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FROM Jena Lewinsohn
DATE April 3, 1998

SUBJECT Draft summary meeting minutes from the 100 Area Study Plan presentation in Spokane, March 31, 1998.

NO OF PAGES 8

Please review the Draft summary meeting minutes and provide **comments** to me **by April 17, 1998**.

100 Area Chromium Toxicity Study
Work Group Meeting
Spokane, Washington
March 31, 1998
Summary Meeting Minutes

DRAFT

Attendees

Arlene Tortoso, DOE
Jamie Zeisloft, DOE
Fred Serier, DOE
Darci Teel, BHI
Dan Audet, USFWS
Julie Campbell, USFWS
Rick Roy, USFWS
Geoff Tallent, Ecology
Tom O'Brien, USFWS
Barbara Harper, YIN
Damon Delastrade, Ecology
Phil Laumeyer, USFWS
Jena Lewinsohn, ECO

Dan Audet reviewed the topics on the agenda for this meeting. The outline of his discussion will be as follows: review the scope of the study plan, touch upon NRDA injury definitions and the relevant injury endpoints for this study plan, outline USFWS' proposed approach, discuss the proposed approach with the work group, and finalize the schedule for the study plan. Dan passed out handouts that outlined the scope, the NRDA injury endpoints and the proposed approach.

Scope of the Study Plan

USFWS was contracted to develop an aquatic resource plan (i.e., assessment plan) based on the NRDA regulations. The focus of the plan is on releases from the 100 Area, with the intent to incorporate restoration into the remediation process. This study plan looks at chromium releases from the 100 Area with the attempt to establish an injury threshold. The intent is also to incorporate restoration into the remediation process. The study plan complements the assessment plan, which will be discussed later.

Injury and Endpoints

Chromium toxicity review. Hexavalent and trivalent chromium both exist. Hexavalent chromium is a driver for remediation, but trivalent chromium could be a factor if you are looking at sediments, or food chain uptake. Key endpoints to look at are survival, growth, reproduction, avoidance, and biomarkers; the endpoints you decide upon will drive the type of studies you perform. Jamie mentioned that University of Washington has a webpage that focuses on chromium issues at Hanford. **ACTION - Jamie, provide the work group with the website address.**

Relevant studies. Based upon the document review, 4 key studies were used to help design the USFWS approach. These studies were chosen based on one or more of the following: (1) the AWQC for chromium, (2) the endpoints that were chosen, (3) they used salmonid species. The four studies are Olson & Foster (1955), Benoit (1976), Billard & Roubaud (1985), and Anestis & Neufeld (1986). The Olson report helped establish the AWQC for chromium. It is a good report; however, there were different exposures back in 1955 that aren't realistic in the

water column today (i.e., used 6ppb after the redd stage). In addition, bioassay methodologies (ASTM) have changed since then, and sublethal effects to alevins weren't addressed. Sublethal effects were studied during the fingerling stage, not the alevin stage.

Chromium (hexavalent), What Do We Know. This page outlines the results of their literature search. The Billard lab study documented injury as low as 5 ppb for fertilization. Jamie noted a discrepancy between the concentrations listed for the survival and death endpoints. Dan stated that these were from different studies, with different variables such as the life stages of the fish that were studied.

Biological Injury. This list is from the regulations. Avoidance would a behavioral abnormality. An enzyme response effect would be a physiological malfunction. Chromium does not have FDA action level (i.e., for food consumption).

Aquatic Resources, Chromium Injury. USFWS proposes studies for the following endpoints: survival/death, avoidance, fertilization, histopathology, and cell/tissue response. The avoidance response has been found with chromium and salmonids. Dennis asked what the relevance of these studies were. If enzyme inhibition was established, would there be an effect on the individual or the population level? How can you make the link, and at what level is an effect relevant? Dan said the trustees need to make that determination because you can establish injury at any level, and you need to tie that injury to restoration. Jamie said that we know we have injury out there. We also have a potential injury to biological resources. The question is, does the injury warrant restoration? Rick said that we need to focus on the most sensitive and the most significant endpoints. You need to focus on sensitive endpoints and then make the tie back to it's relevance. Rick said that it is a weight of evidence approach. You need several pieces of information to get the picture. Since we're focusing on one species for this study plan, the pieces of information you need are various endpoints for that species. It is important to develop a body of evidence. Tom said that all of these endpoints work together when you look at injury to a species; the endpoints are not always distinct.

