All you wanted to know about High Accuracy Data Collection

Eric Muncy
Precision Products
Mapping-GIS Division

Trimble

ESRI

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Tell me your name

What School / Organization

Any experience with GPS equipment

What would you like to get out of this workshop

Tell me last TV show you watched?

about Eric Muncy

- Over 22 yrs experience
- BS Geography – concentration in Environmental Studies from University of Louisville
- Work Experience
  - Self Employed
  - Engineering/Survey Consulting Companies
- Over 10 yrs of Sales/Support/Training of GPS and GIS products
- Memberships to
  - Indiana GIS, Kentucky GIS. Ky Rural Water, Indiana Rural Water Alliance,
  - Ky Gas Association, Ky Telecom Association, American Public Works Association
- Last TV Show Watched

Todays Agenda

1) GPS History / Best Practices

2) Trimble Handhelds

3) Terrasync/Pathfinder Office

4) Field Work – Handhelds ?WEATHER?

5) 10 min break

6) Trimble Receivers

7) GNSS Status / ESRI Collector

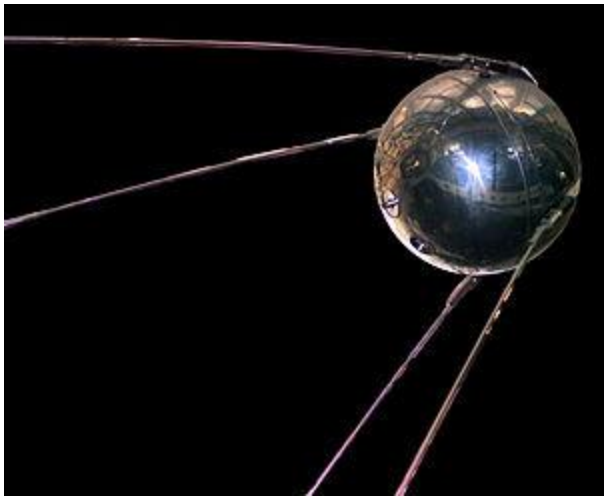
8) Field Work – Receivers ?WEATHER?

9) Question/Answer Period / Work ?WEATHER?

Global Positioning System (GPS) / Global Navigation Satellite System (GNSS)

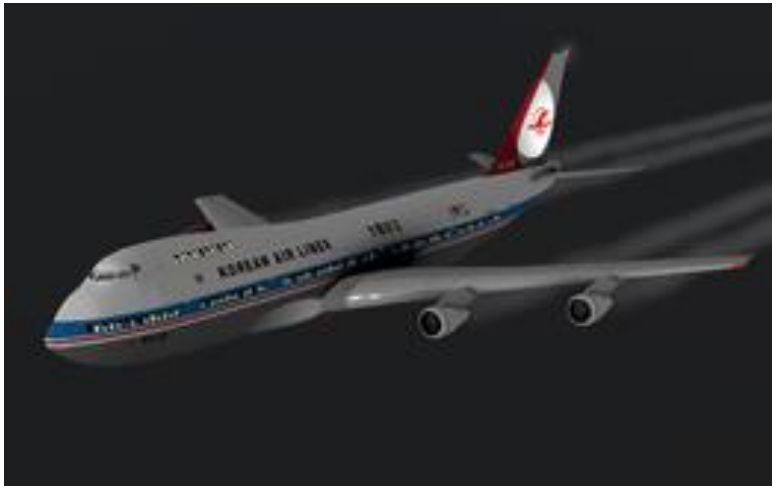
Sputnik

- Launched in 1957 by USSR
- First man made satellite to send radio signals
- Lived for about 3 months



Korean Flight 007

- Shot down September 1983 in Russian Air Space
- Presidential Order was signed to make GPS available for civilian use



