APPENDIX L

IDDE SOP

The IDDE SOP is currently under substantial revision based on priority inspection protocol. The revised SOP will be included as part of the SWMP once completed in late 2014. The following SOP represents the inspection protocol undertaken during the initial permit cycle.

GIS/GPS COLLECTION PROCEDURES MANUAL

Charleston County Storm Water Inventory

January 2006

Prepared by Woolpert, Inc.

3800 Fernandina Road., Suite 100
Columbia, SC 29210

QUALITY

At Woolpert, quality is the cornerstone of our business. We invite your comments and suggestions for improving this document.

TRADEMARKS

All brand names and product names are trademarks or registered trademarks of their respective companies.

NOTICE OF PROPRIETARY INFORMATION

TABLE OF CONTENTS

TABLE OF CONTENTS

OVERVIEW

This manual was designed for use by the City of Charleston System Inventory Project participants. It was created to provide general field procedures to ensure a smooth and timely flow of data. This document was not intended to be a manual for GILware, ArcView or any other software, although some technical information on GILware is provided in the appendices. The intention of the manual is to outline the utility inventory process and is limited to the field survey portion of the utility project. It is organized as follows:

- **This section** provides an overview of the project, directions to the City of Charleston's Engineering Department, and project contact information.

- **Section 2: Field Survey Guidelines** discusses the general field data collection methods for collecting system inventory data on the pen-based Fujitsu computers and discusses the equipment to be used and the proper settings to use. It outlines the daily QA processes that occur during field activities, as well as guidelines for field crews to perform data collection in the field.

- **Section 3: System Inventory** This section outlines the data classification and collection procedures for the Outfall and System Inventories. It also outlines daily QA processes and guidelines for field crews to perform data collection in the field.

- **Section 4: Office Guidelines** outlines office guidelines for the daily QA procedures, data editing and review, final formatting, and weekly reports. This section is also intended to outline the step-by-step process by which field data is collected, processed, and delivered (formatted properly) to the City of Charleston's Engineering Department.

- **Section 5: First Aid Procedures** provides safety information and first aid instructions and procedures.

- **Appendices** contain additional information as supplements to the information and procedures outlines in the sections 1 – 5.

CITY OF CHARLESTON DIRECTIONS

Sarah McCrary, Project Manager
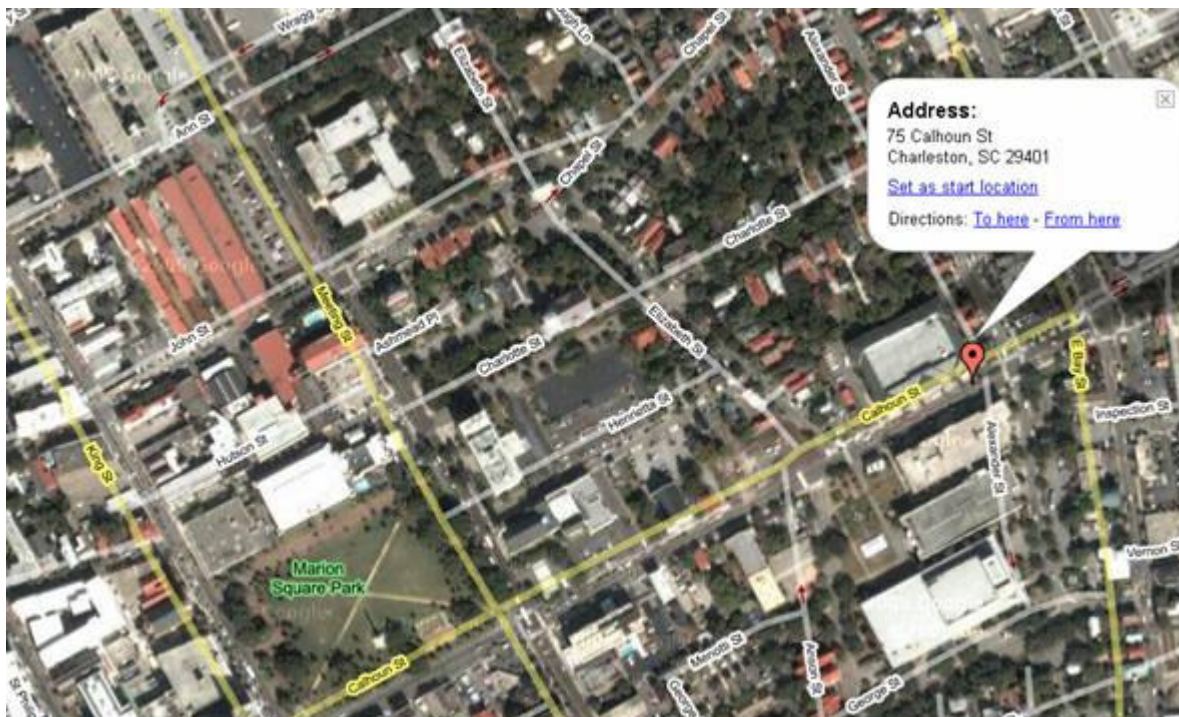Location: Department of Public Service, 75 Calhoun St., Charleston, SC 29401-3506
Phone: (843) 724-3757
Fax: (843) 973-7261
Email: shepherds@ci.charleston.sc.us

Directions from Columbia:

Merge onto I-26 E.	111 miles
Take the Meeting Street Exit	0.2 miles
Turn RIGHT onto Meeting St.	0.8 miles
Turn LEFT onto Calhoun St., end at 75 Calhoun St.	0.3 miles

WOOLPERT CONTACTS

Team Organization

Project Manager – **Brian Bates**, Columbia	GIS Specialist – J**eff Anderson**, Columbia
Project Engineer – **Trevor Gauron**, Columbia	Technical Support – **Gil Inouye**, Sacramento
Land Surveyor - **Gary Kuroski**, Columbia	

Team Contact Information

Bates, Brian, PE **Woolpert** **Project Manager** 3800 Fernandina Road, Suite 100 Columbia, SC 29210, USA **Phone:**(803) 731-0261 **Mobile:**(803) 463-8213 **Fax:** (803) 731-0132 **Email:** brian.bates@woolpert.com	Gauron, Trevor, PE **Woolpert** **Project Engineer** 3800 Fernandina Road, Suite 100 Columbia, SC 29210, USA **Phone:** (803) 731-0261 **Mobile:** 803-546-6474 **Fax:** (803) 731-0132 **Email:** trevor.gauron@woolpert.com	Anderson, Jeff **Woolpert** **GIS Specialist** 3800 Fernandina Road, Suite 100 Columbia, SC 29210, USA **Phone:**(803) 731-0261 **Mobile:**(803) 446-9965 **Fax:** (803) 731-0132 **Email:** jeff.anderson@woolpert.com
Inouye, Gil, PE **Woolpert** **Technical Support** **Phone:**(916) 684-1219 **Email:** gilbert.inouye@woolpert.com	Kuroski, Gary, PLS **Woolpert** **Land Surveyor** 3800 Fernandina Road, Suite 100 **Phone:** Columbia, SC 29210, USA **Phone:**(803) 731-0261 **Fax:** (803) 731-0132 **Email:** gary.kuroski@woolpert.com	

TABLE OF CONTENTS

FIELD SURVEY GUIDELINES

This section discusses the general field data collection methods for collecting system inventory data on the pen-based Fujitsu computers and discusses the equipment to be used and the proper settings to use. It outlines the daily QA processes that occur during field activities, as well as guidelines for field crews to perform data collection in the field.

GENERAL GUIDELINES

Field crews will complete all GPS field data collection for the outfall inventory utilizing real-time differential (RTD) GPS techniques.

GENERAL DATA COLLECTION APPROACH

The following are the general criteria that will guide the field data collection efforts:

1. Prior to each day of data collection, field crews will occupy at least one National Geodetic Survey (NGS) registered horizontal ground control benchmark to ensure that the GPS data collected is within acceptable tolerances.
2. No field crew personnel will enter a property that is impeded by a fence and/or a dog, where access is denied by the property occupant, or where the field crew personnel cannot gain safe access to observe the structure by GPS.
3. Each field crew will carry a copy of a letter from the City of Charleston authorizing the work.
4. If a structure is determined to represent an immediate health or public safety concern, field crew members will call the appropriate public service official and remain at that location until a City representative arrives to take charge of the situation.

Each structure that requires a special review, evaluation, or repair by the City will have a digital photograph(s) taken of the structure. The resulting image file name will be stored within the feature database.

QA/QC GENERAL PROCEDURES

At the end of each observation day, the inventory data will be downloaded from the pen-based field computers and analyzed, at which time suspect points will be scheduled for re-observation. Periodic checks will be made into the above mentioned geodetic control network.