Jamie stated the need to complement this study with pathway studies in order to look at the widespread nature of the injury. Dan said that the pathway is tied to this study because you need to deliver the contaminant to species in the appropriate way. Looking at pathways is a critical part of the design of injury studies. Jamie said that the projects need to get cleanup goals for specific areas out in the Reach as well as restoration levels. Rick said that natural history information is important, because salmon spawning locations are not well known based on the methods used (i.e., flyovers that don't locate the redds in deep/turbid water). Dennis said that one method to locate redds in deep water is to use an underwater camera. Jamie asked if we don't know whether its suitable habitat or not, how do we know avoidance is occurring? Can we make the link? Rick said that link would be made at the quantification phase. Injury and quantification are separate steps. Dan said first we need to establish that injury is occurring. What the acceptable level of restoration is, is based upon the injury. Rick said that this is a phased process. We're talking about phases that need to come down the road. Geoff asked if there was enough information on chromium effects to salmon, then wouldn't we be getting more bang for the buck on the habitat end verses further studies of chromium toxicity? Dan was confident there is injury from chromium occurring between 0-800 ppb, but the group needs to address what injuries those are. Jamie said that we do need to look ahead. Rick agreed, but said those issues are beyond the scope of this injury study plan. Dan said that there is already a lot of pathway information, the question is the dilution factor. USFWS has an idea of what

concentrations are out there and will be setting up studies within those concentrations. Jamie said that porewater concentrations vary significantly. Arlene said that shoreline samples are easier to collect verses porewater. Rick said that they need to get best estimate of what exposures there are, take that concentration range and mimic it as best they can. Dennis added that now we know that chromium is getting into the river from all of the recent nearshore sampling, and we have effect data from the literature review, now we need to make the connection better. Dan said that when the literature review points to injury at 5ppb for an endpoint as important as fertilization, we need to look to see if that is happening. At that very low concentration, the dilution factor may not be that important.

Proposed Approach

Dan told the work group to keep in mind that this study plan is strictly dealing with chromium, and was kept separate from the assessment plan. This proposed approach fits well with the assessment plan concept.

Range of Options

There are four categories of studies that could be done, related to chromium toxicity. These studies would be fairly standard. The four categories are: acute endpoints, early life stage endpoints (using egg, alevin, fry), fish health markers (using parr, that are out of the redds and feeding in river), and behavioral avoidance studies.

The acute endpoint studies would be short studies that focus on sensitive endpoints. Invertebrates could also be looked at in these acute studies because, depending upon the chemical, invertebrates can be more sensitive that fish. Daphnia are typically studied for both sublethal and lethal effects of contaminants.

Early life stages would be the egg, alevin stages. The focus would be on whole body accumulation of chromium because the samples are too small to separate individual organs. The early life stages are also limited for tissue on enzyme work.

Fish health studies would focus on the parr stage. At this stage, it is possible to look at accumulation within individual tissues, such as tissue enzyme work and tissue histology. Keep in mind that the exposure scenario is different for parr. Trivalent chromium may be more important at this stage because of sediment contact, and food chain uptake. Movement between areas and the amount of time spent in contaminated areas is also a factor.

Behavior studies would focus on avoidance at different chromium concentrations. Surrogate species could be used such as rainbow trout. Avoidance to trivalent and hexavalent chromium could be variables.

Dennis asked if the door was still open for looking at different species instead of chinook. Dan said absolutely. USFWS wants to focus on the most sensitive species to chromium, but they are leaning towards salmonid species. Dennis asked if injury to caddis fly was found, if that was a big deal in itself or only if that injury is tied to its impact on chinook? Will the sensitive species that is chosen have to be tied to chinook? Dan answered that chinook was the direction he was given to focus on. Jamie said they he hoped that it doesn't seem like that direction was set in stone based upon the interagency agreement. Dan said that the egg and alevin stages seem to be the most sensitive test because of their location to chromium plumes, immobility, and time duration in the redds. Chinook are also a good species because there is lab and field data for the

species. It is important, at this stage, to stick with a species that isn't too unique, with standard methods in place for that species.