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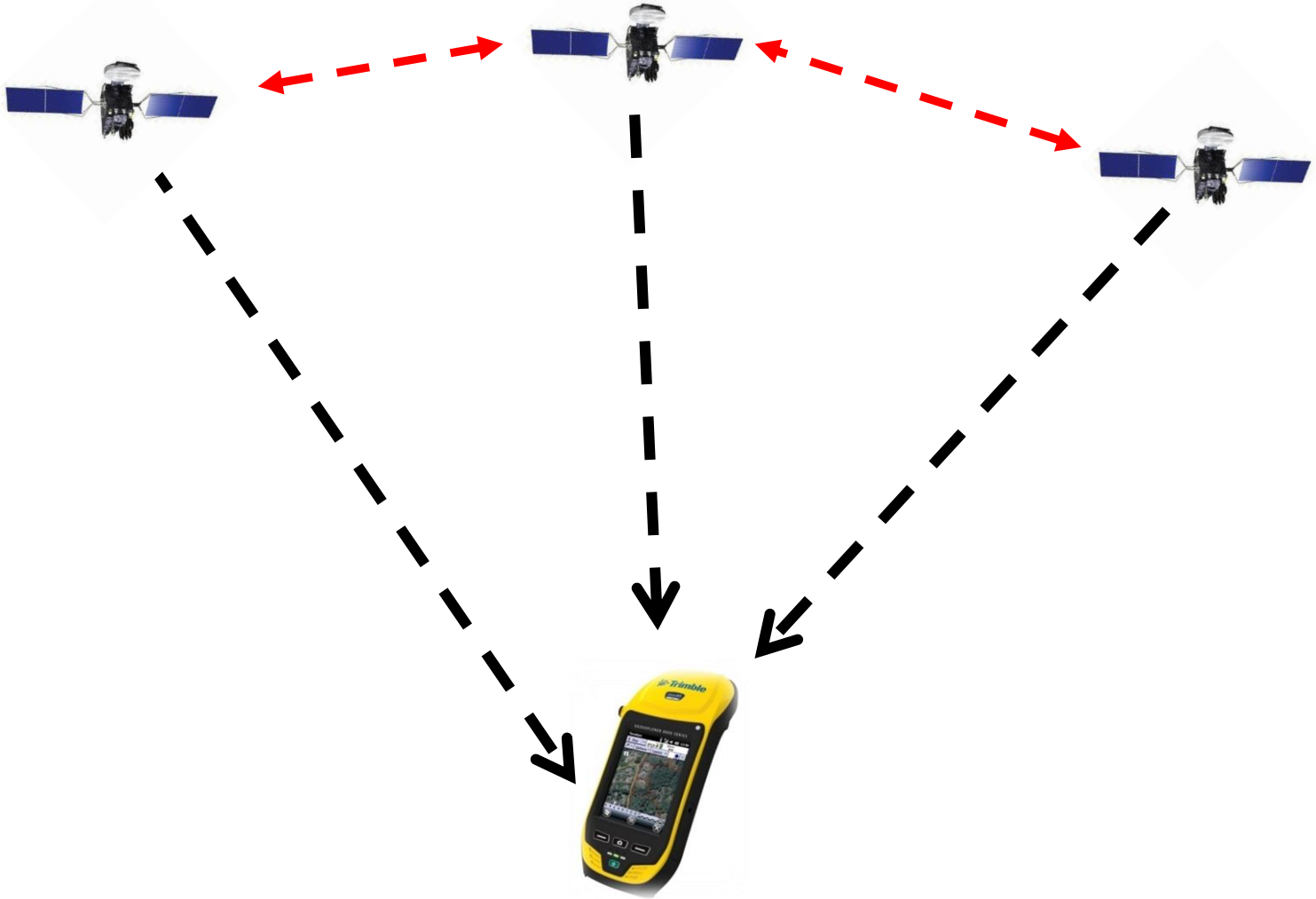
Selective Availability (SA)

- 1989 – Intentional dithering of the satellite clocks by the DOD. Degrades the Accuracy. Over 150 ft of inaccuracy
- 2000 – President Clinton ordered SA to switched off.
- Greatly improved consumer grade GPS accuracy

PRECISION PRODUCTS



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Different Grades of GPS?