Throughout the inventory process, Woolpert employees will perform quality assurance/quality control (QA/QC) checks of the field work. This QA/QC will ensure that the City is receiving a high quality inventory. Some of the work elements may include the following:

- Independent field checks and evaluations of the collected data to be sure that data is being collected as required.
- Periodic meetings with field and office personnel to discuss data collection issues.
- Periodic changes to the data collection procedures and the GILware software to reflect conditions found in the field.

EQUIPMENT AND GPS OPERATING PROCEDURES

Field data collection is performed using Fujitsu pen tablet computers and Trimble real-time differential (RTD) GPS units mounted on backpacks. Each pen tablet utilizes an in-house software program, GILware, which incorporates GIS and GPS capabilities. The program uses GIS to record physical and observable attributes of each outfall at their precise respective location using GPS. The pen tablets are equipped with various map coverages (both planimetric and georeferenced raster images can be used). Using an on-screen cursor displaying the location of the GPS receiver in relation to the georeferenced planimetric layers, field crews can pinpoint their location. In areas where dense tree cover produces a weak satellite signal, locations are hand-placed based on the corresponding planimetrics.

OFFICE PREPARATION

Before beginning any field survey, sufficient office preparation is necessary to ensure a successful survey. For a utility global positioning system (GPS) survey, preparation should include the following elements:

- Installing the necessary software
- Defining project directories

- Understanding the database design
- Loading all required background files
- Understanding GPS constellation
- Customizing proprietary software to meet the needs of the survey crew and to process GPS data correctly
- Educating and training field members to understand the RTD application of GPS, thereby allowing crews to properly apply RTD techniques to the GPS collection process.

SOFTWARE

Various software packages will be used to complete the Charleston System Inventory Project. Besides the basic Microsoft Windows software, the following may be used and referenced within this document:

- Woolpert's proprietary software *GILware*
- ESRI's ArcGIS software
- Microsoft Access
- Microsoft Excel

GILware is a mapping grade global positioning system (GPS) compatible mobile GIS software package created for use on Windows based pen tablet computers.

GILware will use output from the Trimble ProXRS GPS receiver to update and create GIS data in pentop database file (.ptd) format. Pentop database files can be designed and manipulated in Microsoft Access. GILware allows such files to be exported from the .ptd format to shapefile (.shp) format and ultimately the data will be uploaded to a geodatabase specifically designed for this project.

EQUIPMENT CONFIGURATION

Before setting out to collect data with GILware and a Trimble ProXRS GPS receiver, make sure all the necessary GPS hardware, batteries, cables, etc. are present. It is also necessary to configure GPS equipment to ensure quality control within the project.

RTD ROVER EQUIPMENT

The roving receiver, in RTD-GPS surveys, is used to navigate to features of interest where a DGPS position is desired. It must have the ability to receive GPS satellite signals as well as a real-time differential correction signal.

Hardware

For this survey, Woolpert will use Trimble ProXRS GPS receivers as the GPS rovers. They will be connected to a Fujitsu pen-based computer for data entry, manipulation, and storage.

Real -Time Differential Correction

Woolpert applies real-time corrections to its data using either a US Coast Guard Beacon, the Omnistar satellite subscription service, or the Wide Area Augmentation System (WAAS). For this project, Woolpert will apply corrections using the Omnistar real-time differential correction.

Satellite Corrections

The Omnistar system provided by OMNISTAR, INC. is a nationwide fulltime differential GPS broadcast system delivering corrections from an array of base stations positioned throughout North America. When used with the Trimble GPS receiver, Omnistar will give the user consistent sub-meter positioning over a worldwide coverage area. This service costs approximately $800.00 a year per roving receiver.

For more information about Omnistar visit Omnistar's frequently asked questions web page@ http://www.omnistar.com
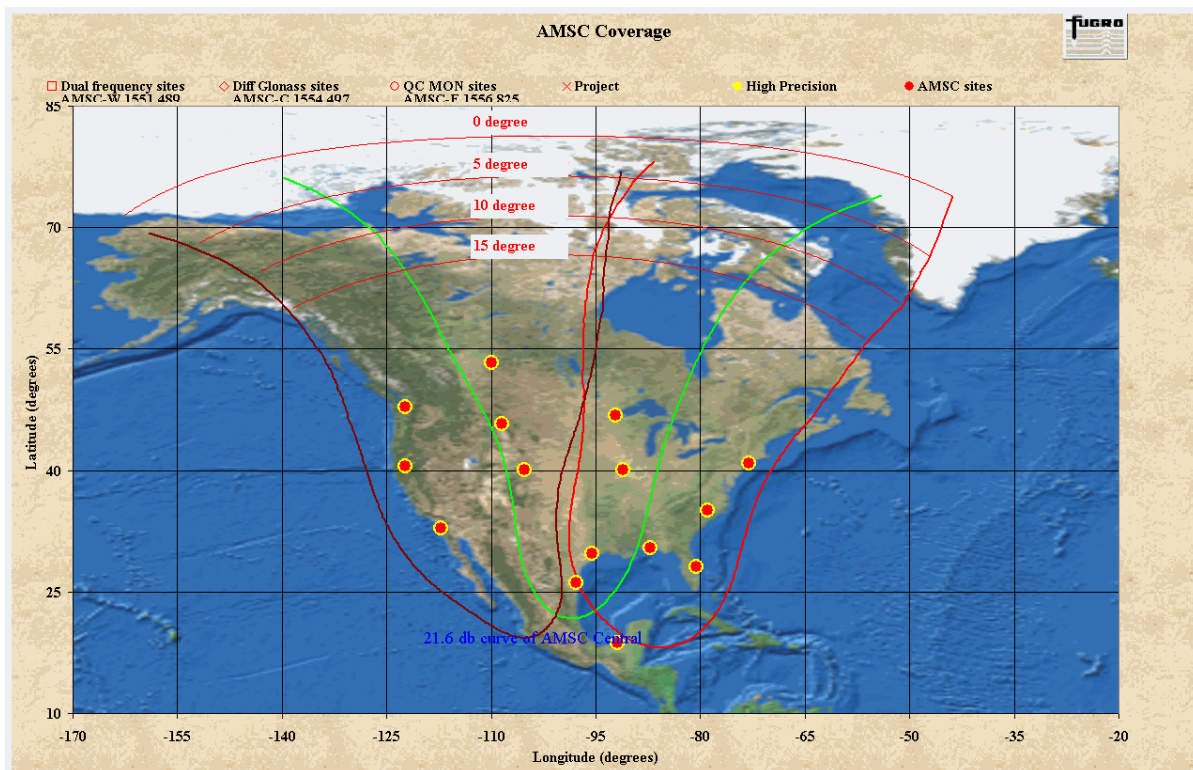
WAAS Corrections

WAAS is an extremely accurate navigation system developed for civil aviation. Before WAAS, the U.S. National Airspace System (NAS) did not have the ability to provide horizontal and vertical navigation for precision approach operations for all users at all locations. With WAAS, this capability is becoming a reality. WAAS provides service for all classes of aircraft in all flight operations - including en route navigation, airport departures, and airport arrivals. This includes precision landing approaches in all weather conditions at all locations throughout the NAS.

The Federal Aviation Administration (FAA) and the Department of Transportation (DOT) are developing the WAAS program for use in precision flight approaches. Currently, GPS alone does not meet the FAA's navigation requirements for accuracy, integrity, and availability. WAAS corrects for GPS signal errors caused by ionospheric disturbances, timing, and satellite orbit errors, and it provides vital integrity information regarding the health of each GPS satellite.

WAAS consists of approximately 25 ground reference stations positioned across the United States that monitor GPS satellite data. Two master stations, located on either coast, collect data from the reference stations and create a GPS correction message. This correction accounts for GPS satellite orbit and clock drift plus signal delays caused by the atmosphere and ionosphere. The corrected differential message is then broadcast through one of two geostationary satellites, or satellites with a fixed position over the equator. The information is compatible with the basic GPS signal structure, which means any WAAS-enabled GPS receiver can read the signal.

Currently, WAAS satellite coverage is only available in North America. There are no ground reference stations in South America, so even though GPS users there can receive WAAS, the signal has not been corrected and thus would not improve the accuracy of their unit. For some users in the U.S., the position of the satellites over the equator makes it difficult to receive the signals when trees or mountains obstruct the view the horizon. WAAS signal reception is ideal for open land and marine applications. WAAS provides extended coverage both inland and offshore compared to the land-based DGPS (differential GPS) system. Another benefit of WAAS is that it does not require additional receiving equipment, while DGPS does.

