FlowTracker2

June 13th 2016

OSW Webinar

Mike Rehmel

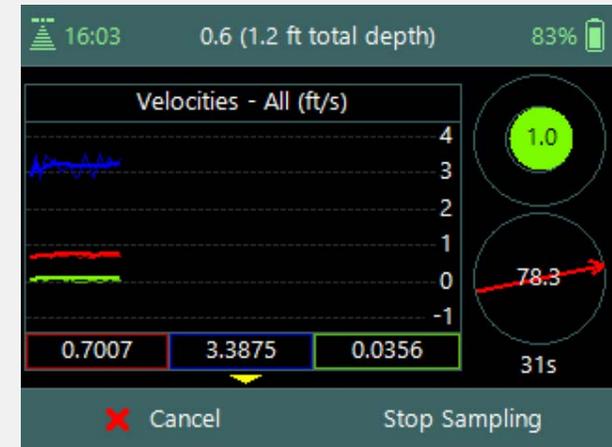Alex Laffoon, Iowa WSC

FlowTracker 2

- New Hardware
- New Software
- USGS Testing So Far
- Sharing comparison data

FlowTracker2 Hardware -Separate Handheld and Probe

Handheld

- Color screen

- Data graphs

- Tactile Button

- Built-in GPS
    - Geolocation tagging
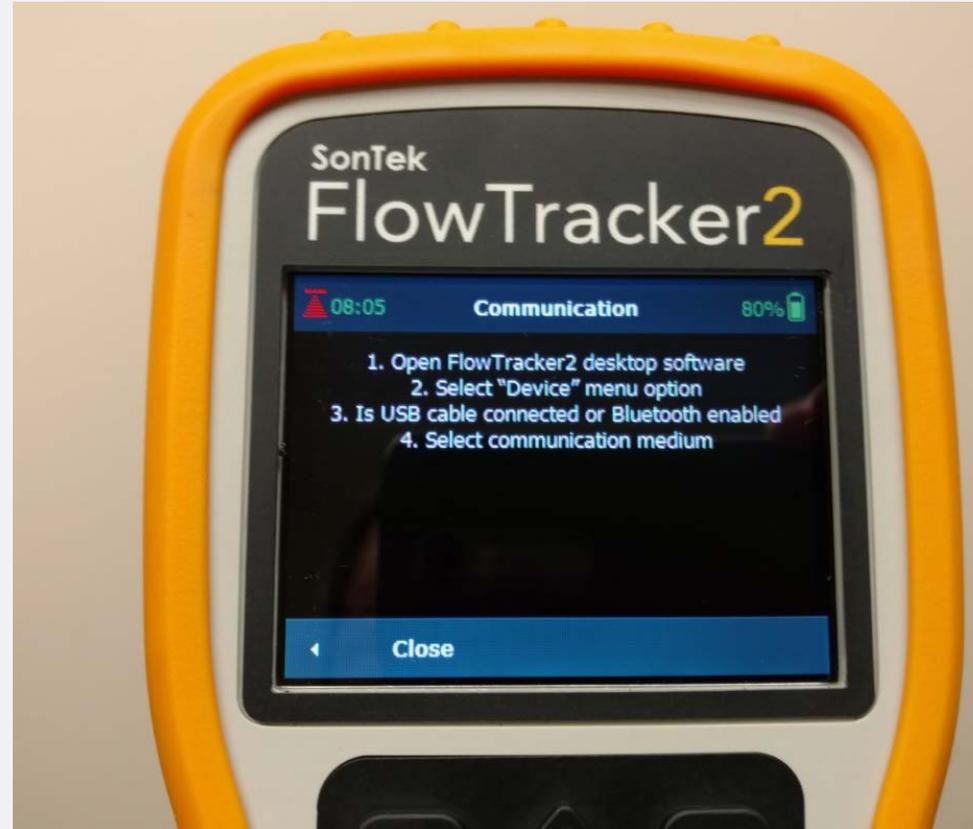   - Set clock

- Audible alerts

Power

- 8 AA batteries

- Approx. 15 hours

- Can change batteries during data collection and still resume measurement

Communications to PC

- Built-in Bluetooth

- Waterproof micro USB for wired connection
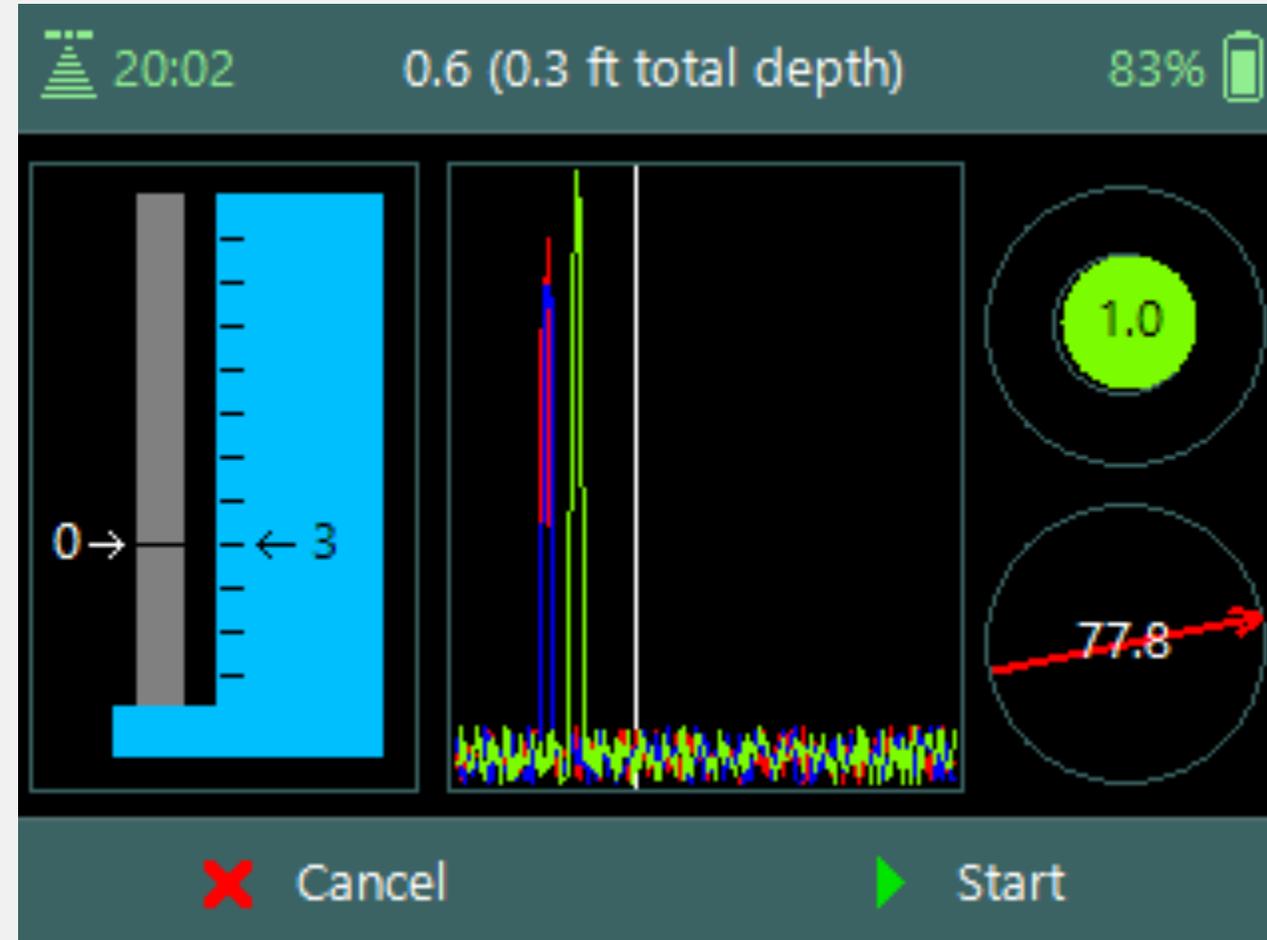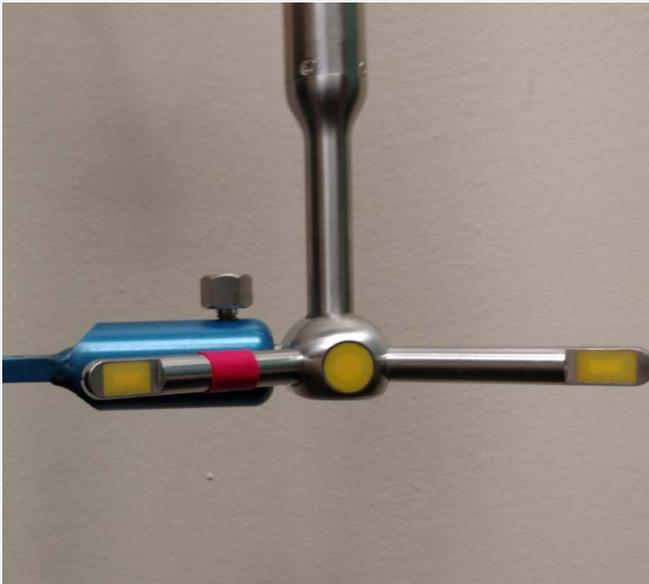

