ssf
R111616A.ssf
R111621A.ssf
Base Files
C:\gps project data\gps mailbox accuracy\base

Internet Search

Base Data Provider
Organization: CORS, Point Loma CA
Station Location: Point Loma CA
Postal Address: CORS, National Geodetic Survey, NOAA N/NGS1,
SSMC3, 1315 East-West Highway, Silver Spring MD 20910-3282   USA
Contact Name: Don Haw
Web Home Page: http://www.ngs.noaa.gov/CORS/cors-data.html
Email Address: don@ngs.noaa.gov
Telephone: 1-301-713-3208 x167
Base Station Type
Ashtech
Reference Position(WGS 84)
Latitude: 32 39' 55.4897" N
Longitude: 117 14' 34.84453" W
Height (HAE): -22.57m

Rover Files and Matching Base Files

Rover File	Coverage	Base File	Start Time	End Time
R103121A.ssf	100%		10/31/2001 2:31:46pm	10/31/2001 2:33:49pm
		plo33040.01o	10/31/2001 1:59:51pm	10/31/2001 2:59:46pm
R110723A.ssf	100%		11/07/2001 4:18:24pm	11/07/2001 4:20:35pm
		plo33110.01o	11/07/2001 3:59:51pm	11/07/2001 4:59:46pm
R110919A.ssf	100%		11/09/2001 12:10:04pm	11/09/2001 12:12:01pm
		plo33130.01o	11/09/2001 11:59:51am	11/09/2001 12:59:46pm
R111320A.ssf	100%		11/13/2001 1:59:32pm	11/13/2001 2:01:39pm
		plo33170.01o	11/13/2001 2:59:47pm	11/13/2001 2:59:42pm
R111416A.ssf	100%		11/14/2001 9:29:37am	11/14/2001 9:31:55am
		plo33180.01o	11/14/2001 8:59:47am	11/14/2001 9:59:42am
R111423A.ssf	100%		11/14/2001 4:55:51pm	11/14/2001 4:58:17pm
		plo33180(1).01o	11/14/2001 3:59:47pm	11/14/2001 4:59:42pm
R111518A.ssf	100%		11/15/2001 11:20:02am	11/15/2001 11:22:09am
		plo33190.01o	11/15/2001 10:59:47pm	11/15/2001 11:59:42am
R111522A.ssf	100%		11/15/2001 3:34:50pm	11/15/2001 3:37:02pm
		plo33190(1).01o	11/15/2001 2:59:47pm	11/15/2001 3:59:42pm
R111616A.ssf	None			
R111621A.ssf	None			

Corrected Files
>   *Output Folder*
>   >   C:\gps project data\gps mailbox accuracy
>   *File Extension*
>   >   .cor
>   *Processing*
>   >   Smart Code and Carrier Phase Processing

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