Other governments are developing similar satellite-based differential systems. In Asia, it's the Japanese Multi-Functional Satellite Augmentation System (MSAS), while Europe has the Euro Geostationary Navigation Overlay Service (EGNOS). Eventually, GPS users around the world will have access to precise position data using these and other compatible systems.

GPS ROVER SETTINGS

Before using a Fujitsu field computer to collect data in the field, the software must be configured. Improper settings can significantly affect the way in which data is logged. To ensure quality data, the receiver must be set up properly, and certain guidelines must be followed. For specific Project Settings, refer to Appendix B.

TRIMBLE SETTINGS

GILware includes the Trimble GPS Receiver control. To access this control, click the **GPS** menu and select **GPS Settings**. An example of the GPS menu with the GPS Settings command highlighted is in Figure 1.

The Trimble GPS Receiver Control Properties dialog opens. This dialog has three tabs:

- General
- External GPS Settings
- Integrated GPS Settings

General Settings

Use the **General** tab to set properties that have an impact on the availability of a position from the GPS receiver and general settings associated with the differential correction messages.

Port Settings

Use the pull-down list in the **Port Settings** field to specify the port that the GPS receiver is connected to for operation. If the port is unknown, select **Auto**. Generally, **COM1** is the correct port setting.

Setting Masks

Masks are minimum or maximum values. Only satellite signals that are within the limits defined by a mask are used. There are four mask settings:

- **Minimum Elevation.** This field specifies a minimum elevation angle above the horizon for tracking satellites. Satellites below the specified angles are not used for positions. **DO NOT CHANGE THE ELEVATION MASK TO ANYTHING BELOW 15 DEGREES.**

- **Maximum PDOP.** This field specifies a maximum Position Dilution of Precision (PDOP) for the satellite constellation. If the PDOP rises above the mask, the receiver ceases computing GPS positions. The PDOP is an indicator of the quality of a GPS position that accounts for each satellite's location relative to the other satellites in the constellation and their geometry in relation to the GPS. A PDOP value of 4.0 or less gives excellent positions. A PDOP below 6.0 is acceptable. A PDOP of 6.0 or greater is unacceptable for collecting appositions to sub-meter accuracy. The minimum PDOP can be raised to 12.0 in order to navigate in situations where it is impossible otherwise, but field crews are advised to avoid collecting GPS positions with the maximum PDOP set to a level greater than 6.0.

- **Minimum SNR.** This field specifies a minimum signal-to-noise ratio. The typical SNR of a satellite at 30° elevation is between 23 and 30. The quality of a GPS position degrades as the SNR of one or more satellites in the constellation falls below 6. **DO NOT EVER LOWER THE ACCEPTABLE SNR BELOW 6.**

- **Minimum Satellites.** The Minimum Satellites field specifies the minimum number of satellites that must be tracked before a GPS position is calculated. Four satellites are required to calculate a three-dimensional position, and 4 is the default setting.

General Differential GPS (DGPS) Settings

The General DGPS Settings tab houses pick lists for all sources of differential corrections.

Source Type

The **Source Type** pull-down list specifies the source of the DGPS signal. There are four options available. These options are listed and described in Table 1: **DPGS Source Signal Types**.

> **Note:** If the SNR mask is lowered, the GPS receiver uses satellites with weaker signals. While this can increase GPS coverage in environments where the GPS signal is weakened (for instance, in heavily wooded area), it can reduce accuracy.

Selecting the Current Coordinate System

Select a current coordinate system within the **Select By** region of the Coordinate System dialog. By default, **Coordinate System and Zone** is selected.

Specifying a Coordinate System

Select a **System** by clicking the **System** pull-down list. There are over 35 coordinate systems available, covering most major regions of the world. **Select US State Plane 1983**.

Specifying a Zone

Specify the zone required for the area in which inventory is being performed from the **Zone** pull-down list. This list contains all zones belonging to the selected coordinate system. **Select South Carolina 3900**.

Specifying the Datum

The **Datum** field within the Coordinate System dialog is usually read-only— normally its contents cannot be modified. The Coordinate Transformer component displays the datum that is associated with the coordinate system and zone that is selected.

However, if either **Latitude/Longitude** or the **Universal Transverse Mercator (UTM)** coordinate system is selected, this field becomes a pull-down list. Select the appropriate datum to interpret coordinates. (see figure 1)

> **Note:** The **Site** option enables selection of a local site. However, this option is enabled only if Pathfinder Office has been installed on the user's PC using the Coordinate System Manager™ software. A site must also reside in a file name PFTOOLS.CSE in this directory on the hard drive: C:\Program Files\Common Files\Trimble\GeoData.
>
> The Site pull-down list becomes visible if the Coordinate System Manager software and a PFTOOLS.CSE site file are present on the hard drive. Select a site from the pull-down list.

> **Note:** If using the Coordinate System Manager software, new coordinate systems, zones, and sites can be selected and transferred from the office computer to the field computer.

Figure 1: Coordinate System Dialog, Datum Pull-down List

Specifying Altitude Measured From

Specify whether the altitudes are displayed as a height above or below the current ellipsoid or mean sea level (MSL).
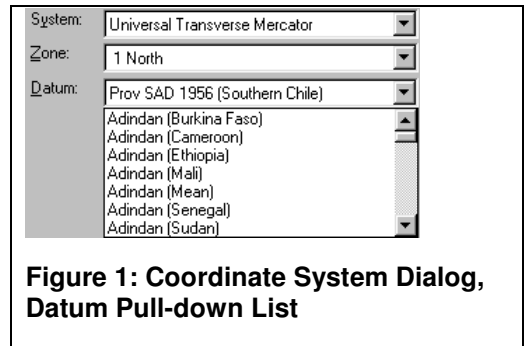
If **Height Above Ellipsoid (HAE)** is selected, altitudes are displayed as height above or below the current ellipsoid. This is determined by the coordinate system, zone, and associated datum that is selected. This value is variable and changes whenever the altitude unit is changed within the coordinate setting.

If **Mean Sea Level (MSL)** is selected, altitudes are displayed as a height above or below mean sea level. This is the usual altitude reference for printed maps. Heights are computed relative to MSL using a geoid model. **Use this selection for the Charleston Project**.

Selecting the Geoid Model

The default geoid model varies depending on the coordinate system selected. Most systems default to the EGM96 global geoid model. However, the geoid model can be changed by clicking the Other option. The Geoid pull-down list becomes enabled. Select the appropriate model from the list. The accuracy of altitudes relative to mean sea level depends on the quality of the geoid model that is used. **Use the Defined Geoid [Geoid96 (Conus)] selection**. **Conus** is an abbreviation for "**Continental US**".

Selecting Coordinate Units

Click the **Coordinate Units** pull-down list to choose the units of measurement to be used when computing or interpreting coordinates. **Select 'feet' for the Charleston project.**

Setting Altitude Units

Click the **Altitude Units** pull-down list to choose the units of measurement to be used when computing or interpreting coordinate. **Select 'feet' for the Charleston project.**

Click **OK** to return to the GILware application window.

SETTING THE ANTENNA HEIGHT

GILware is customized to include an Antenna Height setting; this setting should be checked and entered daily.

COORDINATE SYSTEM SETTINGS

GILware incorporates the Coordinate Transformer component from the Pathfinder Tools Developer Kit. This section discusses how to set up the coordinate system for the GPS Module.

This component provides two unique abilities:

- Saving and restoring coordinate system details between sessions.

- Multiple coordinate systems are available for selection during any session.

- To use and set coordinate system settings, click the **GPS** menu and select **Coordinate System Settings**. This opens the **Coordinate System** dialog.

Table 1. DPGS Source Signal Types

Option	Description
None	Disable the application of different corrections from a real-time DGPS source.
External	Receive differential corrections from an external radio connected to a serial port on the computer or the radio port of the GPS receiver, if applicable. Do not use this setting for RTD.
Beacon	Receive differential corrections from DGPS MSK radio beacon.
Com Satellite	Receive differential corrections from a DGPS communications satellite.

Position Mode

The **Position** pull-down list specifies how the GPS receiver uses an incoming real-time DGPS signal. There are three settings, as listed and described below in Table 2. Select **Corrected Only**. Data that is not collected in the corrected only mode may not be RTD-GPS data.

Table 2. Position Mode Settings

Model	Description
Best Available	The GPS receiver uses the real-time link when it is operating and emits corrected positions. If the real-time link is lost (for example, if the link is obstructed), the GPS receiver receives uncorrected positions. Select Best Available to use positions that are corrected or to use positions that cannot be corrected in real time.
Corrected Only	The receiver only computes and emits positions when the real-time differential correction link is operating. All positions are corrected in real time. Select Corrected Only positions in corrected real time.
Autonomous	The GPS receiver ignores the real-time link completely, even if it is operating correctly. The receiver emits uncorrected positions. Select Autonomous Only to temporarily disable the application of real-time corrections.

