From:	Chet Myers
To:	Colarusso, Phil; Marsh, Michael; Williams, Ann
Subject:	RE: NBH-NMFS call and modeling info
Date:	Wednesday, July 10, 2013 6:27:37 PM
Attachments:	image003.jpg image004.png image005.png 2003-059[1].pdf

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Hi Phil,

We realize that there are more fish out there than just Atlantic Sturgeon; however, the modeling was based on the two standards (Peak Pressure and Peak Impulse) given to us by NMFS, and those standards were set via the previous paper I forwarded that evaluated impacts to shortnose sturgeon.

One other issue that I failed to bring up in the previous e-mail is that we also reviewed the paper that contains the model that Jasco used (Dzwilewski and Fenton, 2003) to help determine what the integration time should be (to see if successive explosions would be additive).

That model has a metric for determining the suggested length of time that Impulse should be integrated over (see pages 20 and 21). It is apparently typically a multiple of the variable "theta" (the model describes two suggested calculations for "tau", one is 5 times "theta", and the other is 6.7 times "theta").

We used the following values for the "theta" equation:

W = 22.7 kg (50 lbs)
K (impulse) = 5.73 (the impulse K variable value for Pentolite, see page 23 of Jasco report)
Alpha (impulse) = 0.91 (see impulse alpha variable value for Pentolite, page 23 of Jasco report)
R = 68.5 meters (This is the radius of the "mitigated" 50 pound Impulse impact area – anything inside this radius already exceeds the 18.4 psi-msec level. Using the unmitigated radius would be a value of 305 meters, which would be less conservative.)

When calculated, we get "theta" (equation 5 on page 20) to be: 0.89 milliseconds

5 times "theta" is: 4.46 ms
6.7 times "theta" is: 5.98 ms

Thus, our calculation of "tau" indicates that the integration time is extremely short (approximately 5-6 msec).

As a result, so long as the delay exceeded this value, there would be no overlap between successive impulse waves. Meaning the "peak" impulse would be the same for an individual explosion as for a delay explosion (so long as the delay was sufficiently long enough to prevent overlap).

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In this case, 25 msec is approximately 4-5 times the calculated “tau” value.

Thanks,

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From: Colarusso, Phil [mailto:colarusso.phil@epa.gov]
Sent: Wednesday, July 10, 2013 2:54 PM
To: Chet Myers; Marsh, Michael; Williams, Ann
Subject: RE: NBH-NMFS call and modeling info

Chet,

I have skimmed your response and the issue for blasting in the September time frame was Atlantic sturgeon, but anadromous fish mortality. Sturgeon mortality from blasting may not be the most sensitive endpoint to answer the anadromous fish question. I don’t think anyone wants to go down the wormhole of whether the modeling results are overly conservative or conservative enough. Ultimately, we need to know that the blasting proposed by Cashman will be consistent/less impactful than what was modeled by Jasco. Perhaps having the expert you mentioned review both the JAsco model and the proposed blasting plan by Cashman would be sufficient to connect those dots. Before you do that, Mike and Ann should weigh in.

Phil

From: Chet Myers [mailto:cmyers@apexcos.com]
Sent: Wednesday, July 10, 2013 2:31 PM
To: Marsh, Michael; Williams, Ann; Colarusso, Phil
Subject: FW: NBH-NMFS call and modeling info

Mike, Ann, and Phil,

I went back to the source documents received from NMFS at the start of the modeling process to see if they could shed some light on the issues we discussed yesterday.

Attached to this e-mail, please find the study that was originally forwarded to Apex (from NMFS) prior to modeling. The study was used to determine whether Atlantic Sturgeon would be impacted by subaqueous blasting by testing shortnose sturgeon. The study was set up as follows:

- Shortnose sturgeon were set into cages at various distances from the detonation (35 feet,

70 feet, 140 feet, 280 feet, and 560 feet).

