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September 26, 2018

Brig. General D. Peter Helmlinger
Commander, Northwestern Division
U.S. Army Corps of Engineers
PO Box 2870
Portland, Oregon 97208-2870

RE: Comments on 'Response to Kondolf (2017) "Review of the Sonoita Creek Mitigation Project Proposal for the Proposed Rosemont Copper Mine"' by Water & Earth Technologies, January 2018

Dear General Helmlinger,

You will find attached comments by fluvial geomorphologist Dr. G. Mathias Kondolf pertaining to the proposed Rosemont Mine mitigation proposal on Sonoita Creek in southeastern Arizona. It is entitled as follows: Comments on 'Response to Kondolf (2017) "Review of the Sonoita Creek Mitigation Project Proposal for the Proposed Rosemont Copper Mine"' by Water & Earth Technologies, January 2018.

As you know, a whole host of concerns have been raised about this proposed open-pit copper mine project. We appreciate the attention your office has paid to these concerns. We hope you will also give these comments careful attention as you consider Hudbay's application for a 404 permit under the Clean Water Act. Additionally, we ask that these comments be made part of the project record.

Sincerely,

Gayle G. Hartmann

Gayle Hartmann, president
(on behalf of the Board of SSSR)

Cc:

William James, National Mining Expert, U.S. Army Corps of Engineers
Col. Aaron Barta, District Commander, Los Angeles District, U.S. Army Corps of Engineers
Kerwin Dewberry, Supervisor, Coronado National Forest
Ray Suazo, Arizona State Director, Bureau of Land Management
Alexis Strauss, Acting Regional Administrator, Region 9, Environmental Protection Agency
C. H. Huckelberry, Administrator, Pima County
Edward D. Manuel, Chairman, Tohono O'odham Nation

Comments on 'Response to Kondolf (2017) "Review of the Sonoita Creek Mitigation Project Proposal for the Proposed Rosemont Copper Mine"' by Water & Earth Technologies, January 2018

G Mathias Kondolf, PhD

25 September 2018

Introduction
I offer some brief comments on the report by Water & Earth Technologies (WET), which I only recently received. My comments are not comprehensive but serve to raise some scientific and professional issues with the document.

Much of the WET 2018 document simply repeats assertions from the 2017 Habitat Mitigation and Management Plan (HMMP), evidently following the formula that if you repeat something enough times, people will believe it. The WET document does not present evidence for most claims, and unfortunately it includes misrepresentations of my 2017 review.

The Ever-Morphing Mitigation Proposal
The proposed Rosemont Mine would fill 103.6 miles of ecologically valuable headwater stream channels, with significant impacts on ecological values of the eastern slopes of the Santa Rita Mountain range as well as Cienega Creek and Davidson Canyon. The mine proponents have been unable to find suitable sites for mitigation of these impacts. In the absence of similar headwater stream environments that could plausibly provide mitigation of habitats comparable to those lost to the mine impacts, the project proponents proposed to intervene on Sonoita Creek, a very different ecosystem draining southwest to the Santa Cruz River rather than east and then north into the Cienega Creek catchment. Unlike the small headwater streams of Cienega that would be obliterated by the mine, Sonoita Creek drains a much larger area and is a wide, sandy-bed, ephemeral stream.

In 2014, WET proposed to excavate secondary channels that were to flow parallel to the existing Sonoita Creek channel, claiming mitigation credit for the area of the newly constructed channels. This proposal was deeply flawed for many reasons, including the lack of sufficient flow to run through the new channels (the proposal included assertions of unrealistically high water availability that were contradicted by available evidence from USGS gaging records and prior analyses), and the fact that the junctions between the existing channel and the secondary channels would not be stable in this dynamic stream environment (thus there was little likelihood that the length of channel and area of mitigation would persist). WET (2014) also proposed to build new artificial channels in the downstream-most 6,000 ft of th Sonoita Spring Ranch parcel. This reach is characterized by dynamic geomorphic functioning and consequently high ecological value. The new, artificial channels were proposed to increase acreage of stream channel, but would have negatively impacted the functioning of the habitats already existing there.