Age Limit

Use the **Age Limit** pull-down list to specify how long the GPS receiver waits after an RTCM message before it stops applying the correction and informs the user that it is no longer receiving corrections.

Most RTCM telemetry links broadcast RTCM corrections every few seconds. The more frequently the correction is received, the more accurate the corrected positions are. If a single correction is missed, the GPS receiver applies an extrapolated correction to each new GPS position that it computes.

If the warning time elapses and no new corrections arrive over the RTCM link, the most recent correction is considered to be too old to provide the basis for accurately corrected positions and the GPS receiver ceases to use it. At this point, a warning will appear that the RTCM link is lost.

External DGPS Settings

Use the **External DGPS Settings** tab to specify parameters for the serial port of the field computer's GPS receiver. This enables real-time data to be carried and accepted over the frequency link. An example of the External DGPS Settings tab is in Figure 2.

If the real-time link is connected to the GPS receiver, the settings are communicated to the GPS receiver. The GPS receiver will then configure its serial port with these settings.

Port Setting

From the **port** pull-down list, select the COM port that the GPS receiver is attached to.

Baud Rate Setting

The Baud Rate field specifies the transfer speed of data from the radio to the field computer or to the GPS receiver port. The default setting is **9600** baud. A baud generally equals a transfer speed of one bit per second for serial communications.

Data Bits Setting

This field should be set to 8.

Stop Bits

The Stop Bits field lets the user specify the number of stop bits at the end of a byte. This number is mostly set to 1, but the user may set this value to **1**, **1.5**, or **2**. A stop bit marks the end of a unit of transmission-a byte or a character.

Parity Setting

To set parity checking, select **Even**, **Odd**, or **None** from the **Parity** pull-down list. Parity is a form of error checking.

All digital messages-including those sent by the GPS-are composed of 1s and 0s. The parity of a byte is the binary sum of the length of the byte. Even parity means that the parity bit is set so that there are an odd number of 1s in the byte-or, "word"-including the parity bit. A parity error happens when one of the bits in a byte is changed-meaning the parity of the byte changed during transmission. When one of the bits becomes changed during transmission, an error occurs.

By default, **None** (no parity checking) is set in this field.

Integrated DGPS Settings

Use the **Beacon Settings** group to configure the operation of the built-in beacon receiver.

Click the Mode pull-down list to specify the way the beacon receiver operates. In an automatic mode, the Pathfinder XR and Pathfinder XRS receivers track any available signals and select the best one. However, they lock onto a signal transmitted by a beacon with an integrity monitor in preference to one without an integrity monitor. If the signal that is in use becomes inadequate, the Pathfinder XR and Pathfinder XRS receivers repeat the selection process.

Table 3 lists and describes each of the options for the beacon settings.

Table 3. Beacon Settings Mode Options	
Option	**Description**
Manual	The receiver uses the signal with the frequency specified in the Frequency field. The Frequency pull-down list is unavailable unless the Mode is set to Manual.
Auto Range	The receiver automatically selects the signal from the closest beacon. This is the default and recommended mode.
Auto Power	The receiver automatically selects the strongest beacon signal.
Off	The receiver is disabled. The Pathfinder XR and Pathfinder XRS receivers compute and store positions without applying real-time corrections from the integrated DGPS receivers.

Communication Satellite Settings

If a Pathfinder XRS receiver is in use, use the **Communication Satellite Settings** group to configure the operation of the built-in satellite receiver.

Setting the Provider

Click the Provider pull-down list to select the service provider for the differential satellite signals. There are two service providers that can be used to receive DGPS signals"

- **LandStar**

- **Omnistar**

This pull-down list is only applies available only when connected to Pathfinder XRS receivers.

Setting the Satellite

Click the **Satellite** pull-down list to choose a DGPS satellite to track. Select the appropriate satellite for the area in which data is being collected. The Omnistar satellite emits a radio signal with frequency of 1530.359

MHz for use in the Eastern USA. This field is available only when connected to a Pathfinder XRS receiver. Details on each satellite and the area that each satellite covers are discussed in the *Pro XR/XRS Receiver Manual* from Trimble Navigation. For a copy of this manual, please visit http://www/trimble.com/

GARMIN SETTINGS

In addition to the Trimble GPS Receiver Control, GILware includes a Garmin 18 GPS control. Woolpert does not anticipate using Garmin receivers on the City of Charleston Inventory, but information about their use has been include as an additional reference tool. The Garmin 18 GPS receiver control includes less detailed specifications as the Trimble Receivers. The Coordinate System, Zone, and datum have to be specified as well as Altitude Reference, Geoid Model, and units. The settings for each of these fields are the same as the Trimble settings discussed above. Figure A (at right) is a screen shot with the appropriate fields selected.

Once all necessary fields are filled in, click OK. This brings the user back to the general Garmin window represented in Figure B. Verify the Coordinate System Details, and select "Start Tracking".

Benefits

Minimal settings are required for initial operation, and GPS tracking begins immediately. Another distinguishing characteristic of the Garmin 18 is its size (about the size of a Hockey puck); it is much smaller than a Trimble Antenna.

Precision

The Garmin 18 is accurate to 3-10 meters with a WAAS DGPS signal and 15 meters with GPS signal.

TABLE OF CONTENTS

SYSTEM INVENTORY

This section outlines the data classification and collection procedures for the System Inventory. It also outlines daily QA processes and guidelines for field crews to perform data collection in the field.

The procedures in this section will be used to perform System inventory in the City of Charleston.

DATA COLLECTION METHODS

The system inventory data in the City of Charleston will be identified and collected per the methodology described below. As points are found, location, attribute data and digital photographs are entered into the pen tablet computer. Point data collected during the day is downloaded each evening. By maintaining data on the pen tablet computer, crews can easily identify which areas have been driven previously and can identify when they were approaching the edge of the basin or city limits.

A number of GIS planimetric layers will be used to assist in locating features as quickly and accurately as possible. These base map coverages may include the USGS streams, municipal boundaries, watershed boundaries, geodetic control (horizontal or horizontal/vertical), urbanized areas, building footprints, and georeferenced documents displaying inventory data from the 1950 City System Map and the 1984 Davis & Floyd Plans.

QA/QC PROCEDURES

Independent QA/QC checks on the attribute collection process should be performed. A senior ISO-certified scientist was used to develop these procedures.

Woolpert recommends that the following procedure is performed to verify the accuracy of the attribute data collection:

- All identified waters of the U.S. are divided into small stream segments and assigned a number. A random number generator is then used to select a sufficient number of stream segments to produce a number of features. This number is statistically determined to be the number of points required to produce a 95% confidence level in the field screening process.

- The QA/QC team walks each segment of storm water drainage system identified in the above procedure looking for missed structures or incomplete attribution.

- When questions arise as to whether the original field crew overlooked a point, the QA/QC team meets on-site with that crew and the project manager. In those cases where the two crews and the project manager can't reach a unanimous decision regarding the point, the point is considered to be in error.

- Results of the QA/QC process are classified according to whether it was a missed point or an incorrect or missed attribute.

INVENTORY GUIDELINES

GENERAL FIELD SURVEY GUIDELINES

Storm water drainage system features having 12-inch pipes and larger, open channels, system connectivity and associated feature attributes will be developed. The storm water drainage system consists of both the closed storm sewer system and the open channel system. The following storm water features and attributes will be collected in the field:

- Horizontal *(X,Y)* coordinates

- Feature type codes (junction, junction box, end treatment, inlet, water body outlet, drainage, stream, and sanitary sewer crossing)

- Attribution (see data dictionary)

- Connectivity, geometry, and size of closed conduits

The methods to gather attribute data will include measuring invert depths and pipe sizes as they enter and exit the structure and noting material type. To gather the attribute data, field crews will access each feature and collect information from the topside of the structure. **Note:** No permit required confined-space entry of structures will be performed.

CONNECTIVITY AND CONVEYANCE

For the purpose of this inventory, a **conveyance** is a line feature representing a linear storm water drainage structure or natural feature connecting two point features (**nodes**) in the storm water drainage system. Conveyance features include drainage (pipes and culverts) and streams.

At each location of which the storm water system changes from one means of conveyance to another, a node is collected denoting the point feature facilitating the change. At each location of which the dimension, condition, direction, or character of the conveyance changes noticeably, a node feature is collected at the location of the change and a conveyance is drawn connecting the nodes at each end of the conveyance segment of consistent dimension, condition, direction, or character.

In the case of problem features (as outlined in the pilot project report), field crews will default to the 1984 Davis & Floyd document that is displayed on the pen tablet computer. If this plan shows information about the features in question, crews will digitized the feature on the designated layer based on the information on the plan.

