The Hunt for Submerged Springs – Silver Springs, Florida
Participant Q&A's – October 2013

Q1: If you know where a submerged spring is located, can you park the M9 above it and get a time series dataset?
A1: Yes.

Q2: Would the beams bounce off cave walls? Could it be used in a cave?
A2: The beams will bounce off of anything that is solid including cave walls, but the system will see this as a boundary and not include the velocity of the walls in the water velocity. The M9, HydroSurveyor and RiverSurveyor Live can only be used from a floating platform, so if you are asking about an autonomous deployment in a cave then no.

Q3: Can the M9 be deployed at depth? I.E. in a spring.
A3: No, it is currently only designed to work from a floating platform in real-time. The M9 has not been designed to be deployed autonomously.

Q4: Does the software correct for tidal changes if used in a coastal environment, i.e. estuary?
A4: No, the software does not correct data by referencing to a tidal datum with a tide file, but at the same time the water surface elevation is recorded in the form of GPS altitude (most accurate with the absolute RTK setup) as well as the elevation of the bottom.

Q5: Have you using other measurement system(s) on site (for comparison)?
A5: Discharge measured by the M9 has been compared to FlowTracker measurements, measurements from our competitors moving boat solutions as well as well-established rated sites. However, at this particular site, we are not aware of comparison with other measurement systems.

Q6: How much does a HydroSurveyor liscense cost?
A6: You can email inquiry@sontek.com or contact your local SonTek representative to receive pricing and a quote.

Q7: Can the HydroSurveyor be used to measure river discharge?
A7: No, it does map velocity spatially, but does not compute discharge. If you have an M9 that is enabled for both HydroSurveyor and RiverSurveyor you can switch over to RiverSurveyor Live to measure discharge.

Q8: What is the range of the base station
A8: It depends on conditions at the site, i.e., line of sight, terrain, waves. Under ideal conditions 1km on low power and 3km on high power.

Q: Does hydrosurveyor produce a 3d representation of the velocity map?
A: Currently no. You can plot a 2-D color map of velocity with depth. However, HydroSurveyor outputs a gridded data set which can be exported to other GIS software for 3-D plotting.

Q: Does Hydrosurveyor plot the velocity vectors with depth points in the transects
A: You can plot the depth averaged velocity, or choose a depth range over which to average the velocity, either when configuring your survey or in post processing.

Q: do you have plans to include any modelling of the bathymetric data in the HydroSurveyor live software?
A: If by modeling you mean 3D visualization, this is something we want to add in the future but a date has not yet been planned.

Q: Did I understand correctly that you cannot get discharge measurements from HydroSurveyor data? Do you have to repeat the survey if you want discharge data in the same area, or just postprocess with RiverSurveyor software?
A: Yes, you understood correctly. HydroSurveyor does not compute discharge. You would need to close the HydroSurveyor software and open RiverSurveyor Live and make another measurement in order to compute discharge.

Q: Is it possible to change bin size with the hydrosurveyor?
A: Currently no, the bin size is determined by the M9 and the SmartPulse algorithm. This is done automatically to ensure the most effective combination of technique (i.e., pulse coherent, incoherent) and transducer frequency (3MHz or 1MHz) is used.

Q: Concerning using the CTD with Bluetooth, does the CTD communicate directly with your laptop or the M9? If laptop, are there any chances of Bluetooth from M9 conflicting with Bluetooth from CTD?
A: The CastAway CTD communicates directly with either a Bluetooth dongle (supplied) connected to your computer, or your computer's internal Bluetooth. This does not conflict with the SonTek 2.4 GHz radio (new PCMs) or the Parani Bluetooth dongle supplied with the earlier PCMs.

Q: We are mostly concerned with bathymetric surveys and determining lake volumes. Has Hydrosurveyor added a feature to calculate volume? I had understood that it could not in the beginning. If not, what type of output files are available to use with GIS applications where tools are available to do this?
A: No, volume calculation has not yet been added. This is planned and will hopefully be included in the next release of the software. Currently it is possible to export all fields or a user selected subset to MatLab or CSV formats.

Q: Can you Q/A the bathymetric data by filtering out GPS data with high HDOP, high pitch, etc?
A: Yes and no respectively. There is a HDOP filter that can be adjusted by the user in the most recent version of the software. You are not able to filter data using pitch and roll unless you export and perform the filter on exported Matlab or CSV files.

Q: Can you please talk about the RTK set up for navigation? I am interested in the vertical datum reference for the bathy data collected. Ideally we'd like to have our bathy referenced to a datum such as NAVD88.
A: HydroSurveyor outputs depth, and GPS altitude data referenced to the WGS84 Ellipsoid. If you desire a different datum, you could export the data and perform a transformation outside of the HydroSuveyor software. For more information on datum transformations, you may find useful this US Office of Coast Survey website: http://www.nauticalcharts.noaa.gov/csdl/learn_datum.html

Q: What do you mean by altitude- refrerenced to what?
A: GPS position data consist of latitude, longitude, and altitude data. These data are referenced to the WGS84 Ellipsoid.