❖Consumer Grade

- Inexpensive
- 15 to 30 feet accuracy
- Good for general locations
  - Navigation
  - Street Signs
  - Trees
  - Buildings (911)

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❖Consumer Grade

❖**Mapping Grade**

- 1 inch to 10 feet accuracy
- Digital Clipboard
- Good for more accurate locations
  - Hydrants
  - Manholes
  - Roads

- ❖Consumer Grade
- ❖Mapping Grade
- ❖**Survey Grade**

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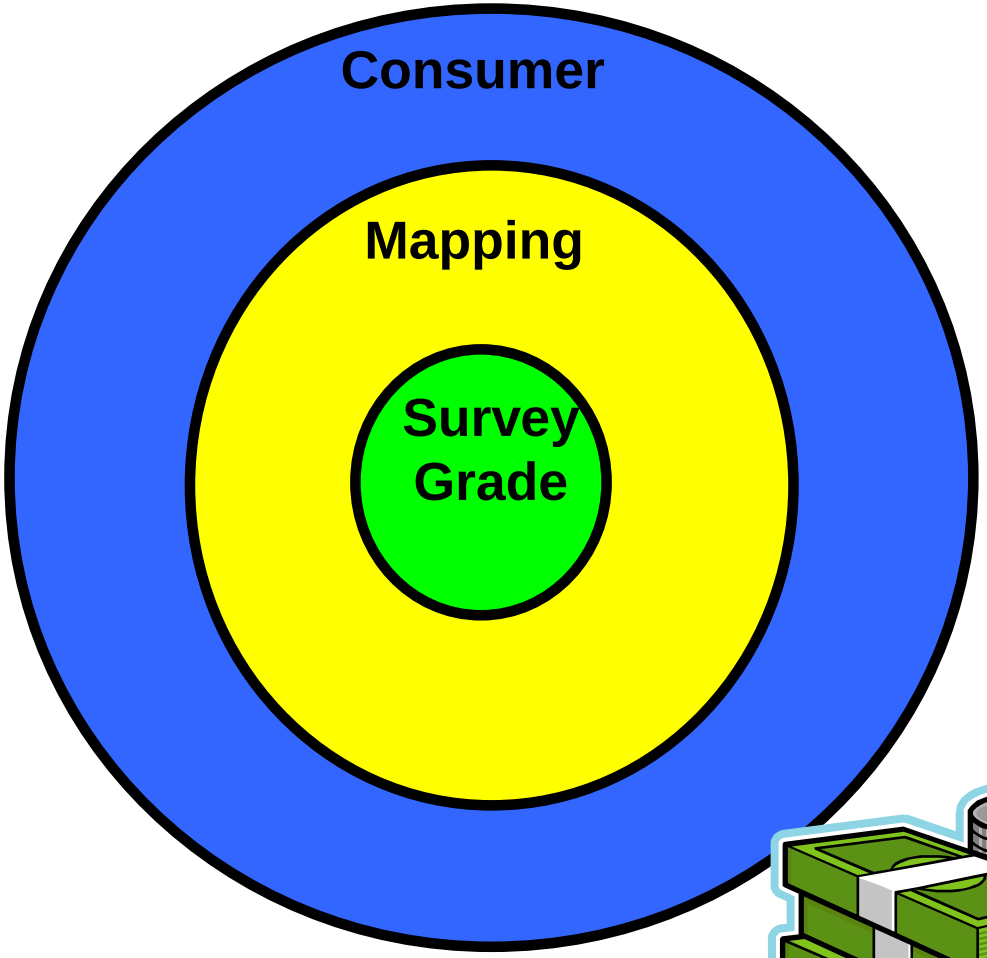
- ➢ Centimeter accurate
- ➢ Good for the accurate locations related to:
  - Control networks
  - Land boundaries
  - Topographic & Engineering Surveys