GENERAL DATA COLLECTION APPROACH

The following are the general criteria that will guide the field data collection efforts:

- All field personnel may be required to wear identification badges with the person's name and the City of Charleston logo. Each field crew must carry a copy of a letter from the City of Charleston authorizing the work.

- One attempt during the location survey will be made to gain access to a structure. If safe access cannot be found on that first attempt, the structure will be "flagged" with one of the following inventory classifications, or the appropriate selection from the picklist in the database:

- **INACCESSIBLE** – Any structure that cannot be accessed during the initial field investigation, (buried, paved over, surcharged, property owner denies access, etc.).

- **NOT FOUND** –Any structure that cannot be located after a reasonable search during the initial field investigation

  - If a structure is determined to represent an immediate health or public safety concern, field personnel should take the appropriate steps to address the situation. Depending on the severity of the situation, crew members may choose to call the City of Charleston.

  - If an invert cannot be derived from a pipe (ex. silt, trash, leaves, etc.) the corresponding attribute selection shall be recorded from the drop down list for CONVEYANCE. Additional comments are encouraged.

General Methodology to Attribute Connectivity

- During low tide, begin nearest the point of discharge and work upstream. Relocate to areas near the upsystem end of the work area during high tide. The low speed vehicle renders transport from one are to another quick and easy.

- From each outfall point a linear system will be developed working from the USGS outfall to the headwaters of each branch of the system, or per the methods outlined in the pilot project report.

- The storm water drainage will be traced up the system until either:

  - The city boundary is reached:

  - The edge of the "working" watershed is reached:

    o If the edge of the watershed is reached, a "stub" point will be collected where the system reaches the digital boundary. These points will be used as start points in the adjoining watershed. A Woolpert GIS Technician may later connect the lines and eliminate the "stub" points.

  - The next structure in the series cannot be found or accessed:

    o Field personnel should spend up to five minutes searching for a feature or access to said feature. If after a five minute search the feature cannot be found, the feature should be assigned the appropriate inventory status, after which it will be up to the operator's discretion as to whether to attempt to locate nearby structures further up the system.

    Or

- The top of the drainage is reached, i.e., no discernible drainage is present.

- The storm water discharge system will use outfall points or junctions to indicate a change in the system. These will be the terminal nodes for the connecting lines (conveyances).

- The system will be drawn to correctly represent the direction of flow of linear storm water drainage features. As such, all conveyances will be drawn FROM the upsystem end node TO the downsystem end node.

Connectivity of Streams

- For longer conveyances, specifically channels or pipes, a junction shall be collected to denote a change in dimension, condition, direction, or character.

Connectivity of Pipes

- Is drawn from surface feature to surface feature.

- Where pipes cannot be accessed the pipe dimensions may not be attributed.

- Pipe bends may not be captured. (In other words, the sub-surface pipe configuration cannot be accurately determined using only above-ground observation methods).

Connectivity of Culverts

- Conveyance shall be deemed a culvert <u>if</u>

- The feature connects an upstream open system to a downstream open system using a singular closed system input point and a singular closed system outpoint and includes NO additional input points.

- The conveyance crosses a public or private road (not a driveway)

FEATURES AND RELATIONSHIPS

All Storm Water Inventory feature types are listed in the data dictionary (Separate Appendix E). Also in this data dictionary are the attributes that correspond to each feature type and the definition of the domain of each attribute.

THE CITY OF CHARLESTON SIMPLIFIED FIELD COLLECTION/ATTRIBUTION PROCEDURE

I. All point (node) features will be connected by line (conveyance) features. Woolpert will collect closed system and open system point features. Charleston County will collect the following closed system point features:

    a. Inlets (see photos for examples) – can connect to other closed system features via pipes. Yard inlets and grate inlets can also connect to open system features via channels.
    b. Manhole – Can connect to other closed system structures via pipes.

II. Woolpert will collect PipeIOs at the meeting place of open & closed systems. Yard and grate inlets can also connect open & closed systems. PipeIOs connect to closed system structures via pipes and to open system structures via channels.

III. Woolpert will connect the following open system structures:

    a. Ditchpoints – Can connect to other open system structures via channels or culverts.

IV. Stub Points can connect to any structure. Stubs are virtual points that can be used to denote any of the following occurrences/circumstances:

    a. Marker – A line that indicates to the user a structure that must be located later. These will often be used when a system branches into multiple directions and the operator must pick a direction to follow.
    b. Not Found – A structure is known to exist but cannot be located by the field crew after a five minute search
    c. Edge of city/watershed
    d. The Critical Line -- Roughly defined as the marsh line
    e. Inaccessible -- If access to a the continued system cannot be gained
    f. Private -- If the system enters a private area that is not maintained by the City
    g. Commercial -- If the system enters a commercial area that is not maintained by the City
    h. Interstate ROW -- If the system enters the right-of-way of an interstate highway and is therefore no longer under the City's jurisdiction
    i. Other -- If any other factors exist that prohibit further collection of the system. Comments should be entered on any features carrying this status.

V. Additional Notes

    a. Conveyance shall be deemed a culvert if:

        1. It does NOT have vertical input/all flow is horizontal and

        2. The conveyance crosses a public or private road.

b. Conveyance shall be deemed a pipe if:

    1. It has vertical input from a structure such as a curb inlet, catch basin, etc. or

    2. It does not traverse a private or public road

c. Structures will not be located on interstate highways.

d. Other Notes - Provisions have been made to include Sanitary Sewer Cross Connections in the dataset. WBOutlets and other unknown structures may be further defined by a Woolpert engineer. Some examples (pictures/diagrams & descriptions) of anomalies/ambiguities are included in Appendix C.

TABLE OF CONTENTS

OFFICE GUIDELINES

OVERVIEW

This section outlines office guidelines for the daily QA procedures, data editing and review, final formatting, and weekly reports. This section is also intended to outline the step-by-step process by which field data is collected, processed, and delivered (formatted properly) to the Charleston Engineering Department.

Daily Office QA Procedures

At the end of each field-collection workday, the field crews will perform a variety of QA checks on the field data. More specifically, the crews will download and backup all field data and check to ensure that all attribute data has been collected properly.

Data Download and Backup

The following is the GILware procedure for daily download and backup files:

1. Save the **stormoutfall.ptp** file.

2. If the Fujitsu has an ethernet connection, plug the ethernet cable into the connection and login to Woolpert's server using the Novell Client Login program. If the Fujitsu does not have an ethernet connection but has a PCMCIA card, plug the ethernet into a dongle, and the dongle into the PCMCIA card, and login to the Woolpert server.

3. Once logged in, return to the GILware project and select "**Tools**".

4. Drag down to "**Export Shapefile**"

5. Select the "**Nodes**" layer.
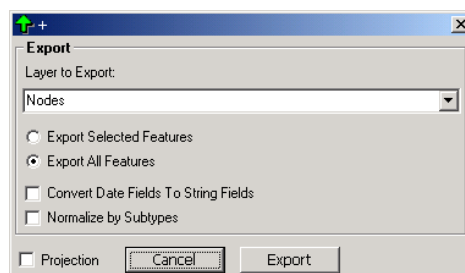
6. Check the "**Projection**" box. Drag down to the selections below:
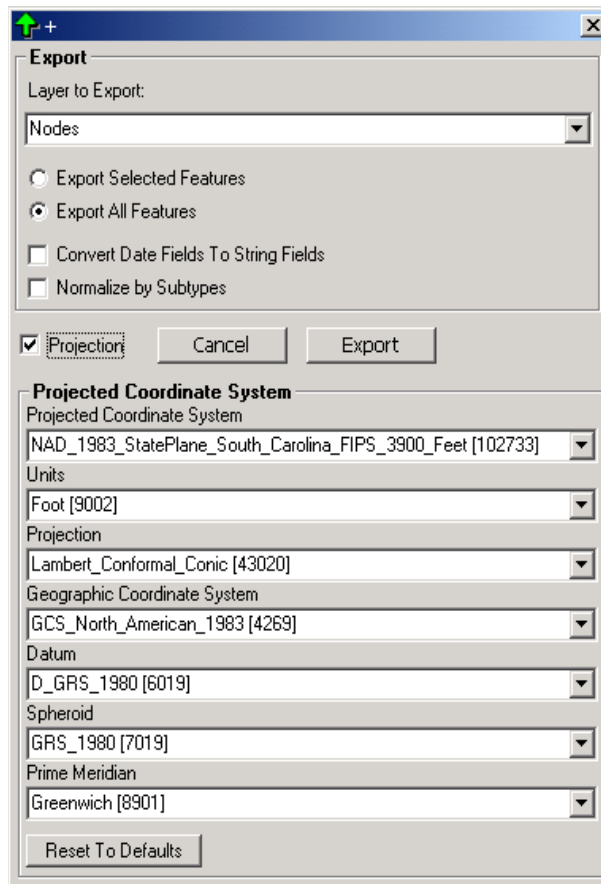
7. Select the proper folder per the procedures established for this project. A dialog similar to the following will appear:
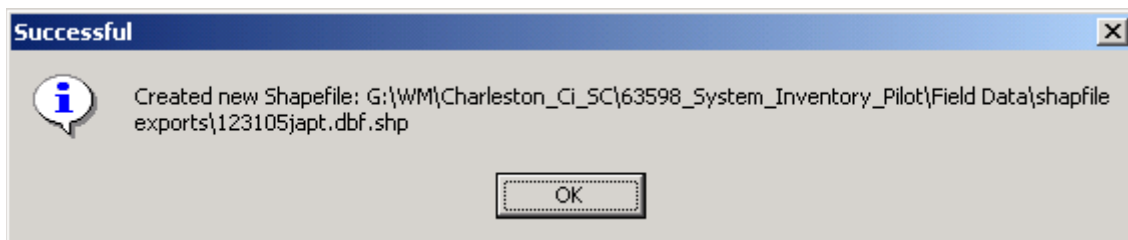
Data Clearing Upon Sub-basin Completion