- The detonations were initiated, and the level of mortality in the sturgeon was assessed based on distance.
- The detonations consisted of 32-33 blasts, of 24-28 kg each (approximately 50-60 pounds each), that were delayed by 25 msec. (i.e. the total charge was 1600-2000 pounds, subdivided into 33 blasts of no more than 60 pounds, with a 25 msec delay between blasts.
- The results of the study concluded that peak pressure should be below 75.6 psi and peak impulse should be below 18.4 psi-msec, which is why those levels were set by Jasco when modeling was conducted.
- More specifically, the study states, on page 5: "Based on this and the best available information, we believe that peak pressure levels at, or below, 75.6psi, and peak impulse levels at, or below 18.4 psi-msec, will cause no injury or mortality to species of sturgeon, including Atlantic sturgeon."
- Please note that NMFS has stated "peak" impulse and not "total" impulse, indicating that they are looking to minimize the impulse over one delay, rather than the whole blast.
- Peak impulse then would be the integrated area under one blast curve. So long as a sufficient time period elapses between curves (so that they don't overlap), the peak impulses are considered separately, and are not additive. NMFS utilized a delay level of 25 msec, which is supported by the results of this study. It is possible that a shorter delay would also be acceptable, but we will accept EPA setting the delay at this level.
- The results are borne out based on the survival of the shortnose sturgeon, where mortality impacts occur at 35 feet, and injuries occurred at 70 feet, but that neither mortality nor injury occurred at 140 feet.
- Also please note that there was 100% survival at 140 feet from the explosions, whereas the Jasco model indicates that the peak impulse for a 50 pound blast would be approximately 1000 feet from the blast (unmitigated). This is further indication that the Jasco model is overly conservative, and indicates that the impacts from blasting associated with the NBMCT would be lower than anticipated based on the modeling results.

This study seems to answer the questions that were posed by Mike and Ann yesterday. We will still work on getting Jasco involved, but this seems to be pretty comprehensive evidence.

The blast pattern is virtually identical to what is being proposed (multiple 50 pound maximum blasts).

Please let me know if you would like to discuss.

Thanks,

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From: Kelly Risotto [mailto:krisotto@landuse.us]
Sent: Tuesday, October 02, 2012 3:44 PM
To: Jay Borkland; Chet Myers; Marie-Noel Matthews
Subject: NBH-NMFS call and modeling info

Good Afternoon All,

Below is a summary of the discussion Chet and I had with Danielle Palmer of NMFS this afternoon regarding the acoustic modeling for NBH in-water work:

1. Blasting
    a. NMFS currently has no formal criteria for assessment of hydroacoustic impacts of blasting on finfish.
    b. Per Danielle, do not use the criteria established for pile driving for assessment of blasting effects. She emailed me the attached consultation wherein the assessment was performed using peak pressure levels reported in psi (≤ 75.6 psi no injury or mortality) and impulse pressure levels reported in psi-msec (≤ 18.4 psi-msec no injury or mortality).
2. Non-Blasting Rock Removal & Pile Driving
    a. NMFS has dual criteria for assessment of injury in finfish
        i. Threshold for onset of injury—peak measurement: peak SPL of any strike exceeds 206dB re: 1μPa
        ii. Threshold for onset of injury—cumulative measurement: cumulative SEL (cSEL), accumulated over all pile strikes, exceeds 187 dB re 1μPa•s
        iii. For vibratory hammer, assessment of cSEL can be done using two methods, either equating the # of vibratory periods to # of pile strikes, or using the duration of vibration in the calculation
    b. NMFS has separate criteria for assessment of behavioral effects in finfish
        i. Threshold for behavioral effects: 150 dB_{RMS}
    c. Map/Output can be a single figure that depicts the three metrics color coded to show the zones of potential impact, or we can produce a single figure for each metric (our choice).
3. # Locations to model for each of the above should be based on the existing conditions within the proposed work area. If a single location will produce results applicable to the entire project site, we can utilize one location; or, we must model one location for each significant change in conditions that would change the model output.

We should have a call to discuss the modeling required and revise our scenarios in light of our discussion with NMFS, to make sure that we produce the results that will enable EPA and NMFS to evaluate and sign off on the project. I am available all day tomorrow, Thursday morning, and all day Friday to discuss.

Thanks,

Kelly Risotto, Senior Ecologist

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