- Download data

- Update Firmware

Probe

- Similar transducer design to FlowTracker1

- ADV electronics now in Probe
  - Allows probe to be separate
  - Better SNR response
  - Can purchase cable extension

- Pings at 40 Hz (vs 10 Hz)

- Stores data at 2 Hz (vs 1 Hz)

Probe

- Built in tilt sensor – ensure probe is level

USGS
science for a changing world

New "J"-Bracket

- Larger setscrew that mates with recess in probe mounting arm

- Provides more consistent mounting
  - Easier Alignment
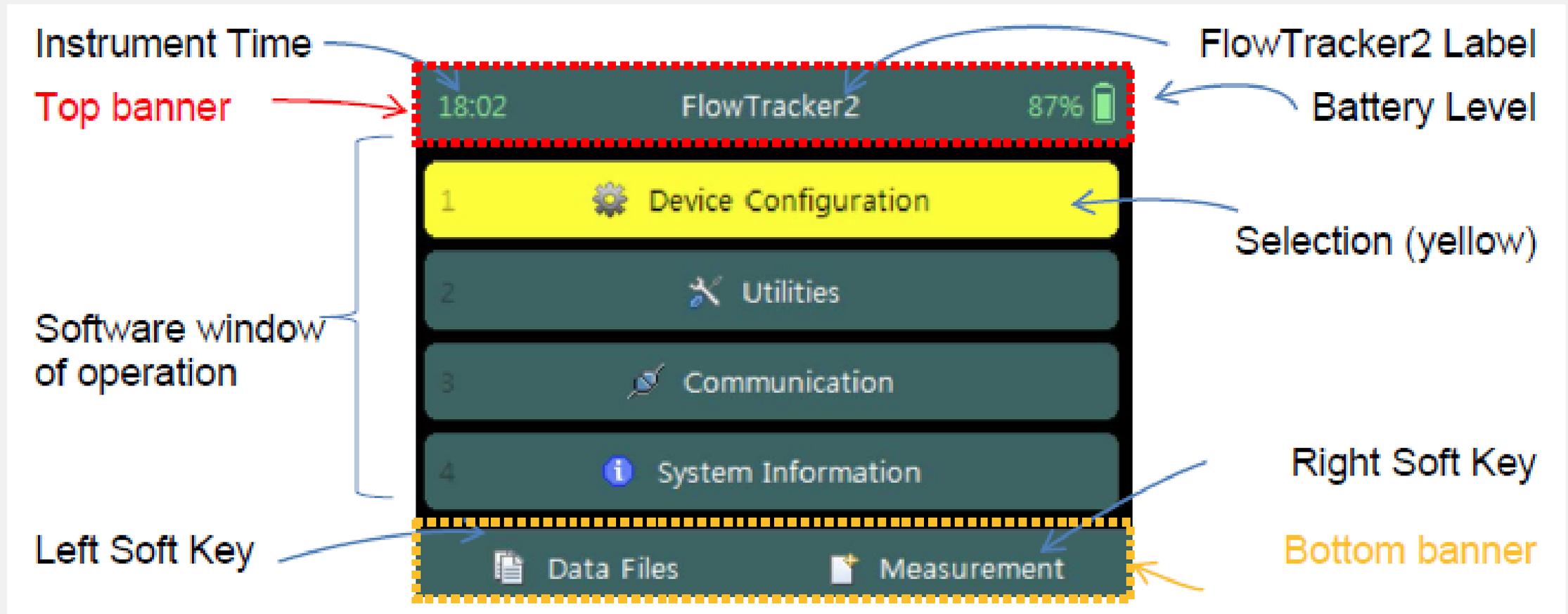 - More secure

- Suggested use by SonTek

Handheld Interface

- Soft keys on top left and right with arrow buttons for navigating
- Left soft key
  - Return to previous menu
  - Restart/cancel
  - Select action
- Right soft key
  - Start new measurement
  - Accept /new
  - Quality control menu
- Enter – key in middle of arrows
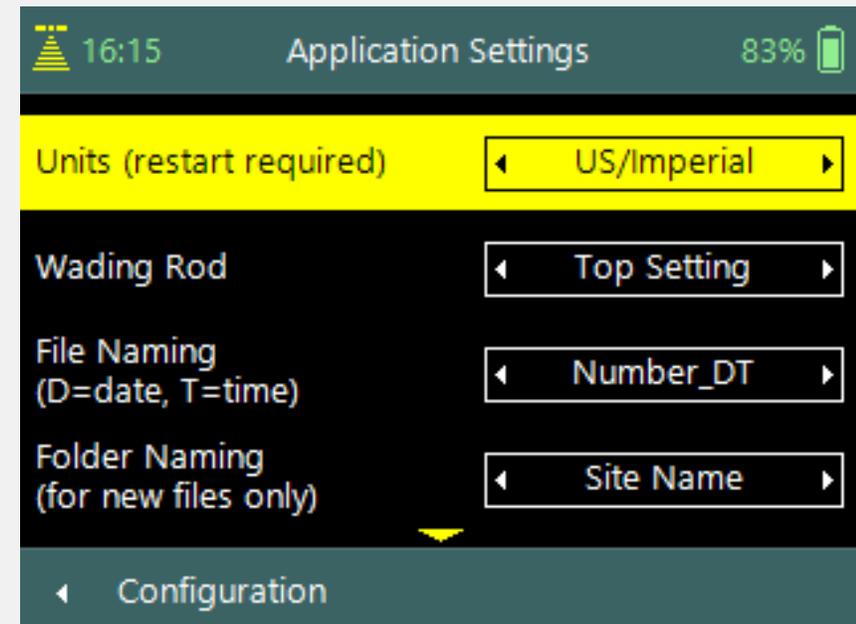 - Select
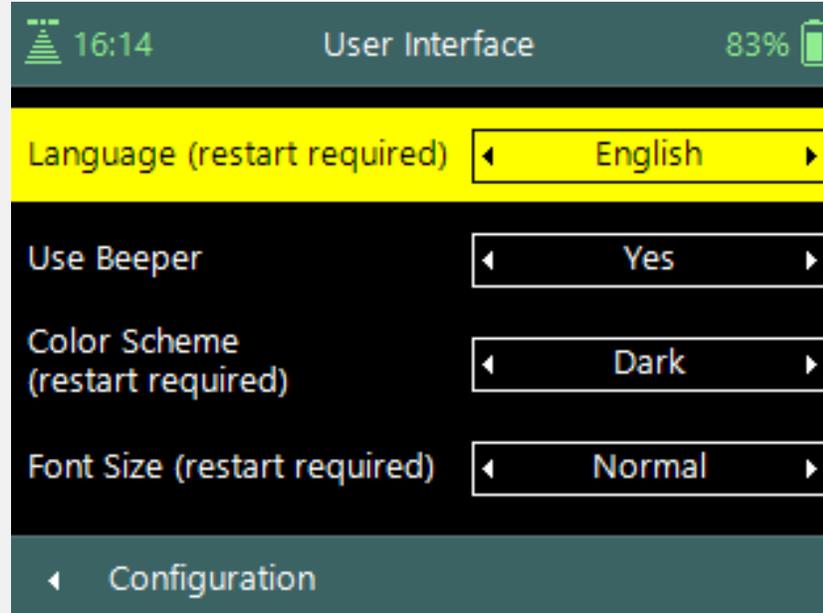