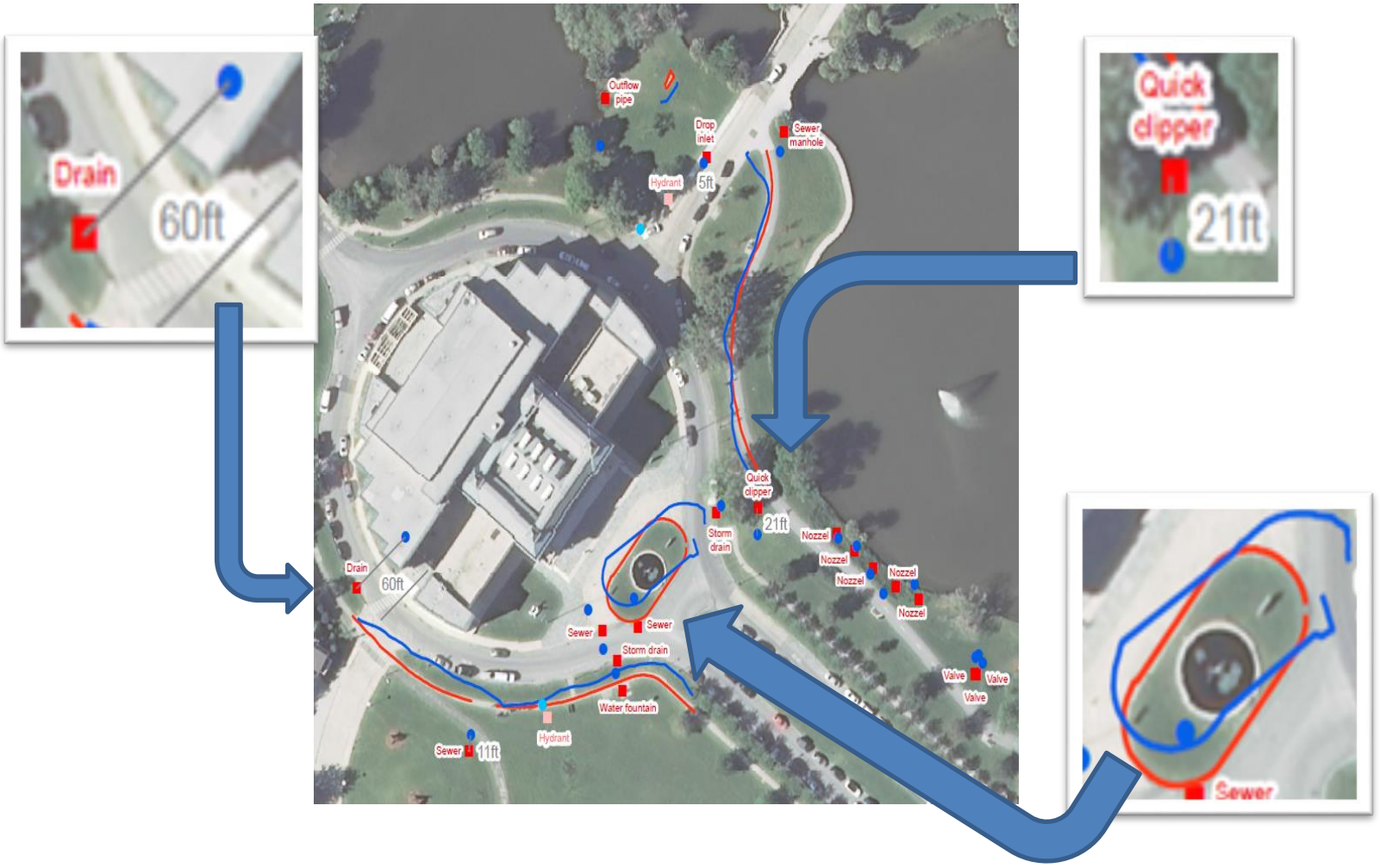
PRECISION PRODUCTS



Lower Costs

Higher Costs

A Comparison: Mapping-Grade GNSS Devices vs. Consumer-Grade Smart Devices



Questions to decide on GPS/GNSS Technology

- Accuracy
- Integration into the software you use
- Ease of use for both field and office workers