Once data collection has been completed for a sub-basin, the data for that drainage sub-area must be kept separate from that of the other drainage sub-area, and a blank data collection file must be uploaded to the field computer. The procedures for switching drainage sub-areas will be established upon commencement of a full-blown Charleston System Inventory

Pen tablet computers often present file transfer challenges. These challenges can result from the presence or absence of familiar peripherals, from varying operating system constraints, and from different networking configurations. While there are numerous file transfer techniques that may be employed during this project, a few proven techniques that may apply to this project are as follows:

1. Pen tablet with Windows 2000 or XP with internal USB port (requires USB removable disk or "thumb" drive) --

    a. Turn on pen tablet computer while thumb drive is NOT attached to the USB port. Allow Windows to load.

    b. Insert thumb drive into USB port. Open My Computer or Windows Explorer. Notice that another drive (usually D: or H:; will be the next available "letter") is available. This is the USB removable disk drive. (see image below)

    c. Copy/cut the necessary data from the field computer to the thumb drive. Wait until the light stops blinking on the thumb drive. When finished, double click on the "Unplug or Eject Hardware" icon in the lower right hand corner of the screen. Select "USB Mass Storage Device" and click on Stop.

    d. Remove thumb drive from USB port and insert it into USB port on the other machine.

    e. Open My Computer or Windows Explorer and paste the data into the appropriate spot on the other machine. Wait until the light starts blinking on the thumb drive. When finished, double click on the "Unplug or Eject Hardware" icon in the lower right hand corner of the screen. Select "USB Mass Storage Device" and click on Stop. Remove the thumb drive from the USB port.

        NOTE: Thumb drives can be used with Windows 98 machines equipped with USB ports, but the appropriate driver files need to be uploaded and installed before the machines will recognize the devices.

2. Pen tablet with Ethernet connection, Windows 95, 98, 2000, or XP, and Novell Client –

    a. Turn on pen tablet computer while Ethernet cable is connected to appropriate Ethernet port.

    b. When the Novell Client login screen appears on the screen (see image below), verify all fields and enter the username and password. Click OK.
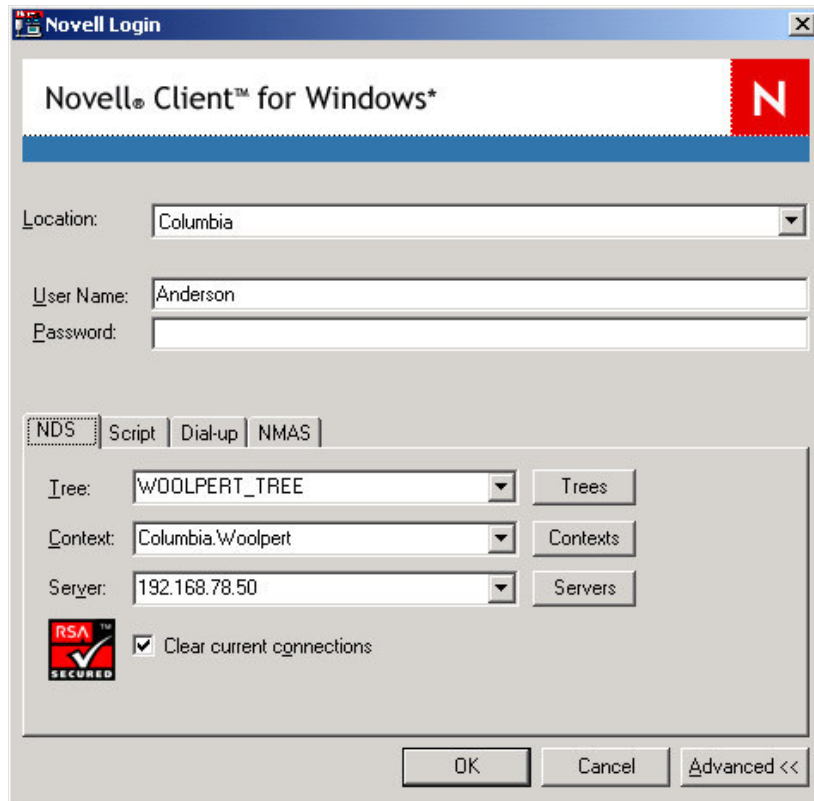
c. When Windows is finished loading, open My Computer or Windows Explorer. Connections are now available to both the computer's hard drive (C:) and the Woolpert server (G:). A two-way file transfer between the machine and the server can now be performed.

d. IMPORTANT: Once file transfer is complete, shut down the field computer before disconnecting the Ethernet cable.

NOTE: Thumb drives can be used with Windows 98 machines equipped with USB ports, but the appropriate driver files need to be uploaded and installed before the machines will recognize the devices.

MANAGEMENT APPROACH

REPORTING

Alarmed Citizens

1. First, allow the property owner to read the "Letter of Intent" to inform him/her of what the field crew is doing in that area.
2. If the citizen still has a complaint, leave the land/area immediately and take available information, such as, name, address, and number.
3. Contact Jeff Anderson, Brian Bates, or Sarah McCrary. (see section 2 for contact information)

4. Submit a written description to Jeff Anderson for inclusion in the project files.

Accidents/Injuries

Procedure for an automobile accident:

1. Make sure everyone in all vehicles involved are okay.
2. Treat any life threatening injuries, e.g. major bleeding or victim not breathing.
3. Call 911 if there are any injuries.
4. If it is safe to do so, stay where you are and wait for police/ambulance/fire personal to arrive.
5. If it is not safe, move to a safe location.
6. If there are no injuries, the vehicles can be driven, and the vehicles are blocking traffic then move them to the shoulder of the road or to a safe area.
7. Contact Jeff Anderson, Brian Bates, or Sarah McCrary. (see section 2 for contact information)

Procedure for a personal injury requiring advanced treatment:

1. Survey the scene and make sure it is to treat the victim.
2. Move the victim only if it is necessary for the safety of you or the victim.
3. Treat the injury.
4. Call 911 if it is a life threatening injury and ask to be transferred to Charleston's emergency medical services. If not life threatening but requiring a doctor's attention, then take the individual to a hospital.
5. Contact Jeff Anderson, Brian Bates, or Sarah McCrary. (see section 2 for contact information)

Hazardous Materials

Procedure if hazardous materials are encountered:

1. The team is to leave the area immediately.
2. Record the location and type of material if known.
3. Contact Jeff Anderson, Brian Bates, or Sarah McCrary. (see section 2 for contact information)
4. Project manager will notify SCDHEC.

Cross Connections (Sanitary Sewers)

Procedure if Cross Connections are discovered:

1. The team should record the location of the cross connection.
2. Contact Jeff Anderson, Brian Bates, or Sarah McCrary. (see section 2 for contact information)

Media

1. Do not answer any questions dealing with the project.
2. Give the media a copy of the "Letter of Intent".
3. Contact Jeff Anderson, Brian Bates, or Sarah McCrary. (see section 2 for contact information)

Employee Identification

Every team member performing field work shall carry appropriate personal identification consisting of a valid ID card (ex. drivers license), any ID cards that may be issued by the City of Charleston, and if available, business cards. Each field vehicle should also have several copies of the "citizens letter" on the City of Charleston letterhead to be handed out as requested by property owners confronted.