USGS
science for a changing world
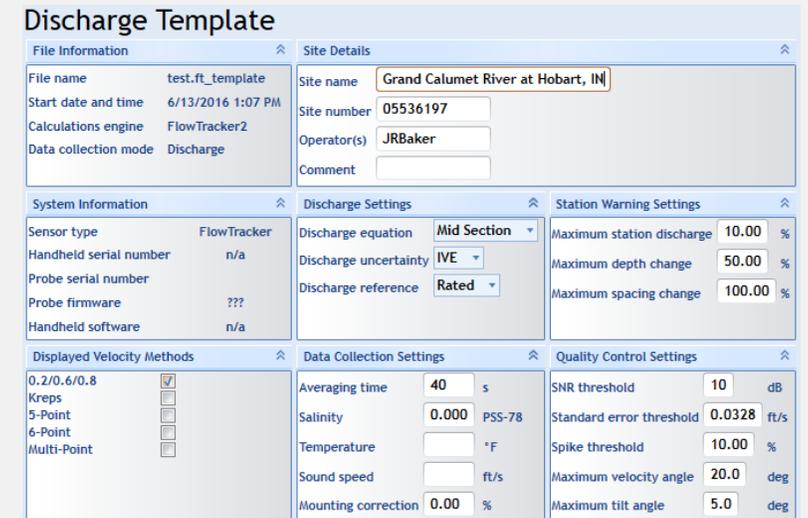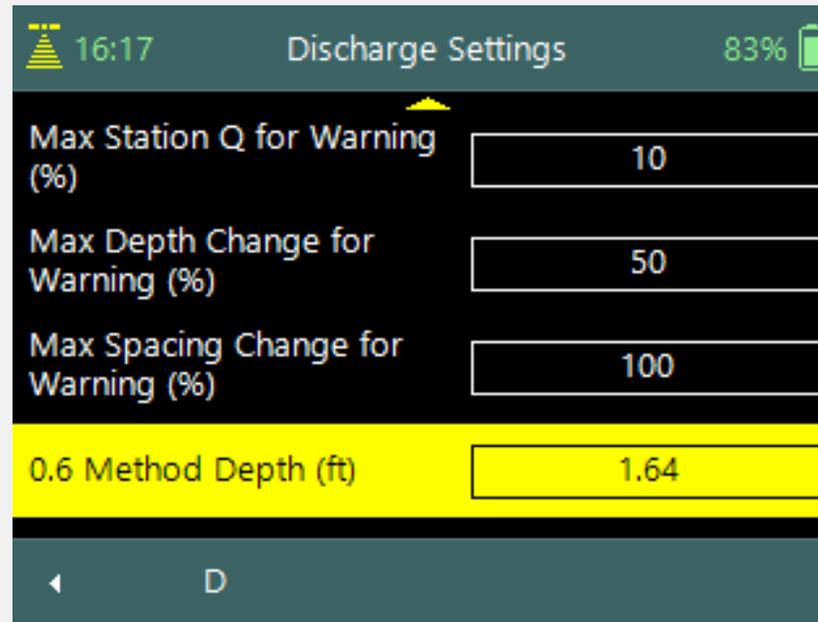
Handheld Screen Layout

Device Configuration

- User Interface
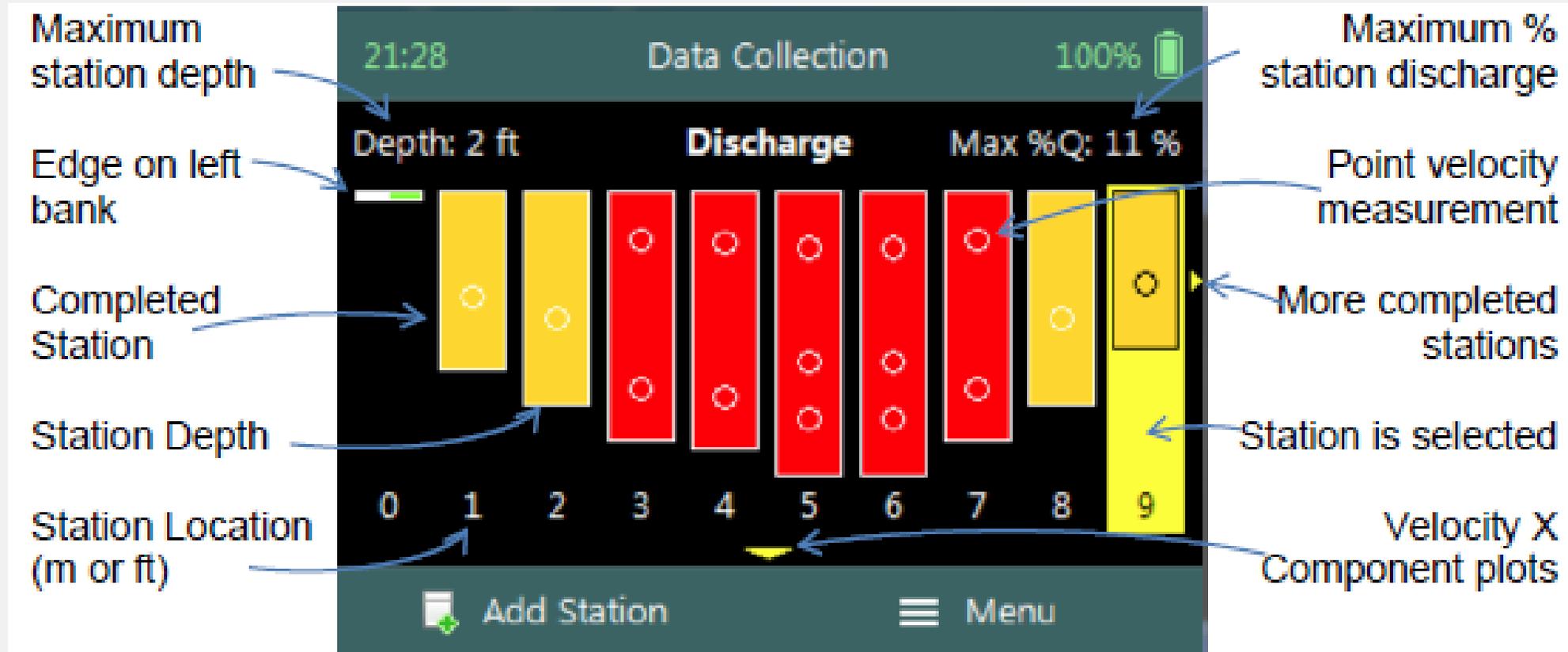
- Applications Settings

- Discharge Templates

Discharge Templates

- Saves settings for a measurement

- Example: can create a template for each station that populates the station name and number.

- Can be created on handheld or in PC software and uploaded to handheld

Handheld Data Collection Screen

Maximum station depth

Edge on left bank

Completed Station

Station Depth

Station Location (m or ft)

Maximum % station discharge

Point velocity measurement

More completed stations

Station is selected

Velocity X Component plots

Depth: 2 ft

Discharge

Max %Q: 11 %

21:28

Data Collection

100%

0 1 2 3 4 5 6 7 8 9

Add Station

Menu

Adding a Station

- At each vertical
  - Enter location
  - Depth
  - Station type
  - Velocity method
- Press measure (right soft key)