Old School Data Collection…

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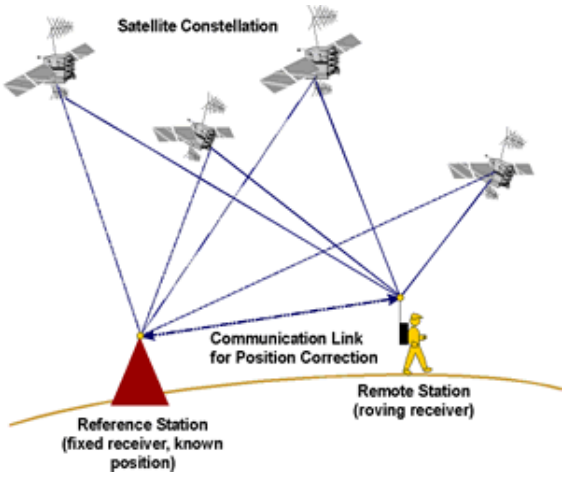
Corrections

How accurate do you want to get



Raw Data

- Uncorrected
- Accuracy – 15 to 30 feet
- Good for general location; features that do not need pin point accuracy

SBAS/WAAS Correction

- Used in Aviation
- Accuracy – 1 to 15 feet (depending on your equipment)
- Free to use
- Not good around buildings and trees

VRS/RTN Correction

- Accuracy – depends on unit
- Free (in some states) / Paid in others to use
- Must have a cell data/internet connection
- Usually ran by a state agency (DOTs)

Satellite/Radio Correction

- Accuracy – depends on unit
- Paid service
- Not effected by limits of cellular/internet service

Postprocessing

(Software)

- Accuracy – depends on unit
- Free
- Not effected by limits of cellular/internet service
- Extra Steps

Best Field Practices

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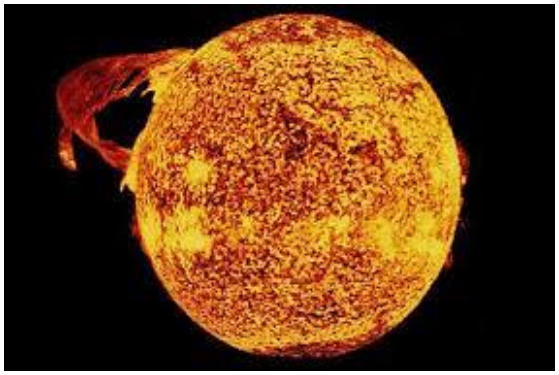
Best Practices….

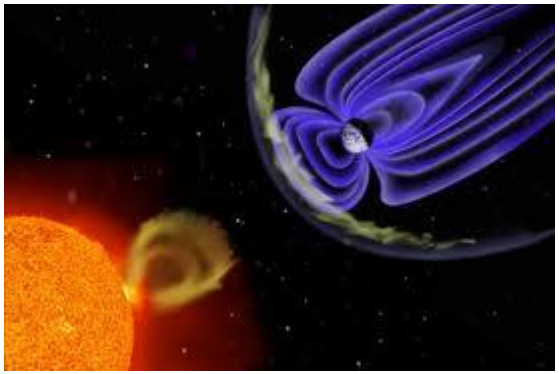
- Current OS and GNSS Firmware installed.
- Current Date and Time on the data collector & Right time Zone
- Unit is fully charged / Spare Battery.
- Software installed, compatible and working?

Best Practices continued….