TABLE OF CONTENTS

FIRST AID PROCEDURES

CHEMICALS

Chemicals In The Eyes

1. Immediately flush eyes thoroughly with a gentle stream of clean, cool water for at least **20 MINUTES WITHOUT DELAY**. Delay of a few seconds can greatly increase the extent of the injury.
2. Do not use neutralizing solutions including boric acid and out-of-date bottled eye wash solutions.
3. Hold eyelids apart and roll eyeballs around during irrigation to wash the entire surface.
4. Wash alkaline solutions for longer periods of time, as they are more hazardous than acid solutions.
5. Notify Management and/or Environmental Health Specialist immediately for documentation.

Chemicals On The Body

1. Immediately rinse affected areas thoroughly with cool water for at least **20 MINUTES WITHOUT DELAY**. Act fast to reduce absorption through the skin and damage to the skin.
2. Remove contaminated clothing while rinsing. Speed in removing chemicals from the skin is the most important way to reduce the extent of injury.
3. Do not use neutralizing chemicals, creams, or lotions.
4. Notify Management and/or Environmental Health Specialist immediately for documentation.

Inhalation Of Chemicals

1. Act quickly. Get the crew-member into fresh, uncontaminated air if the rescue action does not put you at risk.
2. Be prepared to provide important information to the Emergency Services. If known, identify the chemical(s) inhaled. Describe medical signs and symptoms. Accurate information will result in the best handling of a poisoning.
3. Notify Management and/or Environmental Health Specialist immediately for documentation.

Ingestion Of Chemicals

1. Be prepared to provide Public Safety with the name of the chemical and the amount ingested, if known. Describe medical signs and symptoms. Accurate information is essential for the Poison Control System (617) 232-2120) to provide effective medical assistance via the telephone.
2. If the crew-member is conscious and not convulsing, immediately have the person ingest one to two glassfuls of milk or water to dilute the chemical. This is the preferred treatment of choice as water and milk does not result in a hazardous exothermic chemical reaction that would worsen the situation.
3. Never induce vomiting. It is frequently dangerous to the victim, particularly if corrosive materials have been ingested.
4. Make certain the chemical container goes to the hospital with the victim. Also, send a sample of vomitus for analysis.
5. Notify Management and/or Environmental Health Specialist immediately for documentation.

Benzene Characteristics

Benzene is an aromatic hydrocarbon that is produced by the burning of natural products. It is a component of products derived from coal and petroleum and is found in gasoline and other fuels. Benzene is used in the manufacture of plastics, detergents, pesticides, and other chemicals. Research has shown benzene to be a carcinogen (cancer causing). With exposures from less than 5 years to more than 30 years, individuals have developed, and died from, leukemia. Long-term exposure may affect bone marrow and blood production. Short-term exposure to high levels of benzene can cause drowsiness, dizziness, unconsciousness, and death. The current permissible exposure level is 1 part per million (ppm) in air for an 8-hour average with a short-term exposure limit of 5 ppm. Benzene can also be absorbed through the skin. As with all chemicals, follow the first aid guidelines described above.

Chloroform Characteristics

The National Institute for Occupational Safety and Health (NIOSH) has established a recommended exposure limit (REL) for chloroform of 2 ppm (9.78 mg/m(3)) as a 60-minute short-term exposure limit (STEL). NIOSH also considers chloroform a potential occupational carcinogen [NIOSH 1992]. As with all chemicals, follow the first aid guidelines described above.

CLOTHING FIRES

1. Drop to the floor and roll.
2. Use a drench shower only if it is in **VERY CLOSE PROXIMITY.**
3. Do not run if your clothing is burning. Running fans the flames, intensifies the fire and the extent of the burn injuries.
4. Use a device(s) to extinguish flames with great caution because burning clothing retains heat and may continue to smolder.
5. **DO NOT** remove clothing if it is stuck to the skin, but rather, continue to apply water.
6. Notify Management and/or Environmental Health Specialist immediately for documentation.

THERMAL BURNS

1. Apply cool water to the burned area to reduce pain and swelling.
2. Apply a dry sterile dressing to the burned area. Do not touch or directly breathe on the wound.
3. Do not use any commercial sprays or home remedies such as butter.
4. Do not break any blisters.
5. Notify Management and/or Environmental Health Specialist immediately for documentation.

ELECTRICAL SHOCK INJURIES

1. Take fast action because electrical shock injuries can cause burns and can cause a person's lungs and/or heart to stop functioning.
2. **NEVER** approach or touch a person who is in contact with live electrical equipment. Locate and shut-off power source first.
3. If power shut-off is not possible and you believe it can be done without personal risk, you may use a nonconducting object (e.g., long piece of wood) to disconnect the person from the live electrical source.
4. Notify Management and/or Environmental Health Specialist immediately for documentation.

CUTS AND BLEEDING WOUNDS

- *Use disposable gloves.*
  1. Control bleeding with direct pressure on the wound with a sterile gauze pad. Elevate the wound above the level of the heart.
  2. Do not remove any object such as glass or wood from a cut. Medical personnel should do removal.
  3. If a person is bleeding heavily, have the person lie down with feet elevated. Keep the crew-member warm and calm.
  4. **NEVER** apply a tourniquet.
  5. Notify Management and/or Environmental Health Specialist immediately for documentation.

MOVING AN INJURED PERSON

1. Do not move an injured person until medical assistance arrives unless there is a real danger of further injury (e.g., an approaching fire).
2. If you must move the crew-member, move the person as a whole, protect the crew-member's head at all times and watch where you are going.
3. Support every part of the body if circumstances require you to lift the victim. Keep the crew-member's body in a straight line, do not bend. Always use your legs, not your back, while lifting or pulling.
4. Notify Management and/or Environmental Health Specialist immediately for documentation.

NOSEBLEEDS

- *Use disposable gloves.*
    1. Loosen collar.
    2. Crew-member can GENTLY blow nose prior to applying direct pressure. Caution crew-member not to blow nose after initial treatment.
    3. Apply direct pressure to his/her nose for five minutes, by the clock, without stopping. This can be repeated if bleeding has not stopped.
    4. Can apply ice packs to back of neck and/or to nose bridge.
    5. The crew-member may sit upright or with head tilted slightly forward to avoid blood running down the throat and to encourage clotting.
    6. Allow the crew-member to rest before returning to normal activities
    7. Notify Management and/or Environmental Health Specialist immediately for documentation.

NAUSEA / VOMITING / ABDOMINAL PAIN / FAINTING

Nausea and Vomiting

1. Have the crew-member lie down. Keep quiet, warm and under observation.
2. Give no fluids or food.
3. Notify Management and/or Environmental Health Specialist immediately for documentation.
4. Advise a consultation with a physician, if symptoms continue for more than half an hour.

Abdominal Pain

1. Have the crew-member lie down.
2. Give no medication or anything by mouth.
3. Notify Management and/or Environmental Health Specialist immediately for documentation.
4. Advise a consultation with a physician, if symptoms continue for more than half an hour.

Fainting

1. Keep the crew-member lying down.
2. Loosen tight clothing around the neck.
3. Make sure the crew-member gets plenty of fresh air.
4. Bathe face with cold water or cool wet cloth.
5. Give no liquids until the crew-member is fully conscious.
6. Assess reason for fainting (ex. too hot, allow to cool down); unknown-keep warm and treat for shock.
7. Notify Management and/or Environmental Health Specialist immediately for documentation.

BITES / STINGS / SKIN IRRITATION

Snake Bites

- *Poisonous* -
    1. Lay the crew-member down and keep calm.
    2. **Call 911 or local emergency response team**.

3. Notify Management and/or Environmental Health Specialist immediately for documentation.

- *Non-Poisonous* -
  1. Treat as for dog, bat or other animal bites.
  2. Notify Management and/or Environmental Health Specialist immediately for documentation.
  3. Advise to consult with physician.

Dog, Bat, and other Animal Bites

1. Use disposable gloves.
2. Cleanse wound with soap and abundant amounts of water.
3. Cover with dry dressing.
4. Notify Management and/or Environmental Health Specialist immediately for documentation.

Insect Bites

- *Severe reaction* -
  1. If the crew-member has injectable epinephrine, have him/her administer medication to him/her self.
  2. **Contact 911 or local emergency response team**.
  3. Notify Management and/or Environmental Health Specialist immediately for documentation.

- *Minor reaction* -
  1. Use disposable gloves.
  2. Remove stinger if still present with a scraping motion.
  3. Apply a paste of baking soda or meat tenderizer, or a cold compress to the affected area.
  4. Notify Management and/or Environmental Health Specialist immediately for documentation.

Poison Ivy, Oak, or Sumac

1. Use disposable gloves.
2. Cleanse skin with warm water and soap to remove the oil, which causes the irritation.
3. Rinse with clear water and dry.
4. Change all exposed clothing.
5. Notify Management and/or Environmental Health Specialist immediately for documentation.