Prior to Starting Each Point Measurement

- Graphic indicates top setting rod location

- Level indicator to insure probe is level

- Angle displays flow direction. Not used for aligning FlowTracker

- Live beam SNR information prior to starting measurement

20:02   0.6 (0.3 ft total depth)   83%
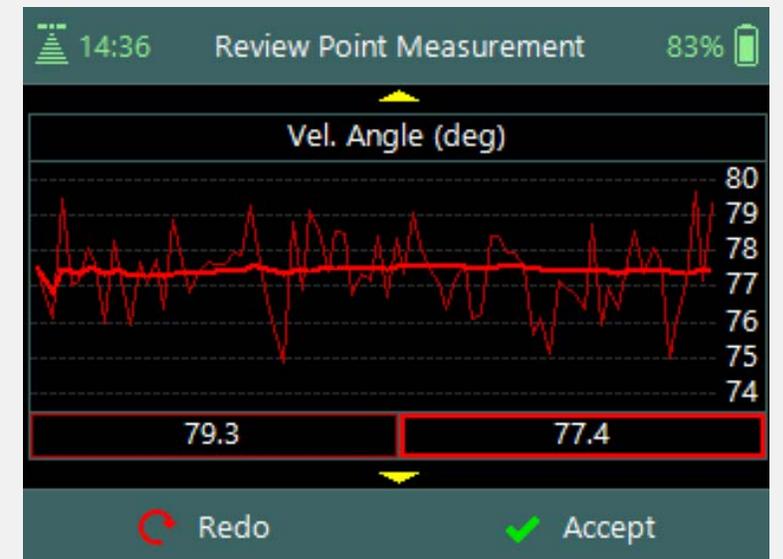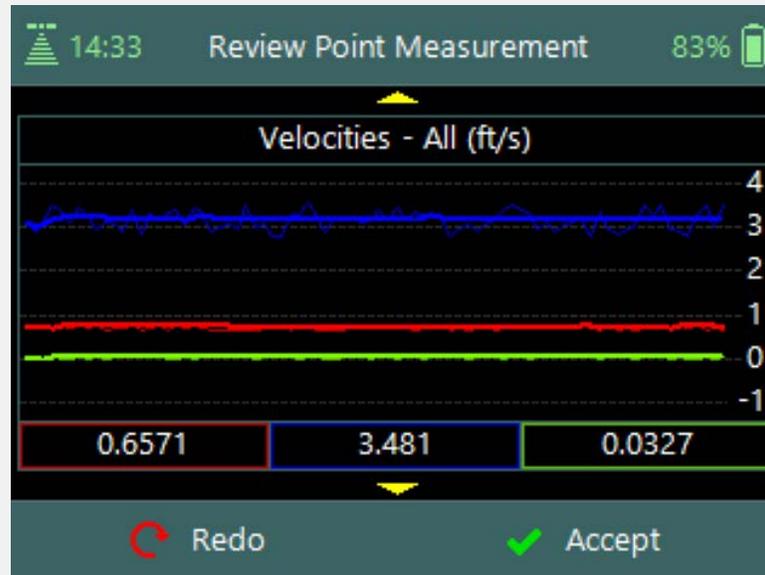
0→   ←3

1.0
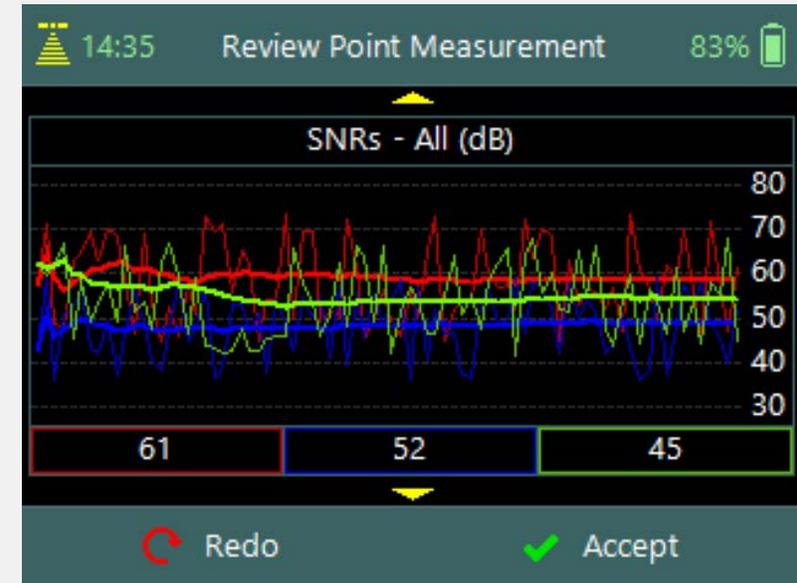
77.8

✖ Cancel   ▶ Start
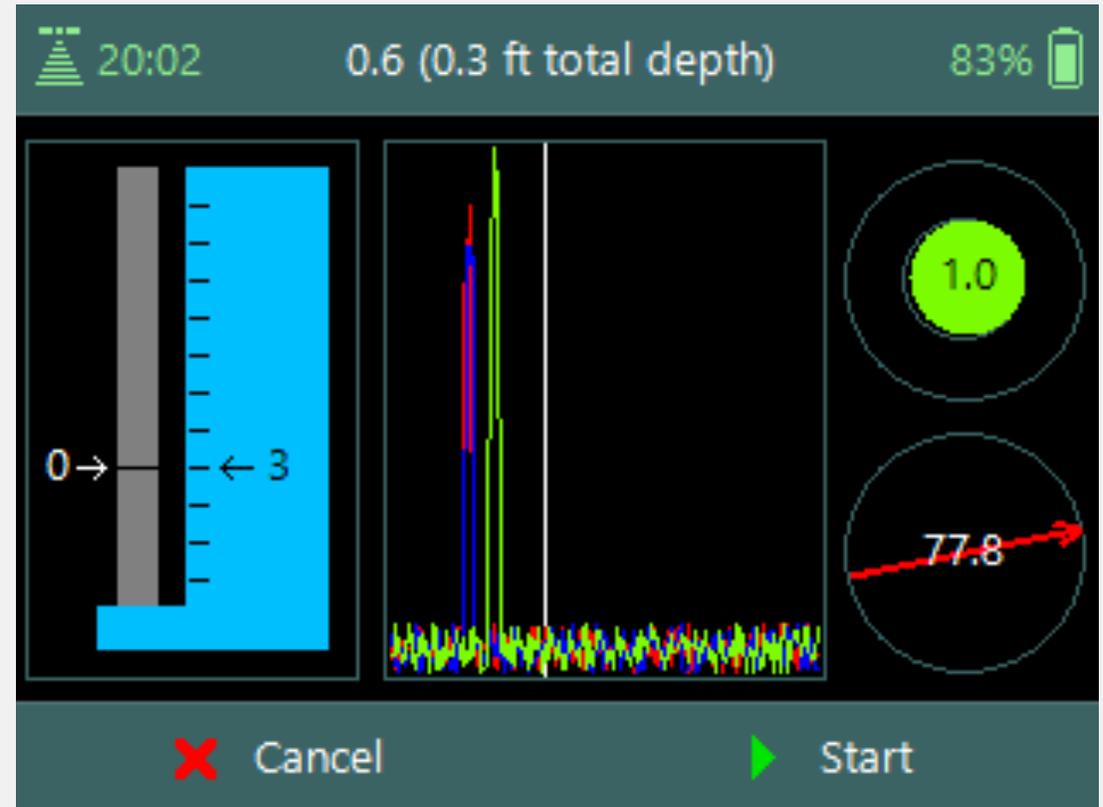
Graphs

- Number buttons (1, 2,3, 4) toggle what is displayed (velocity on graphs X,Y, all)
- Moving average vs individual samples
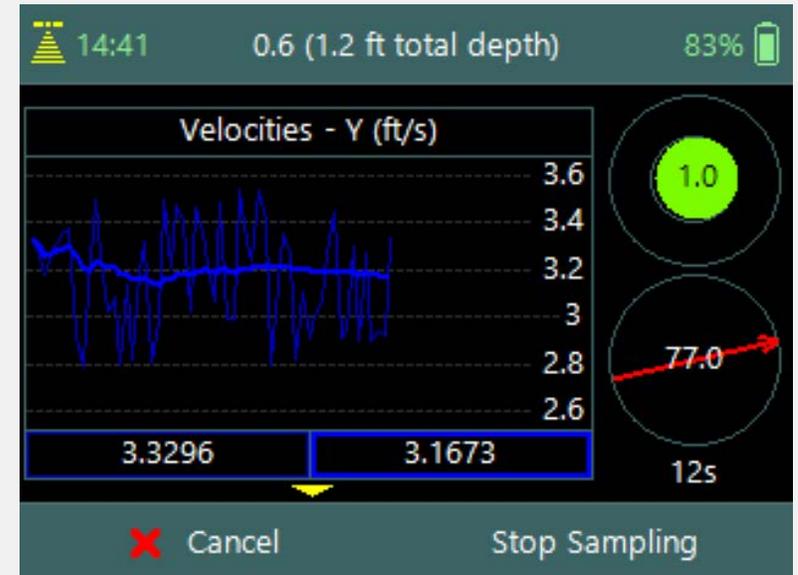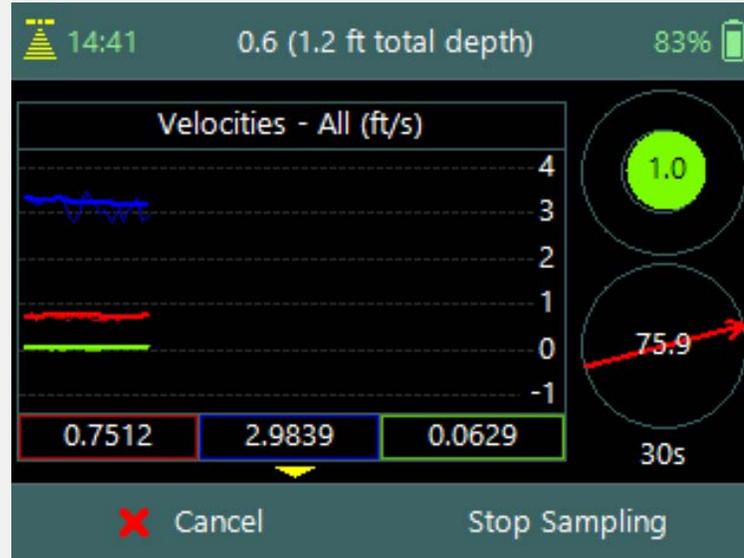
Point Review