Round 1 Studies

Initially, the approach would start with salmonid species as the sensitive species. If tribal issues, or other issues came up, other species could be used. But for right now, USFWS recommends using chinook. Geoff asked if Columbia river water would be used. Dan said not during this round. This first round is a controlled approach within the lab which will reconstruct the water. The controlled approach will determine what injuries exist from chromium. Jamie added that you don't want to introduce variables that you can't explain, such as what you'd find in the river; you need to pinpoint the effects. Dennis said the key thing is to replicate water found in Columbia river. Dan said they will replicate the water without the other contaminants in order to keep chromium as the only variable. Rick said that you have to take out other variables first in order to pinpoint effects from only chromium. Dan said this first round will establish a baseline of endpoints and sensitivities to chromium toxicity. The lab will maintain variables such as pH and hardness because those variables affect chromium toxicity. Altering the water chemistry during the parr stages can be done during the study to replicate river water conditions. Replicating porewater conditions would be during the egg/alevin stages. The Olson study kept chromium concentrations constant throughout the life stages, where this study will want to replicate realistic conditions. Jamie said that the Olson study probably did replicate the realistic conditions back then when chromium was discharged directly to the river. Barbara asked about determining dose response curves for the various treatment groups. Dan said yes, that is the plan, but they would stick to basic treatment groups. Dan said this round 1 work can start this September. All of this round 1 work could be implemented in September 1998 if we get consensus very soon. Hatchery fish have similar schedules with wild fish which is big factor in the timing of these studies.

Round 2/3 Studies

These studies are not being proposed until we get the data from the first round and know the endpoints to focus on. What to look for in the second and third round of studies are as follows. Hanford site water would be utilized, with either river water or groundwater. Another option is to run the studies on the site, or transport the water to an off-site lab. Artificial redds can be set up in the river and/or in a lab, using site water. Dennis asked if the gravels for the redds would be realistically replicated in the lab. Dan answered, yes, and that sampling from real redds would be hard to do logistically. Another option would be to use water that has been treated from one of the pump and treat operations, or another technology (i.e., treatment water exposure in the handout). The question to answer there is how effective is your treatment? Nitrate/tritium interactions can be studied using site specific or operable unit specific groundwater. Jamie recommended adding location of redds to the list.

Food Chain Pathway. Locate nursery areas for parrs, and determine exposure pathways (i.e., water, sediment, biofilm, inverts, fish). Now we are dealing with issues related to the assessment plan.

Fish Health Markers. Can expand and look at other species. This chart includes the health markers identified in round one, verifying field exposure, and comparing concentrations to those found from the lab studies. Field exposure is tricky when collecting parr, because you

don't know where they were reared and their life exposure history (i.e., in the redds).

Behavioral, Avoidance. The question to answer: is there any evidence of avoidance in the field? This would incorporate habitat assessment, and telemetry techniques. Need to pinpoint avoidance of areas in the field if avoidance was documented in the lab.

Summarize Rounds

The results from round 1 will drive rounds 2 and 3. By focusing on chromium only in the first round, you get the endpoints which you can then tie into other interactions with other contaminants. Chromium certainly is a major player, so it makes sense to proceed with chromium. Rick said the same approach was done at Rock Mt. Arsenal. At the Arsenal, they focused on dieldrin with both lab and field studies. They found what dieldrin does in the lab, and looked to see if the same effects were found in the field. The key is to get the endpoints before looking in the field where there are interactions with other contaminants. Jamie said that chromium is a major player in some operable units but it is also mixed with other contaminants. And in order to remediate, you would need to focus on the whole picture, not just chromium. Dan said that if you find an enhanced effect in field, then you start looking at interactions. You wouldn't need to go back to the beginning, but build from the baseline that was established. Geoff asked how this fits into the other 4 study plans. Dan said the estimate was $100K for each study, with a total of 4 studies. Jamie asked if round 2 could be completed this fall. Dan said no, only round 1 could be completed this fall.

Workgroup Discussion, How to Proceed

Life stage approach, chromium assessment. This overhead outlines the life stages and endpoints that would be studied in the proposed approach.

Site specific studies. These are some issues that you need to deal with for site specific studies, and these factors support doing lab work first. It is important to have a relevant baseline, and sometimes that means conducting lab studies before the field studies. It is important to work with disease-free fish, and disease-free chinook/salmonids are available. Tolerance from pre-exposed fish is important to watch out for when you collect fish from specific sites. You cannot establish baseline thresholds/criteria from tolerant fish. Typically, criteria (i.e., AWQC) are based upon lab studies.