In the most recent incarnation of the proposal, the downstream reaches are fortunately to be left alone, but upstream WET (2017) proposed to fill in 8.9 acres of the existing channel of Sonoita Creek, and to construct an artificial replacement channel with higher sinuosity, claiming mitigation credits for the new channel. This was justified largely on WET's assertion that the existing Sonoita Creek channel is so degraded as to have essentially no ecological value or function, but the document provides no data or analysis to support this claim. The new proposal suffers from many of the flaws of the earlier proposal.

Unsuitability of Sonoita Creek as Mitigation for Loss of Headwater Stream Habitats
As noted in my 2017 comments, the project proponents have been unable to identify suitable opportunities to mitigate for the destruction of headwater stream habitats at the proposed mine site. The proposal to use an artificial channel on Sonoita Creek as mitigation is fundamentally flawed in light of the very different character of Sonoita Creek and its location in a different watershed. WET (2018) did not provide convincing evidence for the implausible claim that Sonoita Creek would be suitable as a mitigation site for the very different stream environments that would be impacted by mine.

Repeated Assertions
WET (2018) repeatedly asserts many claims, mostly repeated from the assertions in its 2017 report, without providing new evidence or logical support for the assertions. For example, on p.1 WET (2018) asserts, "The creek is extremely limited in its capacity to dynamically respond to natural variability in flow and sediment regimes through mutual adjustments to all dimensions of the channel. This ultimately diminishes geomorphic complexity and the amount and diversity of instream and floodplain habitats." While these are fine words, the claim is not supported by sound scientific analyses. Nonetheless, these two sentences are repeated *word-for-word* on p.3. Presumably, the authors believed that by repeating the claims enough times, reviewers without a strong technical background might eventually accept the assertions.

Sinuosity and Misrepresentations of My 2017 Comments
In my 2017 comments, I noted the high sinuosity of the proposed artificial channel (Figure 1), and I pointed out that many stream reconstruction projects elsewhere had failed by the channel cutting across meander bends and creating a straighter channel than what had been constructed. This is a serious concern, especially because the generous credits the proponents claim for the artificial channel are based on the unnaturally large meander bends proposed and the consequently increased length of the channel. I noted that the sinuosity of the Sonoita Creek channel in Rail X Ranch and from the 'reference reach' downstream to the point where Sonoita Creek begins to follow Hwy 82, and the sinuosity of Walnut Gulch on the 'reference reach' identified by WET, were all approximately 1.07, much lower than the sinuosity of the ideally meandering, artificial channel proposed by WET.

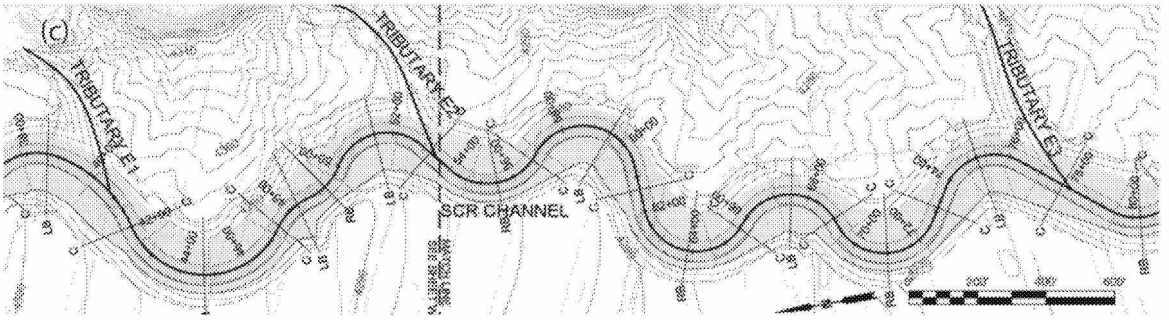

Figure 1. Design for artificial channel proposed to replace Sonoita Creek, showing sinuosity of over 1.36 from confluence of Tributary E1 to Tributary E3 (detail from WET Drawing 11, excerpted from my 2017 report).

WET (p.8) misleadingly claims that I presented "...1.07 as the sinuosity value that should apply to the proposed channel..." This is false. At no point in my report did I "present" any sinuosity value "that should apply" to an artificial channel in the Sonoita Creek valley. As no scientifically valid case has been made for filling in the existing Sonoita Creek and replacing it with an artificial channel, I do not propose any sinuosity for a channel that should not be built.