- Let Unit ‘cook’ if you have not used it for a while / going to job site
- Make sure to minimize interference
  - Trees
  - Buildings
  - Other (Multipath)
  - Solar Flares
- If using Realtime Correction Service (make sure you are connected to it (keep tabs)

Solar Flares





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- Will disrupt GPS technology
- May have to wait or re-collect data
- NOAA website
  - http://www.swpc.noaa.gov/
- Space Weather Website
  - http://spaceweather.com/

More Best Practices…

- Always Question data
- Metadata?
- Receiver? Accuracy? Environment? Date/Time? Realtime Correction? (OCWD – Kenny)
- Coordinate System? Datum? Coordinate Units? Altitude Units?
- Check in with a survey marker or monument
  - https://www.ngs.noaa.gov/datasheets/

PRECISION PRODUCTS

Overview of the Handheld Units that will be used today

PRECISION PRODUCTS

Juno 3

- 8 to 12 ft (processed/realtime)
- 5 MP Camera
- Windows Mobile OS
- Rechargeable Battery
- SD Card / Built in Stylus

PRECISION PRODUCTS

2008 (3000) GeoExplorer

- Submeter & Subfoot Options
- Windows Mobile OS
- Rechargeable Battery
- SD Card / Built in Stylus

PRECISION PRODUCTS

GeoExplorer 7

- Submeter, Subfoot, Centimeter Options
- Can track multiple constellations
- Built in camera / Optional Rangefinder
- Built in Modem for ATT or Verizon
- Optional Rangefinder

Software

Terrasync/Pathfinder (Postprocessing)

PRECISION PRODUCTS

- Terrasync (field software)
  - Data Collection
  - Navigation

- Pathfinder Office
  - Viewing Data
  - Postprocessing
  - Exporting

PRECISION PRODUCTS

10 Minute Break

PRECISION PRODUCTS

Overview of the Receivers that will be used today

R1 RECEIVER

- Submeter Accuracy
- Bluetooth Output Only
- iOS, Android, Windows
- 10 hrs of usage (less than 5 hrs to completely charge)

R2 RECEIVER

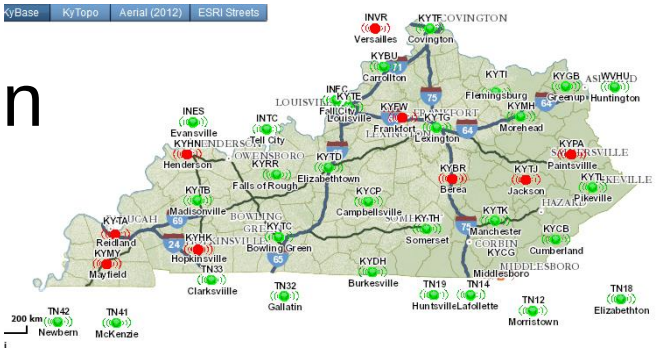
PRECISION PRODUCTS

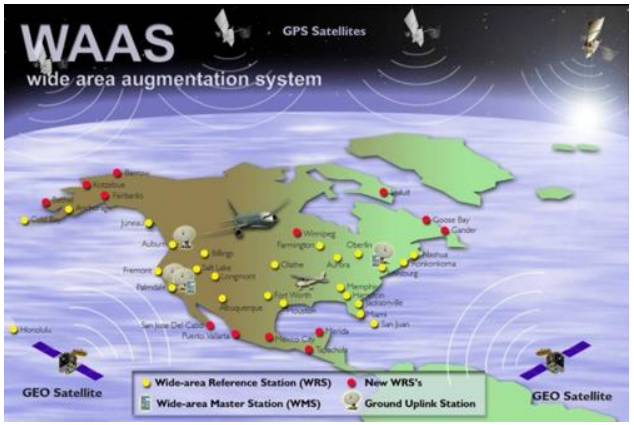
- Accuracy
  - Submeter
  - Subfoot
  - Centimeter
- iOS, Android, Windows
- Use on range pole or backpack