Strategy, Round 1. Barbara asked how the planning and decisions for this study plan fit into plume treatment decisions. Jamie said that it was very timely. Arlene said that when the data comes in from this study, the projects will needing to be making decisions for long-term remedies. Dan said that the key issue is to have decisions from work group very soon. Dennis asked if the plan should get EPA's acceptance if we'll be getting information that could change the criteria. Geoff said that we're generating information for somewhat different ends. We may have outstanding injury at lower levels than 11 ppb, and that has to be factored into the cleanup process. Jamie said that we're really talking about a waiver of an ARAR, AWQC. Jamie said that Larry Gadbois, EPA, is on board with all of this. Barbara asked if you can you waive an ARAR to be less stringent. Jamie said that it could go either way.

Strategy for Rounds 2-3. Round1 establishes a chromium toxicity baseline. Rounds 2 and 3 fit into the assessment plan approach. On-site sampling will occur. Work could start in September 1999 for rounds 2,3, and would tie into on-site contractor support.

Proposal, Sampling Design Details. Dan said that USFWS is ready to put together a

workplan and studyplan for round 1; however, they need concurrence from work group for the round 1 approach. Dan presented the estimated costs for round 1 work. Acute work $22,000 (one species, fertilization endpoint). The acute work could be started before this September if cutthroat trout were used; if salmon were used the work would start in September. The key is to add chromium while fertilization is occurring. Using chinook would incur additional costs; the costs are based on the Jackson lab fees, and includes all overhead fees. Early life, $87,000 (4 endpoints). Fish health, $128,000, the costs are higher mainly because of the histopathology, and enzyme work. Behavior, $84,000, the avoidance studies would focus on juveniles only. The total cost is $321,000 for the round 1 work.

Geoff asked if rounds 2 and 3 would be more expensive. Dan said that the labor costs would be more expensive, but those studies would be identified and detailed from the round 1 results. There are also the rad issues, which would require safety measures and extra coordination. Dan pointed to the handout where the rounds are lined up and asked the group to see how those studies are tied together. Jamie said the work group will need to review this information, and will schedule a conference call to discuss the approach. Dan said USFWS needs 4 weeks to develop the work plan after the decision from the work group is made. The early life stage studies need the green light very soon or they can't be done this year. Jamie said the funding constraints may limit some of these studies. Dennis asked if Woodward put together the round 1 work in more detail. Dan said yes, but he didn't want to present it today because it is very rough. Barbara asked for more detail on the type of studies identified in the proposed approach so the work group can make a better informed decision if certain studies cannot be performed based upon cost constraints. Geoff wanted to know how these costs were generated so the work group can evaluate the scope and the costs, and come up with something that best meets the work group needs. Jamie said perhaps a short paragraph with little more detail on each endpoint.

ACTION - Dan will get together with Dan Woodward and provide that information to the work group.

Geoff asked how much money should be reserved for rounds 2 and 3, since we'd be lucky to pay for one piece of round 2 with the committed funds. We knew from the beginning that we'd be limited in performing all of the studies. Darci added that now it looks like we can't even perform the first study, just round 1 of the first study. Dennis said that he thinks field verification is needed in order to substantiate the injury found in the lab studies, but what he's hearing is that the regulations state a lab study is enough to determine injury. Dennis thinks we need to ask what lab work is the most meaningful to what is happening out in the field. Barbara said that if we were looked for a waiver of the AWQC, she thinks we'd need some field work. She wouldn't think we'd get a waiver based on lab work that just looked at chromium without other contaminant interactions. Jamie asked how much we could get by prioritizing and maybe combining rounds 1, 2, and 3? He doesn't want to start the process without being able to finish it. Dan said that the early life stage and fish health studies are tied together and they are hard to separate. Jamie asked if USFWS could help the work group prioritize the round 1,2,3 studies for planning purposes. Dan said that would be hard to do without the round 1 data. Round 2 and 3 are in line with the assessment plan since it's dealing with more contaminants. Dennis said to consider building priorities based on field scenarios for funding rounds 2 and 3. Help establish priorities based upon the connection between lab and field studies, and then the issues you'll

resolve based on that information. Dan told the group that for costs such as enzyme tests, one less enzyme test wouldn't affect the cost that much, it's initiating the enzyme work that is costly. Jamie said that one approach is to write the study plan for this proposed approach. Costs, and what pieces of the study plan to implement, are separate questions. For this step, the work group needs to accept the plan, not necessarily based upon costs. Dennis asked why the costs were being mixed with the plan. Don't costs come into play once the plan has been accepted and then contractors are chosen based on their costs to implement the plan?
ACTION - Work group to have a conference call April 9, 9am. Tom was not sure if he should be involved. Darci will see if Putz is available.

Jamie said that he would like to discuss the strontium issue at N-Area after lunch if people can stay.