HEAD INJURY / HEADACHE

Major Head Injury - Loss of Consciousness

1. **DO NOT MOVE the EMOPLYEE**. Keep warm and quiet.
2. If movement is necessary because scene is unsafe, keep head and spine in alignment.
3. Observe for signs of shock, restlessness: fast or weak pulse, pale or bluish skin, moist skin, nausea and vomiting, and treat accordingly
4. Notify Management and/or Environmental Health Specialist immediately for documentation.
5. **Call 911 or local emergency response team**.

Minor Head Injury

1. Lay the person down. Keep warm and quiet.
2. Apply cold compress to affected area to reduce swelling.
3. Notify Management and/or Environmental Health Specialist immediately for documentation.

Headache Not Associated with Injury

1. Allow the crew-member to lie down with a cold compress.
2. Check for fever.
3. **Give no medications** (unless authorized to do so.)
4. Notify Management and/or Environmental Health Specialist immediately for documentation.

EMERGENCY MEDICAL CARE

Serious medical emergencies:

1. Difficulty breathing.
2. Shock due to: excessive bleeding, severe pain, insulin reaction, fractures.
3. Bleeding difficult to control.
4. Unconsciousness or altered levels of consciousness.
5. **Do NOT try to deal with extreme emergencies by yourself. GET HELP!**
6. **While you give first aid, instruct others to call 911 or your local emergency system.**
7. **DO NOT hang up** until the emergency person has all necessary information regarding the crew-member's location.
8. Give appropriate first aid. If breathing is impaired or significant head or neck injury is suspected, **DO NOT MOVE CREW-MEMBER**.
9. **Notify** Management and/or Environmental Health Specialist immediately for documentation and the person given as "emergency" contact.

Poisons

Treatment

- *Use disposable gloves to remove poison from contact with body.*
    1. Oral - wipe out mouth
    2. Eyes - flush with water
    3. Skin - remove clothing, brush off any dry chemicals, flush affected areas with large amounts of water
    4. Fumes - get crew-member to fresh air
    5. **DO NOT** give crew-member anything to eat or drink unless instructed to do so by poison control.
    6. Call Poison Control Center - 1-800-860-0620.
    7. Follow instructions of Poison Control Center.
    8. Save any poison containers or vomitus for medical personnel.
    9. Initiation of Ipecac or charcoal should be done by medical personnel or parent if instructed to do so by Poison Control.
    10. CPR may be initiated by someone trained in the process at any time, if needed.
    11. **Call 911 or local emergency response team**.

12. The poison container and/or vomitus should also accompany crew-member to hospital.
13. Notify Management and/or Environmental Health Specialist immediately for documentation.

Sprains/Fractures/Dislocations

1. Without an x-ray you usually cannot distinguish between a fracture, dislocation, sprain or strain, so always **treat as a fracture**.
2. **DO NOT** move the crew-member.
3. Control any bleeding first.
4. Treat for shock.
5. With any ankle injury, **DO NOT** take shoe off.
6. Splint in position you find injury.
7. Apply splint so it immobilizes the joint above and below the possible fracture.
8. Apply cold pack and elevate injured appendage.
9. Notify Management and/or Environmental Health Specialist immediately for documentation.
10. **Call 911 or local emergency response team**.

EMERGENCY CONTACT INFORMATION

Assorted Charleston Area Contacts

EMS	911
Sheriff	843-554-4700
State Highway Patrol	803-896-7920
	800-768-1501 (Emergency)
Forest Fire Reporting	800-777-FIRE
DNR (Wildlife Emergency)	800-922-5431

Local Police

Charleston	843-720-2401
Folly Beach	843-588-2433
Goose Creek	843-863-5200
Hanahan	843-747-5711
Isle of Palms	843-886-6522
Lincolnville	843-871-6220
North Charleston	843-554-5700
Mt. Pleasant	843-884-4176
Sullivan's Island	843-883-3931
Summerville	843-851-4100

Hospitals

The Medical University of
South Carolina (MUSC)
Medical Center
171 Ashley Ave.
Charleston, SC 29425
843-792-2300

Roper St. Francis Medical
316 Calhoun St.
Charleston, SC 29401
843-724-2000

Bob Secours St. Francis Hospital
2095 Henry Tecklenburg Drive
Charleston, SC 29414
843-402-1000

Roper St. Francis Medical Center
Goose Creek
149 St. James Ave.
Goose Creek, SC 29445
843-553-5050

East Cooper Regional Medical Center
1200 Johnnie Dodds Blvd.
Mt. Pleasant, SC 29464
843-881-0100

Roper Medical Center Northwoods
2233 Northwoods Blvd.
North Charleston, SC 29406
843-824-8733

APPENDIX A: CONTACTS FOR EQUIPMENT AND SERVICES

TRIMBLE NAVIGATION LIMITED

- 645 North Mary Avenue
  Sunnyvale, CA 94088

- Contacts: Micheal O'Grady, Sales Engineer
                 1192 Mill Run Drive
                 Noblesville, IN 46060
                 Phone: 317-770-1616
                 Fax: 317-770-1617

For more information: www.trimble.com

OMNISTAR, INC.

- 8200 Westglen
  Houston, Texas 77063

- Contacts: A. D. Smith, Office Manager
                 Mike Guerra, Technical Representative
                 Max Huff, Technical Representative
                 Phone: 713-785-5850
                 Fax: 713-785-5164

For more information: www.omnistar.com

WALKABOUT COMPUTERS, INC.

- 2655 North Ocean Drive
  Suite 510
  Singer Island, Florida 33404

- Contacts: Don Paisley, Sales Rep.
                 Phone #1: 614-882-001
                 Phone #2: 1-888-925-5226
                 Fax: 561-881-7345

For more information: www.walkabout-comp.com

Project Datum and Projection Settings

Trimble Control Form – General Tab

Trimble Control Form – External DGPS Settings Tab

Trimble Control Form – Integrated DGPS Settings Tab
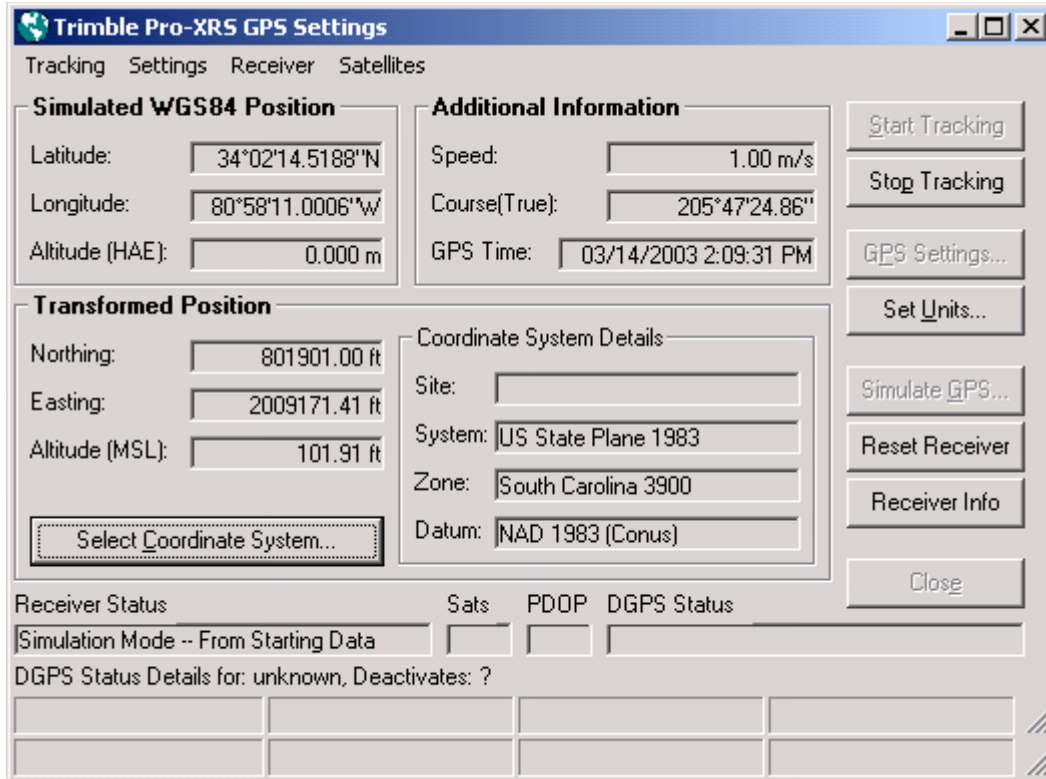
Trimble Pro-XRS Settings