Q: You mentioned that plant growth was an issue. How is the bathymetry function affected in areas where you have dense bottom vegetation?
A: Depending on the density and type of vegetation it may still work, or not at all if the vegetation is very dense and the acoustics cannot penetrate through to the bottom.

Q: and can hydrosurveyor overcome errors during wavey lake surfaces?
A: Yes, the internal pitch and roll sensor is used to correct for depth and location. Heave is not compensated for.

Q: How deep can the hydrosurveyor go for a lake baththymetry?
A: Under ideal conditions 80m. However, this depends on the condition of the water in the lake. Very high concentrations of sediment can reduce the range.

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Q: Can it correct for tide change during survey?
A: No, the software does not correct data by referencing to a tidal datum with a tide file, but at the same time the water surface elevation is recorded in the form of GPS altitude (most accurate with the absolute RTK setup) as well as the elevation of the bottom.

Q: what is the resolution of the hydrographic data? what is the accuracy of the GPS? what GPS solutions are being used?
A: This depends on many factors. The main one is the speed of the boat. HydroSurveyor records one sample per second which includes 5 depths--one from the vertical beam and four from either the 3MHz or 1MHz profiling beams. The system is also recording velocity profile data once a second, from an average of multiple pings per second (number within sample depends on depth). So if the boat is moving quickly samples will be spaced farther apart than if it is moving slowly. Also, the deeper the water the more spread out the depth measurements from the profiling beams will be. These beams are aimed 25deg from vertical. Regarding the interpolated bathymetry, HydroSurveyor will perform interpolations and create a grid according to a user-specified interval. The accuracy of the GPS depends on the system you chose to use. Using the SonTek supplied DGPS (SBAS) the accuracy is <1.0m, with RTK it is <0.03m.

Q: what correctors is the GPS using - what is the accuracy?
A: SBAS DGPS correctors with a horizontal accuracy of <1.0m and RTK GPS (if using) with a horizontal precision (repeatability) of <0.03m. Please contact SonTek for more details on GPS accuracy.

Q: in post processing can velocity from each beam be resolved or are bin velocities 9 beam solutions?
A: RiverSurveyor software can output water velocity data in beam coordinates, relative to the axis of the acoustic beam, for each beam. This is recommended only for advanced users. Usually, East-North-Up (ENU) coordinates are used, or less often, XYZ coordinates relative to the transducer face. For ENU and XYZ coordinates,the velocity is a 4-beam average. Only 4 beams at a time are used for profiling velocity--either the 3MHz or 1MHz. HydroSurveyor software does not support beam coordinates.

Q: can you run both the hydrosurveyor and riversurveyor software at the same time?
A: No, it is possible to have one M9 licensed for both, but you can only use one software at a time.

Q: is there an integrated heave pitch and roll sensor in the M9? How is bathymetric data corrected for sea state?
A: Pitch and roll are corrected for using the internal pitch and roll sensor. Heave is not accounted for.

Q: M9 is able to penetrate the sediments on the bottom of the river? On what depth?
A: The M9 is looking for the bottom, and may penetrate into very loosely consolidated sediment, but does not provide acoustic information past the bottom.

Q: Can I see a M9 unit at work in Romania?
A: You can email inquiry@sontek.com with this request and you will be put in contact with our Romanian representative.

Q: can you imagine adding a remote control to the trimaran and working remotly (naturally no ctd correction)
A: Great question. Yes, and in fact options already exist from different manufacturers. Some popular options used by our customers are the following:
http://www.oceanscience.com/Products/Q-Boats/Q-Boat-1550T.aspx.
http://www.xylemanalytics.co.uk/media/pdfs/R2V2-specifications.pdf
We would be happy to provide more information on this kind of solution, if desired.

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Q: How easy / time consuming is it to change the M9 from a RiverSurveyor to a HydroSurveyor and in the Hydrosurveyor software is there a real time update for your boats path in relation to your grid
A: Easy, all you need to do is close one software and open the other. And yes, there is real-time navigation in the HydroSurveyor software that shows the boat movement, boat track and navigation tools that help you complete a survey line plan. For example, the software will show when you are on a survey line and how much of the line has been completed. There is also a tool for navigation that indicates how close you are to the middle of the user defined corridor.

Q: Is there any possiblity of using a M5 for any applications other than discharge mapping?
A: If you are asking about the SonTek S5, the answer is no. HydroSurveyor does not work with a S5.

Q: Does HS account for ray bending caused by sharp gradients in SOS (or density) when used with the CTD?
A: Yes, that is one of the main purposes of using the CastAway CTD to profile during a survey.

Q: How is velocity data displayed in HS? Depth averaged, layer averaged?
A: Either way. This can be defined by the user in the setup or in post-processing. Also, the individual cell velocity can be viewed on a color map.

Q: Can an M9 upgraded for Hydrosurveyor still be used with RiverSurveyor Live without changing firmware?
A: Yes, as long as the M9 has the most current firmware version. Then all that is needed to upgrade is a license key.