- Displays QC warnings at end of point measurement

- Can review graphs
  - Velocity
  - SNR
  - Temperature
  - Tilt
  - Vel angle

FlowTracker2 Software

Measurement Summary Window

- File Information

- System Information

- Discharge Summary

- Discharge Uncertainty

Section Tab

- Discharge

- Velocity

- Depth with sample locations
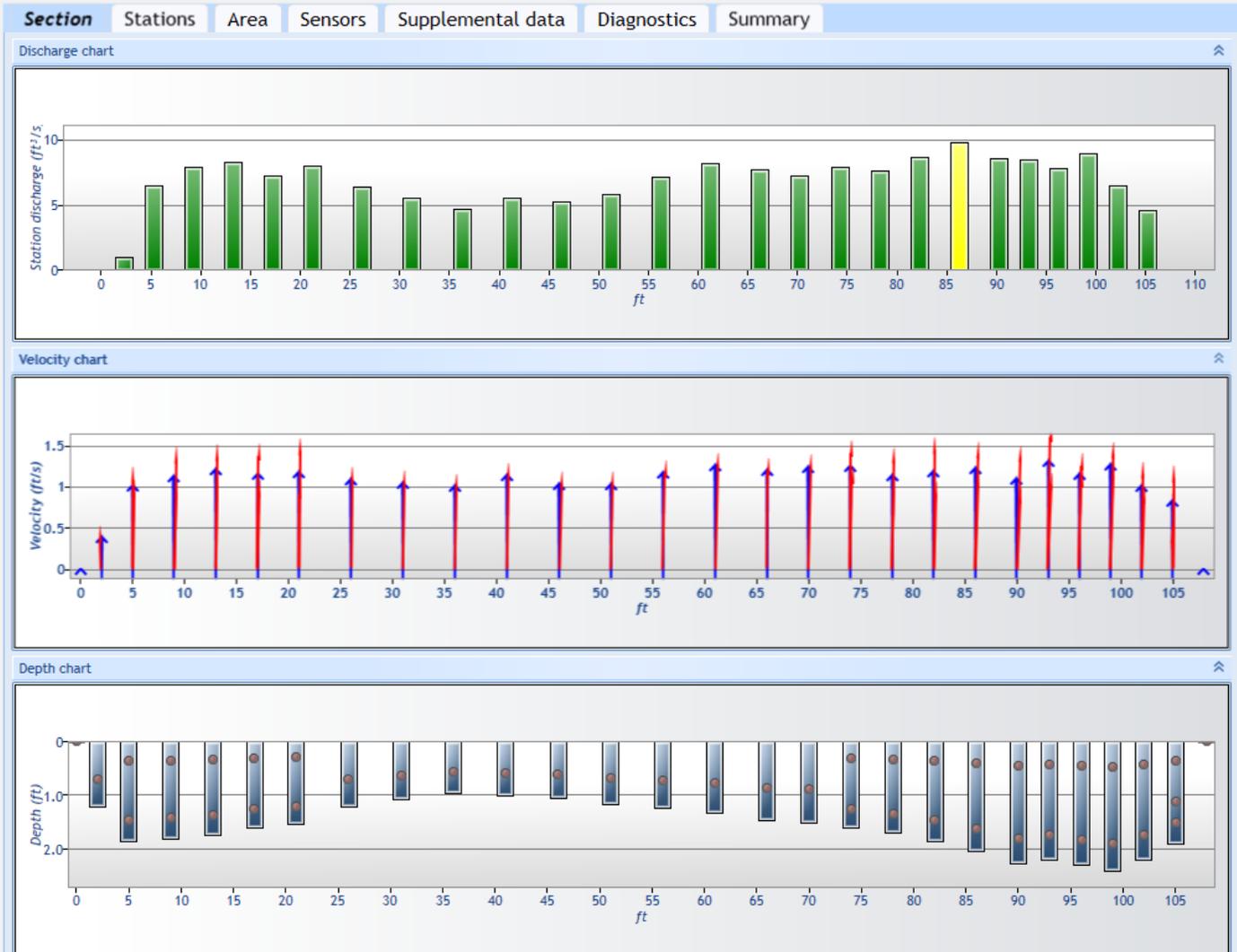
Stations Tab

- Unit value velocity and SNR plots for selected sample

- Table of samples

- Beam check of sample
  - From single ping collected prior to each sample
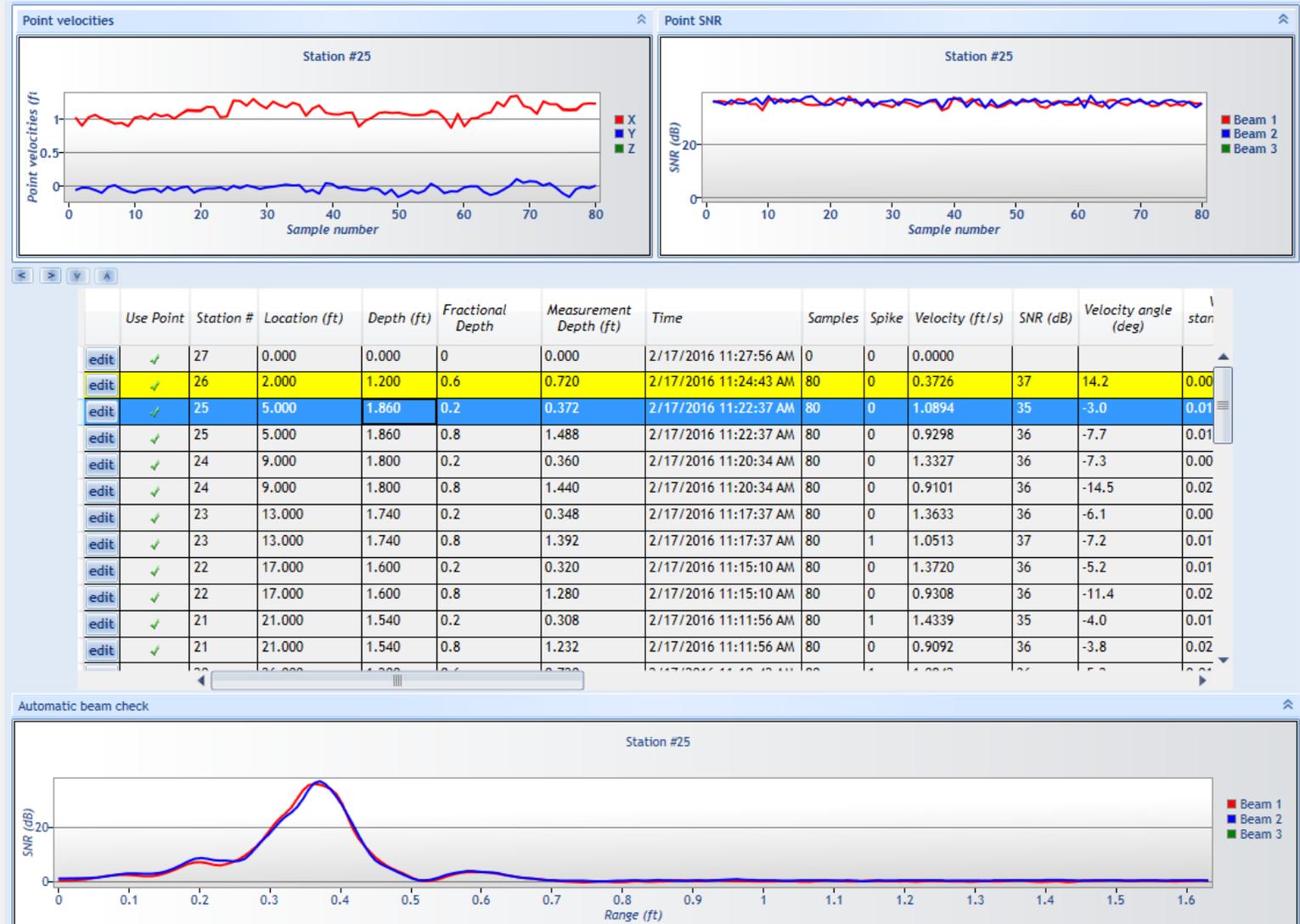
Stations Tab – Cont.