WET created a strawman - that I proposed a sinuosity for their proposed artificial channel - and then attacked this strawman. This is an old rhetorical trick. Such tricks have no place in a scientific report. On p.9, WET (2018) stated, "...oversimplifying the channel design with a single uniform sinuosity of 1.07 increases specific stream power and the possibility of channel incision on reaches with steeper valleys." Combined with the prior false statement, this statement clearly implies that my report recommended "oversimplifying the channel design with a single uniform sinuosity of 1.07." This is a misrepresentation and a falsehood.

I invite readers to look closely at my 2017 report. I make no proposals for sinuosity for the artificial channel proposed by WET. WET's claim that I did, and then attacking the supposed 'proposal,' are distortions and falsehoods. Such falsehoods only undermine the credibility of the WET report.

Likelihood That the Artificial Channel Will Fail

In attempting to argue against my critique of the highly sinuous artificial channel proposed, WET (p.11) states that the proposed artificial channel is designed to be flanked by low, easily inundated benches, so that "significant storm events with a flow depth great than 2-feet deep will have a straighter flow path..." Thus, the flow path at higher flows will be straighter, cutting across meander bends. WET introduces a new variable, "dominant sinuosity" of the channel, which WET (p.11) defines as the "sinuosity of flood inundation during the 5-year event," and which will be much lower than the sinuosity of the active channel visible on the plans presented by WET (2017). Introducing this new variable serves to confuse the discussion of sinuosities. It is important to recognize that "dominant sinuosity" is not an accepted term in fluvial geomorphology. Rather, it is a new creation, part of the onslaught of words presented by WET (2018) in its response to my 2017 report. While these words (and their accompanying tables and figures) can initially give an impression of substance, in the end they are mostly irrelevant and fail to support the WET arguments.

More importantly, however, the acknowledgement by WET that high flows will cut across the meander bends supports my point that flood flows are likely to cut across the exaggerated meanders and create a straighter path, eroding the unprotected sediments in the channel banks. The result is likely to be that meander bends will be abandoned and a straighter channel will result, offering far less mitigation acreage than promised for the highly meandering artificial channel proposed for construction.

WET asserts that the examples of failed channels I presented in my 2017 review were not applicable to Sonoita Creek. WET (2018, p.6) makes a valid point that the examples I cited were projects with banks protected by rock and large wood, whereas the banks of the

artificial channel proposed for Sonoita Creek would not be protected, but would be free to erode and adjust. However, this means that if anything, the channel bed and banks of the proposed artificial channel would offer even less resistance to erosion than the examples presented in my report. As flood flows cut across the meander bends of the proposed artificial channel, there will be nothing to prevent these straighter flood flows from carving a straighter channel and cutting off the long meander bends ('chute cutoff'), which is precisely what occurred on the streams whose case studies I presented in my 2017 report. As acknowledged by WET (2018, p.14), "chute cutoff is a natural response in dryland river of this type, and would not trigger channel maintenance." Thus, once the meanders cut off, they would not be rebuilt.

The proposed design of the artificial channel encourages flood flows to cut across the meander bends, which will almost certainly result in meander cutoffs, which will not be repaired. The straighter channel that results will not have the large mitigation acreage that the proponents seek in the highly sinuous artificial channel they propose.

Conclusion

The findings in my 2017 report (*Review of the Sonoita Creek Mitigation Project Proposal for the Proposed Rosemont Copper Mine)* remain valid. The WET (2018) report adds nothing new of substance. The proposed mine would destroy 103.6 miles of ecologically valuable headwater stream habitat. These impacts cannot plausibly be mitigated by manipulations of the channel of Sonoita Creek, a very different stream system in another watershed. The ever-morphing proposals put forth to manipulate Sonoita Creek are not scientifically sound. As currently proposed, WET proposes to fill reaches of the existing creek and to build a highly meandering artificial channel. However, as acknowledged by WET (2018), at high flows the stream would cut across meander bends in a straighter flow path. As this excavated channel will consist of unprotected sediments, it will offer little resistance to erosion by these straighter flows. Meanders will cut off and a straighter stream channel will result, as has been documented in other such artificial meandering channel projects. The resulting straighter channel will not have the mitigation acreage promised from the meandering artificial channel.