To: Scott White - DESSC member (Sentry 'friend')
Dave Caress – DESSC member

From: Dan Fornari & Ross Parnell-Turner

Date: June 10, 2021

Subject: Discussion about NDSF AUV sidescan data processing capacity at DESSC

Hi Dave and Scott

In advance of a short presentation that Dan will make at the DESSC meeting tomorrow, Friday afternoon, regarding sidescan data processing we wanted to provide both of you with some information as background context for this topic that we feel would benefit from input and possibly action by DESSC and the federal agencies.

Note that some of the ideas and information noted below have resulted from recent discussions with Scott and Larry Mayer at UNH-COMM, as well as other colleagues in the community who are familiar with near-bottom sidescan sonar data and have used it in their research.

As you are aware, sidescan data can be a powerful additional dataset in which one can use the backscatter information to better assess seafloor textures, structures and relative ages, depending on the terrain and tectonic setting. However, processing these data post-cruise requires expertise, access to specialized software and computing resources.

The at-sea products generated by the WHOI-NDSF *Sentry* group provide the necessary information for quality control and to make operational decisions, and are not intended to be final maps and images. The optimized navigation solution is typically added to the binary data file headers by the *Sentry* group at sea, although may require updating if further re-navigation is required post-cruise (for example this was the case because of significant USBL biases during our 2018 and 2019 EPR cruises). Hence final re-navigated, processed, co-registered mosaics are the responsibility of the science team, yet as far as we know, such products are not routinely generated post-cruise for most PIs due to lack of resources and familiarity with sidescan data processing techniques.

Processing of sidescan data at sea is carried out by the Sentry team using Chesapeake Technology's *SonarWiz* software (commercial license), installed on a custom NDSF-owned workstation with high graphics capability. This setup is optimized for sidescan processing, however is not commonly found in academic research groups in the US. As Dave is aware, some sidescan processing capability is available using MB-System. However, specialized software tools in *Sonarwiz* such as navigation adjustment, waterfall plots, gain corrections, and color balancing, mean that producing a final, multi-dive mosaics are better suited and more efficient to sidescan post-processing than using MB-System alone. It would be great to have Dave's perspectives on this topic given his

decades-long commitment and development of MB-System software, which is extensively used by the Sentry group for real-time processing of the AUVs near-bottom multibeam data and for optimizing navigation both within each dive and for multiple dives.

A *Sonarwiz* software academic license ~$7.5k ($10k without academic discount), plus an annual ~$1k maintenance contract that ensures bug fixes and software upgrades are always available to the user. In addition, users would need access to a computer able to handle large sonar imagery files, requiring significant graphics card and memory capacity (e.g., 128 GB of each, respectively). The computing infrastructure costs are likely to be of the order of $5-7k. These costs are not excessive as a one-off, however, they do become significant if every NSF-funded science team processing AUV sidescan data has to purchase a software license and suitable computing resources. Data collection efforts may be separated by several years, and PIs may not be able to justify such expenditure for a single project or dataset. In addition, sidescan processing takes considerable effort and experience to do properly and efficiently, and the reality is that not many PIs in the US MGG community have expertise in sidescan data processing.

We'd like to discuss with you both and DESSC committee members ways in which the DESSC and NSF can help US PIs routinely deliver post-cruise processed AUV sidescan data, which can then be archived in repositories such as MGDS and used by the wider scientific community. We have suggested three possible solutions below, and there are no doubt others.

Option A - WHOI-NDSF purchases and retains SonarWiz software license (s), computing resources, and expertise, to process AUV sidescan data post-cruise. Scientists could include funds in their grants to have the processing done at WHOI, with interaction/feedback from the scientist(s) involved. This resource could be part of the NDSF facility, and provide year-round access to both software and computational resources, and could be used to support activities such as sidescan processing workshops/training events. This option would build US sidescan processing capability by training PIs, postdocs and graduate students, who would then strengthen the academic community, and the US workforce. The main problem with this option is that NDSF personnel are likely to have limited availability due to sea-going commitments or other projects and currently there is no solid expertise in sidescan processing within NDSF.

Option B – NSF (via NDSF?) maintains a SonarWiz license, which can be 'checked out' by scientists to use in their home institutions when they have sidescan datasets to process. This would require PIs to acquire their own computing resources, however would defray significant up-front costs. This approach would require some degree of support and the provision of training materials, possibly with an expert (either from NDSF, software provider, or industry) available to consult when needed.

Option C – Routinely process AUV sidescan data using an expert commercial contractor, such as Greg Kurras of SeaFloor Investigations Ltd (SFI), who has a track record of working with NDSF and with a wide-range of PIs. Having an annual agreement between

NDSF and a contractor such as SFI, working under the direction of PIs, would permit their sidescan data to be processed expertly and efficiently, and archived in a timely fashion. The main drawback of this approach is that it does not add expertise to the US research community and academic/student workforce. This point about building 'capacity' in the US academic community in terms of expertise in sidescan sonar data processing techniques is something that should be discussed. We believe these types of data will be key to a range of societally relevant topics such as offshore wind farm pre-development surveys, geotechnical surveys of seafloor terrains in area where remediation of oil&gas facilities are being demobilized, and areas being considered for marine protected areas for coral and/or other habitat preservation.

We are not sure of the best solution, however we wanted to highlight this issue to DESSC and NSF, as our current research at the EPR has been impacted by these challenges. Solving this issue would be important for all current and future users interested in using the Sentry's excellent sidescan data for their research, and also potentially could add to the broader impacts of NDSF via targeted student and PI training in sonar processing. To expand this line of reasoning – this could also lead to improved training for early career scientists if workshops were set up to educate them about fundamental vehicle data systems, data processing and map-based products.

Thanks for your attention, and we look forward to talking more with you both and the DESSC about this topic.

Best Regards,
Dan and Ross