- Can change erroneous locations, depths or correction factors
- Can mark section with erroneous velocity as not used

Area Tab

- Area
- Width
- Velocity
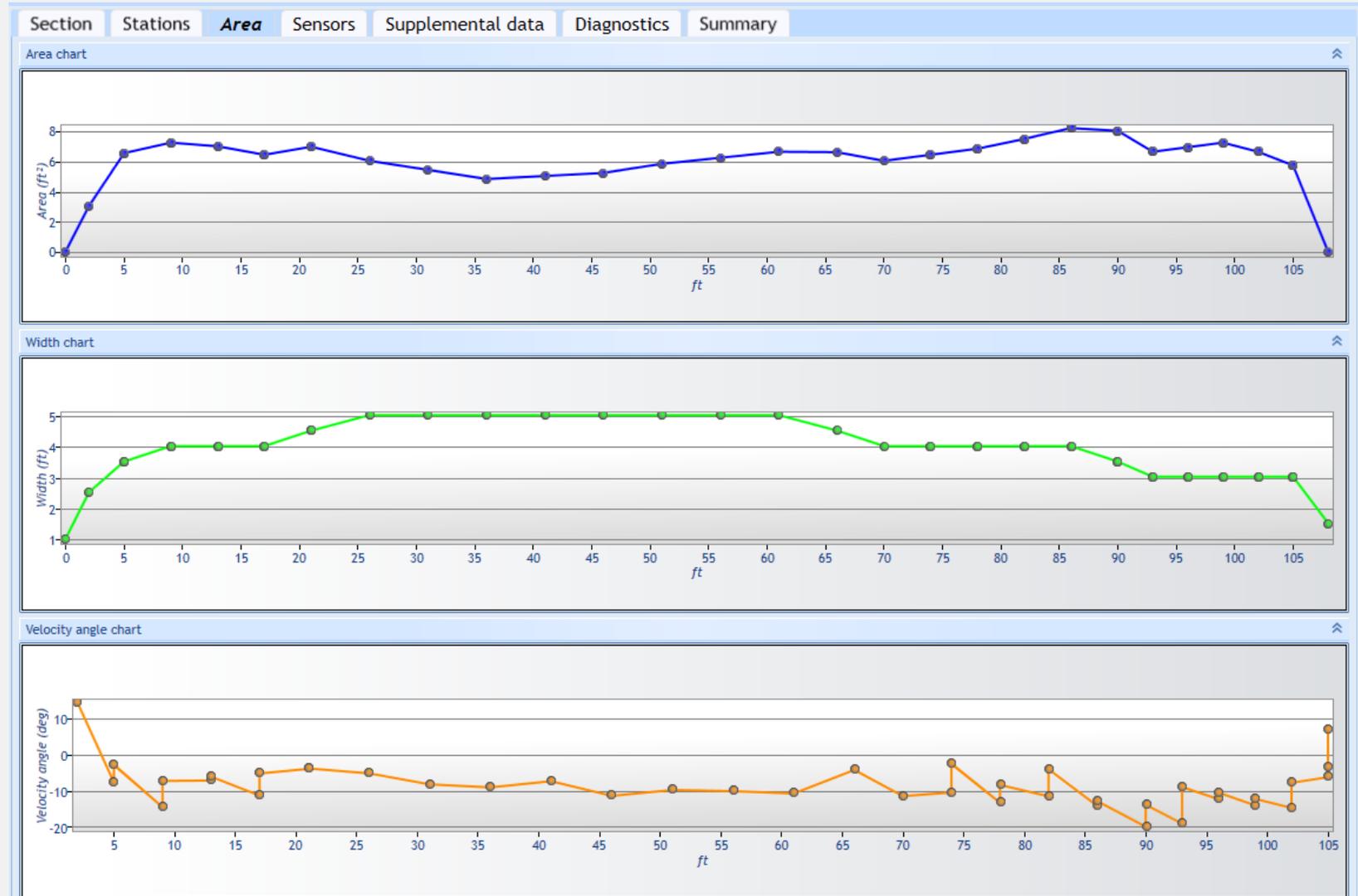
Sensors Tab

- Temperature

- Tilt

- Battery

Supplemental Data Tab

- Gage heights

- Rated Discharge

- Gage height comments

Diagnostics Tab

- **Mean SNRs**

- **Spikes**

- **Velocity Std Errors**

- **# Samples**
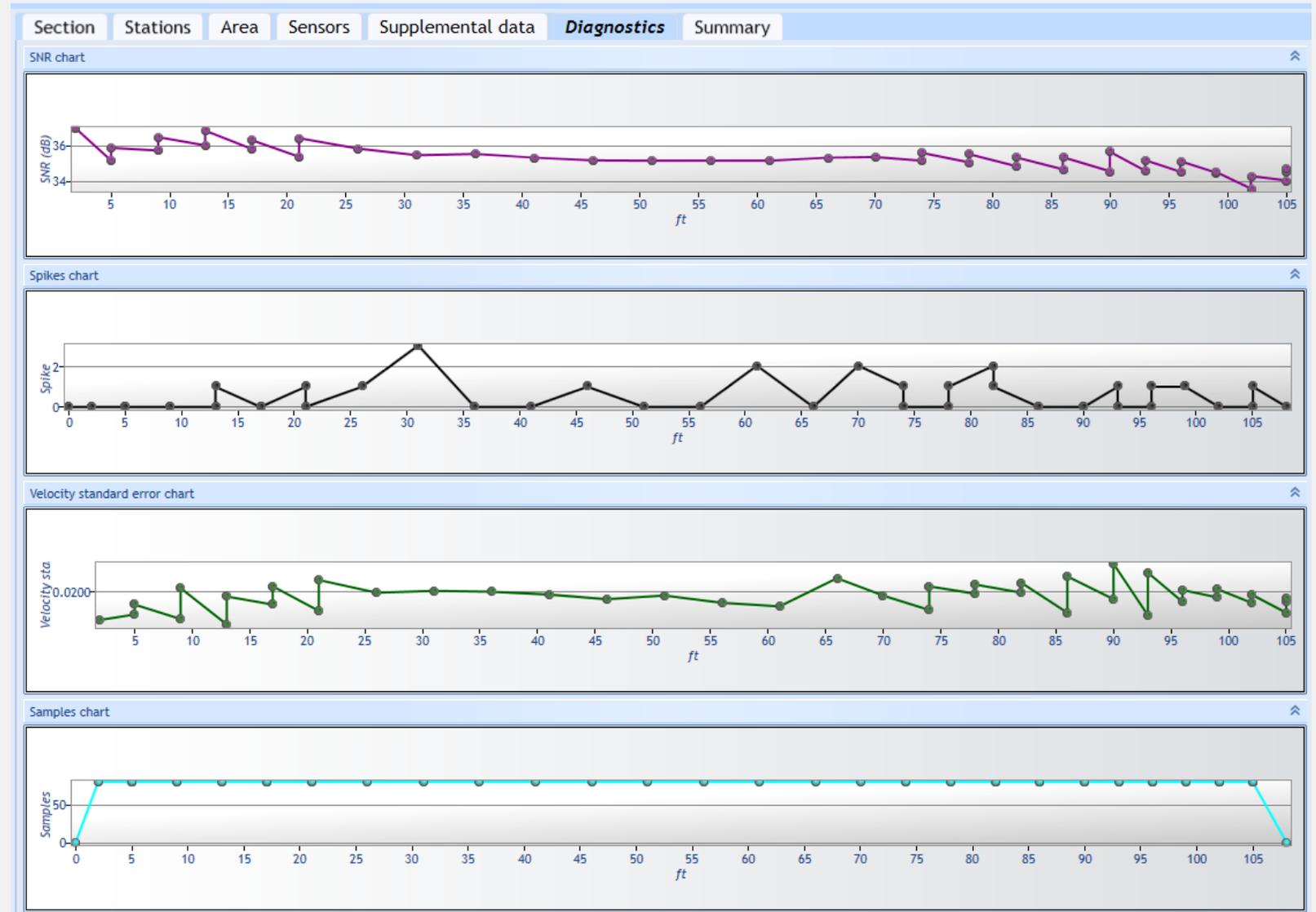
Summary Tab

Discharge Measurement Summary

File Information
File name	Dysart0216_20160217-112836.ft
Start date and time	2/17/2016 10:23 AM
Calculations engine	FlowTracker2
Data collection mode	Discharge