Real Time Solutions

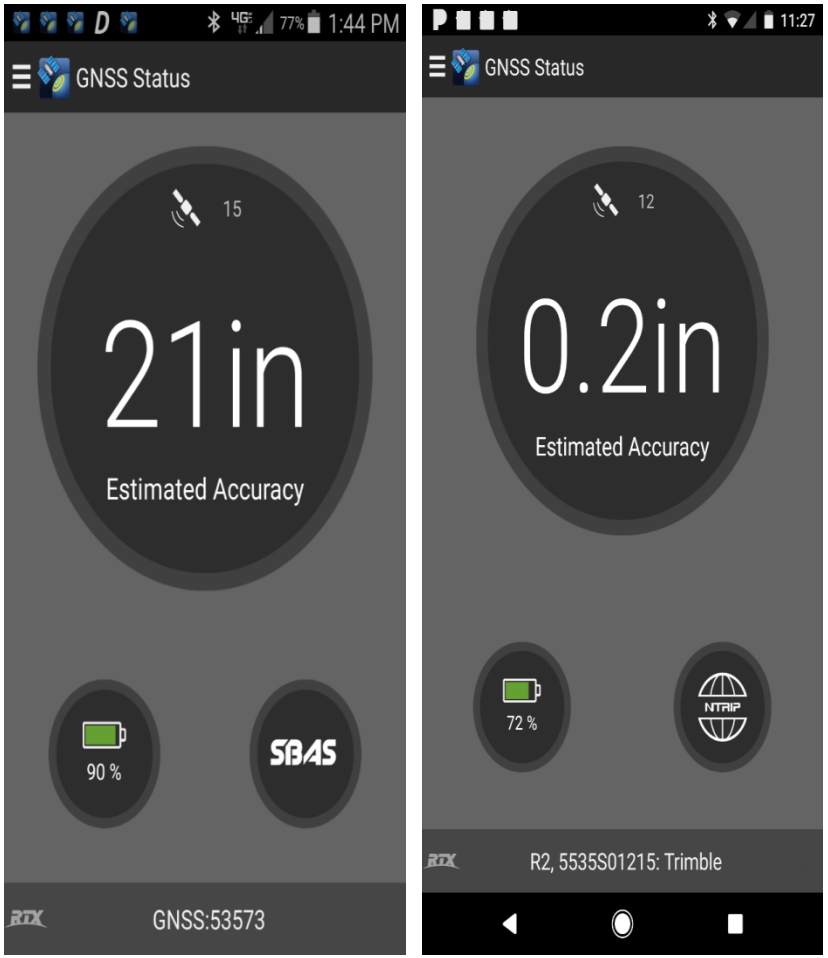
PRECISION PRODUCTS

- Raw
- SBAS/WAAS
- VRS – Virtual Reference Station
- Radio/Satellite





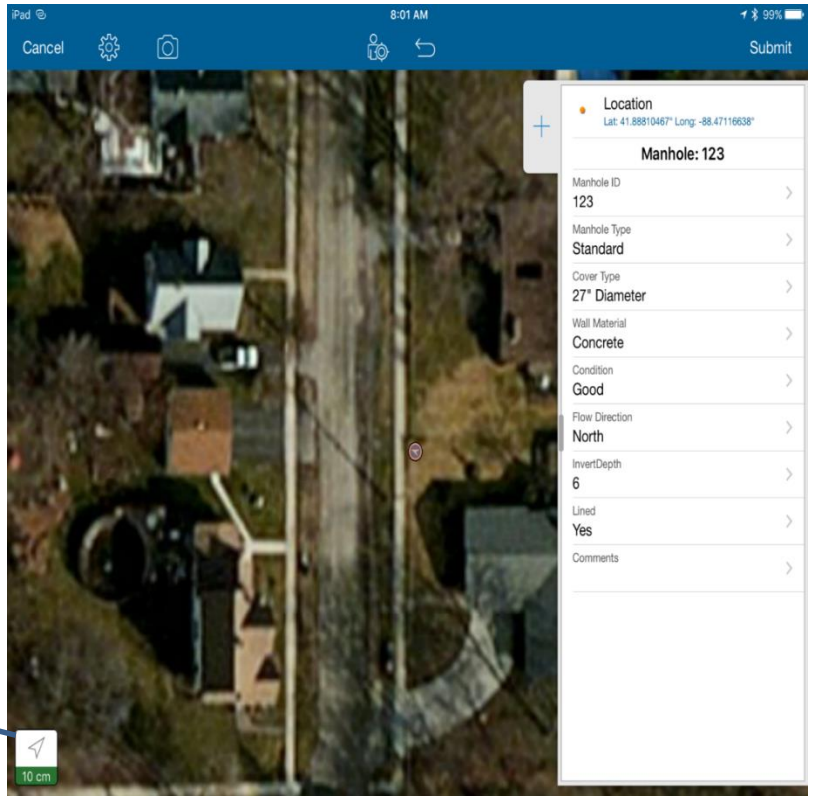
GNSS Status Application

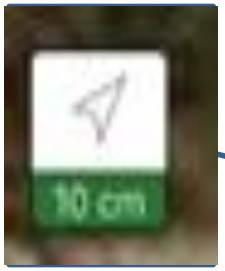


- Application developed by Trimble
- Works in conjunction with ESRI Collector or other 3rd party Apps
- Configures GNSS Receiver
- Confirms receiver is working

ESRI Collector v10.4

- Added Support for High Accuracy Receivers
  - Submeter
  - Subfoot*
  - Centimeter*

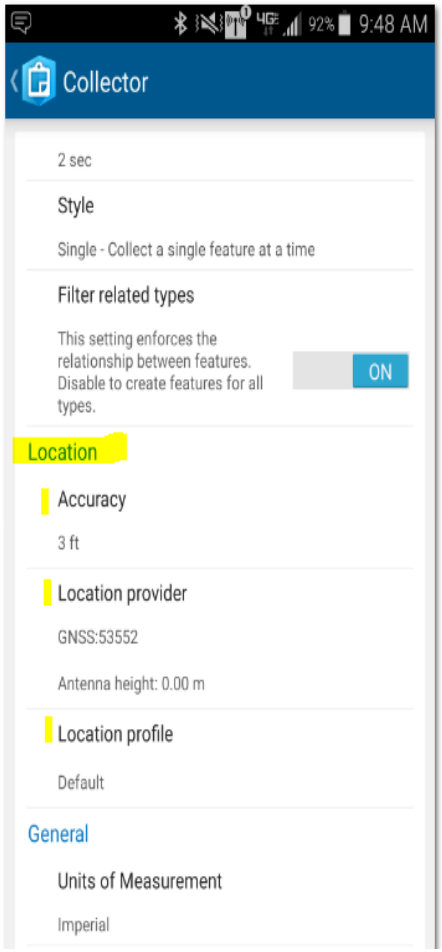




*VRS or Satellite Based Corrections required.

No Postprocessing available

High Accuracy GNSS Receiver Integration



- Location Set-up within the settings of Collector
  - Accuracy
  - Location Provider
  - Location Profile

PRECISION PRODUCTS

GNSS Metadata