Q: How do you use the m9 or similar ADCPs to map and survey estuary environments where water salinity gradually change with depth and distance from the sea?
A: In an environment like this, the M9 will work well when also using the CastAway CTD to correct for sound speed variations do to salinity/density changes.

Q: Does the RiverSurveyer do anything that the HydroSurveyor cannot? If so, what?
A: Yes, it computes discharge and is specifically designed for this purpose. Other related features are offered accordingly. For example, a detailed color picture of the velocity field in a river cross section can be viewed in RiverSurveyor but not HydroSurveyor.

Q: is there a minimum effective depth for the surveyor?
A: Yes, for depth measurement the minimum is 0.2m and for velocity profiling it is 0.3m.

Q: Great GPS and ground tracking. Is there a way to tweak the transducers for better vegetation penetration or to interpret the bottom through the plants better (in the weeds).
A: No, unfortunately there isn't.

Q: Velocities are in N, E, U, and D. what are the U and D components and what is a section in the velocity data.
A: The U velocity is the vertical or "up" component of the flow. The D velocity is not actually a real velocity. It is a quality parameter called the "Delta" or difference velocity. Basically it should be around zero. What the D value looks at is a comparison of the flow in opposing beam pairs, to see if the flow is homogeneous (the same) across all beams.

Q: Could you see the springs and its source?
A: During the training we did not have a chance to investigate this. Presumably yes, if the input is significant enough to create velocities that can be measured.

Q: What is the significance of the "black" area between bottom data and bottom of water body?
A: This is the area where the software discards the velocity data because of possible side lobe interference from the bottom. The default in the RiverSurveyor Live software is a commonly accepted value (10% of

measured depth) though this can be user-specified to any value from 0 to 100. In RiverSurveyor Live an extrapolation method is used to determine the velocity in the region where data are discarded. The extrapolation method can also be customized.

Q: Why are there 2 profile lines for castaway data?
A: Are you referring to the slide showing the CastAway software? If so, this is because there are two separate casts selected to display. So, each profile line is from a different cast and is represented by a different color. You can choose to show as many or as few casts as you wish.

Q: How often do you deploy castaway?
A: It would depend on your site. Typically at the beginning, middle and end of the survey. However, if you are expecting significant changes in salinity and/or temperature, as you would see in an estuarine type environment, you would want to make more frequent casts.

Q: Can you see the vegetation on the ADP?
A: It may be hard to distinguish between the actual bottom and vegetation.

Q: We have a river with a large spring upwelling in the river. Would the Hyrdosurveyor be able to obtain bathymetry and velocity with the upwelling?
A: Yes, as long as the velocity of the upwelling water is significant compared to the horizontal velocity in the river.

Q: how can one receive detailed training for hydrosurveyor. and those it include a field work?
A: SonTek provides HydroSurveyor training for customers who request it, as the SJRWMD did. If you would like to receive more information you can email us at support@sontek.com. The training can be customized to fit your needs and does typically include at least one day in the field.

Q: Will it account for the changes in elevation when on a wavy lake (i.e. 1-2 m waves)?
A: Elevation change is recorded in the GPS data, however waves or heave are not corrected for at this time.

Q: what is the cost of a new m9 ADCP with a river and hydro surveyor license? Is leasing an option?
A: There are several configurations available and a range of prices depending on options. If you would like pricing information you can contact inquiry@sontek.com. We do have local representatives in many areas who do provide leasing/rental options. SonTek does not directly lease instruments. You can visit our website, www.sontek.com, or email inquiry@sontek.com to be put in touch with a local representative.

Q: Can bathymetric data be displayed in 3D mesh or isopach maps or is it just available in color gradation??
A: For now the only options are the color gradation or isobath map.

Q: What happens if the surveyor loses the rf link?
A: The answer depends on which software you are using. If using RiverSurveyor Live for discharge measurement, data files are stored both on the M9 and your computer. This is not simply a redundancy: if comms are lost or your laptop dies in the middle of a measurement, you can pick up and complete the measurement after re-establishing comms. You won't have to start over. Also, it is impossible to have dropped samples with the M9 RiverSurveyor because the data are always stored directly to the instrument--you can always re-download the files straight from the instrument if needed. HydroSurveyor stores data differently. If you lose the radio link during a measurement, you will lose this data. However, once the boat is back within range, HydroSurveyor will reconnect automatically, and resume data collection automatically.

Q: I imagine that if you were monitoring water level you could easily make the adjustment to tide corrected - is that correct?
A: Yes and no. You can put in a fixed water surface elevation, so if an average water level, based on the monitored water level, for the survey is sufficient then yes, you can input this as the fixed water level, either in

the setup or in post processing. However, at this time HydroSurveyor cannot take input of water level elevation changing over time.

THANK YOU FOR YOUR PARTICIPATION AND GREAT QUESTIONS. IF YOU STILL NEED CLARIFICATION ON ANY QUESTIONS, PLEASE DON'T HESITATE TO CONTACT US.