Discharge Summary
# Stations	28	Avg interval	40
Mean depth	1.522 ft		
Mean velocity	1.1229 ft/s	Total width	108.000 ft
Mean SNR	35 dB	Total area	164.3500 ft²
Mean temp	33.399 °F	Total discharge	184.5448 ft³/s

System Information
Sensor type	Top Setting
Handheld serial number	FT2H1542013
Probe serial number	FT2P1538001
Probe firmware	1.17
Handheld software	1.0.9

Site Details
Site name	Dysart0216
Site number	
Operator(s)	Ajl
Comment	

Discharge Uncertainty
Category	ISO	IVE
Accuracy	1.0 %	1.0 %
Depth	0.1 %	1.3 %
Velocity	0.3 %	1.6 %
Width	0.1 %	0.1 %
Method	1.0 %	
# Stations	1.8 %	
Overall	2.3 %	2.3 %

Discharge Settings
Discharge equation	Mid Section
Discharge uncertainty	IVE
Discharge reference	Rated

Station Warning Settings
Maximum station discharge	10.00	%
Maximum depth change	50.00	%
Maximum spacing change	100.00	%

Summary overview
No changes were made to this file
Quality control warnings

Data Collection Settings
Salinity	0.000	PSS-78
Temperature		°F
Sound speed		ft/s

Quality Control Settings
SNR threshold	10	dB
Standard error threshold	0.0328	ft/s
Spike threshold	10.00	%

Measurement results

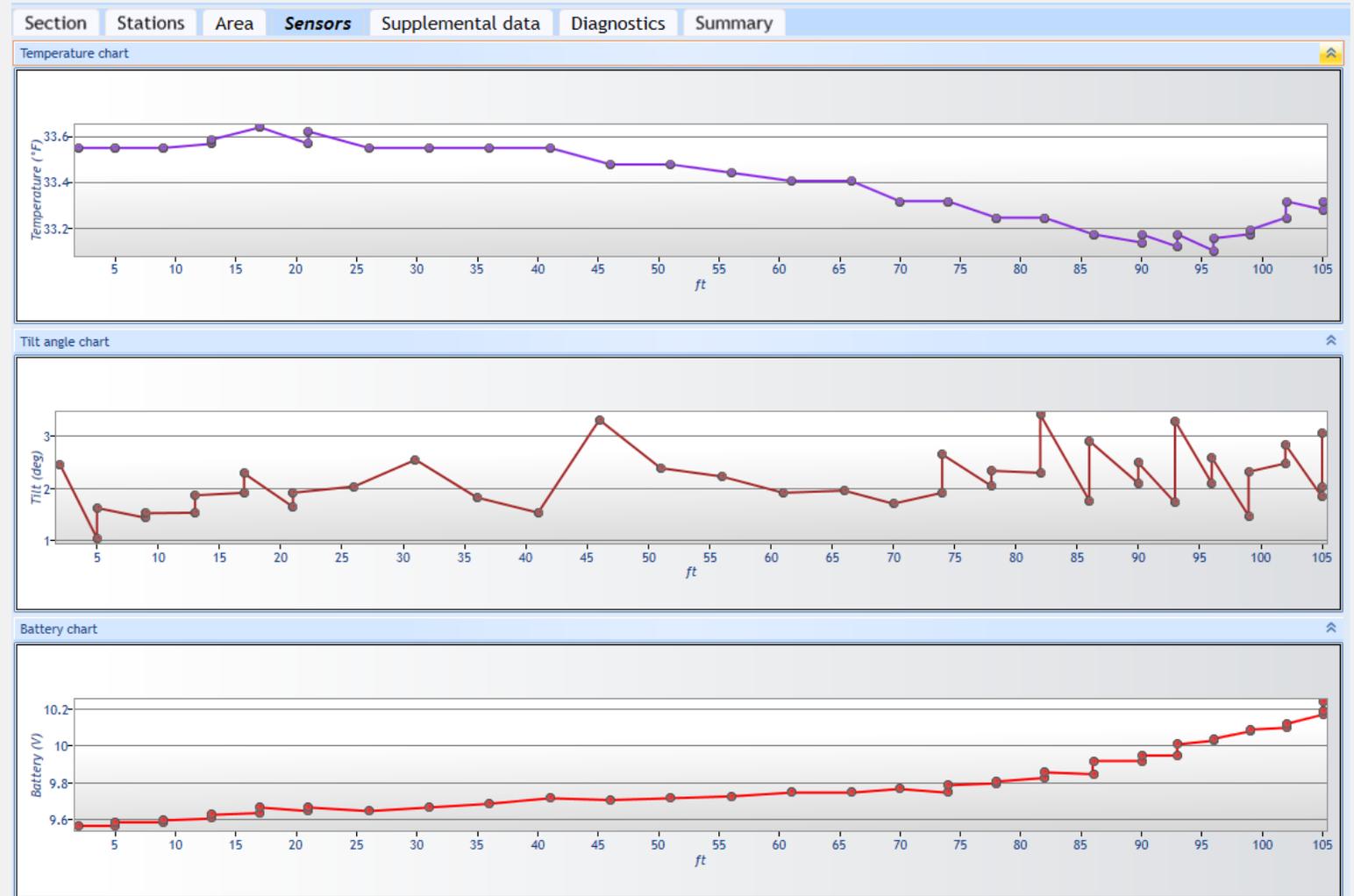| St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (ft/s)	Correction	Mean Velocity (ft/s)	Area (ft²)	Flow (ft³/s)	%Q
27	11:27 AM	0.000	None	0.000	0	0.000	0	0.0000	1	0.3726	0.0000	0.0000	0.00
26	11:24 AM	2.000	0.6	1.200	0.6	0.720	80	0.3726	1	0.3726	3.0000	1.1177	0.61
25	11:22 AM	5.000	0.2/0.8	1.860	0.2	0.372	80	1.0894	1	1.0096	6.5100	6.5724	3.56
25	11:22 AM	5.000	0.2/0.8	1.860	0.8	1.488	80	0.9298	1	1.0096	6.5100	6.5724	3.56
24	11:20 AM	9.000	0.2/0.8	1.800	0.2	0.360	80	1.3327	1	1.1214	7.2000	8.0741	4.38
24	11:20 AM	9.000	0.2/0.8	1.800	0.8	1.440	80	0.9101	1	1.1214	7.2000	8.0741	4.38
23	11:17 AM	13.000	0.2/0.8	1.740	0.2	0.348	80	1.3633	1	1.2073	6.9600	8.4026	4.55
23	11:17 AM	13.000	0.2/0.8	1.740	0.8	1.392	80	1.0513	1	1.2073	6.9600	8.4026	4.55
22	11:15 AM	17.000	0.2/0.8	1.600	0.2	0.320	80	1.3720	1	1.1514	6.4000	7.3688	3.99
22	11:15 AM	17.000	0.2/0.8	1.600	0.8	1.280	80	0.9308	1	1.1514	6.4000	7.3688	3.99
21	11:11 AM	21.000	0.2/0.8	1.540	0.2	0.308	80	1.4339	1	1.1715	6.9300	8.1187	4.40
21	11:11 AM	21.000	0.2/0.8	1.540	0.8	1.232	80	0.9092	1	1.1715	6.9300	8.1187	4.40
20	11:10 AM	26.000	0.6	1.200	0.6	0.720	80	1.0842	1	1.0842	6.0000	6.5050	3.52
19	11:09 AM	31.000	0.6	1.080	0.6	0.648	80	1.0412	1	1.0412	5.4000	5.6223	3.05
18	11:08 AM	36.000	0.6	0.960	0.6	0.576	80	1.0059	1	1.0059	4.8000	4.8285	2.62
17	11:06 AM	41.000	0.6	1.000	0.6	0.600	80	1.1361	1	1.1361	5.0000	5.6805	3.08
16	11:04 AM	46.000	0.6	1.040	0.6	0.624	80	1.0270	1	1.0270	5.2000	5.3402	2.89
15	11:03 AM	51.000	0.6	1.160	0.6	0.696	80	1.0253	1	1.0253	5.8000	5.9466	3.22
14	11:01 AM	56.000	0.6	1.240	0.6	0.744	80	1.1670	1	1.1670	6.2000	7.2356	3.92
13	11:00 AM	61.000	0.6	1.320	0.6	0.792	80	1.2555	1	1.2555	6.6000	8.2860	4.49
12	10:58 AM	66.000	0.6	1.460	0.6	0.876	80	1.1979	1	1.1979	6.5700	7.8705	4.26
11	10:57 AM	70.000	0.6	1.500	0.6	0.900	80	1.2338	1	1.2338	6.0000	7.4031	4.01
10	10:54 AM	74.000	0.2/0.8	1.600	0.2	0.320	80	1.4093	1	1.2472	6.4000	7.9819	4.33
10	10:54 AM	74.000	0.2/0.8	1.600	0.8	1.280	80	1.0850	1	1.2472	6.4000	7.9819	4.33
9	10:52 AM	78.000	0.2/0.8	1.700	0.2	0.340	80	1.3212	1	1.1350	6.8000	7.7178	4.18
9	10:52 AM	78.000	0.2/0.8	1.700	0.8	1.360	80	0.9488	1	1.1350	6.8000	7.7178	4.18
8	10:49 AM	82.000	0.2/0.8	1.860	0.2	0.372	80	1.4474	1	1.1815	7.4400	8.7900	4.76
8	10:49 AM	82.000	0.2/0.8	1.860	0.8	1.488	80	0.9155	1	1.1815	7.4400	8.7900	4.76
7	10:44 AM	86.000	0.2/0.8	2.040	0.2	0.408	80	1.3949	1	1.2208	8.1600	9.9616	5.40
7	10:44 AM	86.000	0.2/0.8	2.040	0.8	1.632	80	1.0467	1	1.2208	8.1600	9.9616	5.40
6	10:42 AM	90.000	0.2/0.8	2.280	0.2	0.456	80	1.3390	1	1.0924	7.9800	8.7175	4.72
6	10:42 AM	90.000	0.2/0.8	2.280	0.8	1.824	80	0.8458	1	1.0924	7.9800	8.7175	4.72
5	10:39 AM	93.000	0.2/0.8	2.200	0.2	0.440	80	1.6055	1	1.3080	6.6000	8.6326	4.68
5	10:39 AM	93.000	0.2/0.8	2.200	0.8	1.760	80	1.0104	1	1.3080	6.6000	8.6326	4.68
4	10:36 AM	96.000	0.2/0.8	2.300	0.2	0.460	80	1.2530	1	1.1499	6.9000	7.9341	4.30
4	10:36 AM	96.000	0.2/0.8	2.300	0.8	1.840	80	1.0467	1	1.1499	6.9000	7.9341	4.30
3	10:34 AM	99.000	0.2/0.8	2.400	0.2	0.480	80	1.3916	1	1.2645	7.2000	9.1044	4.93
3	10:34 AM	99.000	0.2/0.8	2.400	0.8	1.920	80	1.1374	1	1.2645	7.2000	9.1044	4.93
2	10:32 AM	102.000	0.2/0.8	2.200	0.2	0.440	80	1.1515	1	1.0048	6.6000	6.6315	3.59
2	10:32 AM	102.000	0.2/0.8	2.200	0.8	1.760	80	0.8580	1	1.0048	6.6000	6.6315	3.59
1	10:25 AM	105.000	0.2/0.6/0.8	1.900	0.2	0.380	80	1.1027	1		5.7000	4.7009	2.55
1	10:25 AM	105.000	0.2/0.6/0.8	1.900	0.6	1.140	80	0.9171	1		5.7000	4.7009	2.55
1	10:25 AM	105.000	0.2/0.6/0.8	1.900	0.8	1.520	80	0.3619	1	0.8247	5.7000	4.7009	2.55
0	10:24 AM	108.000	None	0.000	0	0.000	0	0.0000	1	0.8247	0.0000	0.0000	0.00