Attribute	Field alias	Field name	Field type	Domain
Receiver Name	Receiver Name	ESRIGNSS_RECEIVER	String(50)	
Horizontal Accuracy	Horizontal Accuracy (m)	ESRIGNSS_H_RMS	double	
Vertical Accuracy	Vertical Accuracy (m)	ESRIGNSS_V_RMS	double	
Latitude	Latitude	ESRIGNSS_LATITUDE	double	
Longitude	Longitude	ESRIGNSS_LONGITUDE	double	
Altitude	Altitude	ESRIGNSS_ALTITUDE	double	
PDOP	PDOP	ESRIGNSS_PDOP	double	
HDOP	HDOP	ESRIGNSS_HDOP	double	
VDOP	VDOP	ESRIGNSS_VDOP	double	
Fix Type	Fix Type	ESRIGNSS_FIXTYPE	Short	GNSSFixType (optional)
Correction Age	Correction Age	ESRIGNSS_CORRECTIONAGE	double	
Station ID	Station ID	ESRIGNSS_STATIONID	Short	NumStationID (optional)
Number of Satellites	Number of Satellites	ESRIGNSS_NUMSATS	Short	NumSatellites (optional)
Fix Time	Fix Time	ESRIGNSS_FIXDATETIME	Date	

Questions?

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