Summary Tab – cont.

1	10:25 AM	105.000	0.2/0.6/0.8	1.900	0.6	1.140	80	0.9171	1	0.8247	5.7000	4.7009	2.55
1	10:25 AM	105.000	0.2/0.6/0.8	1.900	0.8	1.520	80	0.3619	1	0.8247	5.7000	4.7009	2.55
0	10:24 AM	108.000	None	0.000	0	0.000	0	0.0000	1	0.8247	0.0000	0.0000	0.00

Quality control warnings

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings
26	11:24 AM	2.000	0.6	1.200	0.6	0.720	Boundary Interference
1	10:25 AM	105.000	0.2/0.6/0.8	1.900	0.2	0.380	Water Depth > QC
1	10:25 AM	105.000	0.2/0.6/0.8	1.900	0.6	1.140	Water Depth > QC
1	10:25 AM	105.000	0.2/0.6/0.8	1.900	0.8	1.520	Water Depth > QC
0	10:24 AM	108.000	None	0.000	0	0.000	Water Depth > QC

Settings

- Edit Measurements Settings

- Save changes to file

- Reload last saved changes

- Revert to original data

- FlowTracker1 files also have "unlock" option

New File formats (not yet supported by SVMobile)

- The FlowTracker2 and FlowTracker2 software stores in JSON format
- FT2 software can export in format similar, but with some differences, to .dis, .sum, ctl, .dat exported by original FT1 software
- Have requested FCIS implement import of JSON and/or new FT2 export format
- For now, summarize discharge measurement info in SVMobile until FT2 support is implemented

Loading files from original FlowTracker Software

- Converts original FlowTracker files into FT2 format that will load into FT2 software
- Must have .wad and exported .dis, .dat, .ctl, and .sum with original software
- Select Utilities.. FlowTracker1 Import… select original .wad
- Will create a FT2 .ft file that can be loaded in FT2 software

Field Testing Completed

- 4 Prototype FlowTracker2's tested by USGS
- 40+ comparison measurements collected by
  - Iowa WSC
  - New England WSC
  - South Atlantic WSC
- Tested multiple handheld, probe, and software beta versions and provided feedback to SonTEk
- FlowTracker2 discharges compared favorably with original
- Special thanks to Philip Habermehl and Alex Laffoon – who made many of the comparisons

HIF Hydraulics Lab Testing

- Rotated All 4 prototype FlowTracker2's through the Hydraulics Lab
  - Velocity
  - Flow angle
  - Temperature response
  - Worked on developing QA procedures for FT2
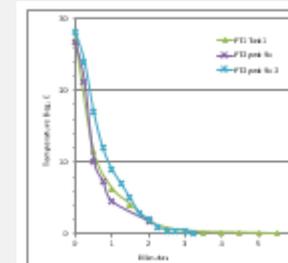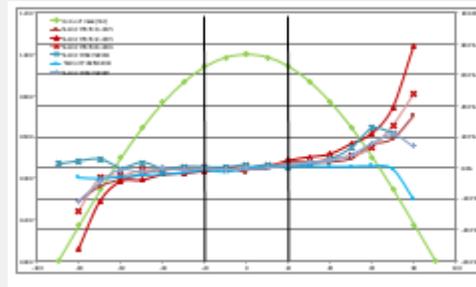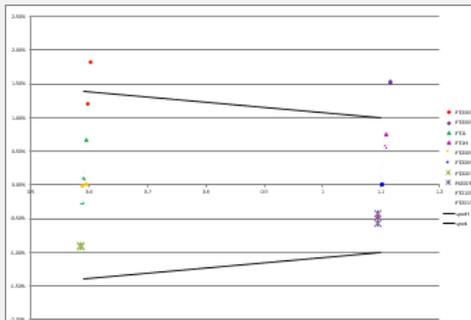
HIF

- All FlowTrackers are required to be quality assured at HIF prior to use
- HIF can now test FlowTracker2's in the small acoustic tow tank
- Recently shipped first 10 FlowTracker2's purchased

Comparison Needs

- Will be contacting WSC's directly who are getting first batches of FlowTracker2s to provide test plan and place on hydroacoustics.usgs.gov

- All units purchase through the HIF will have been velocity and other QA checks

- USGS still needs to compile comparisons for production FlowTracker2 measurements made over wide range of conditions

- Water Science Centers please submit any comparison data

Questions?