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Reviewing Officer
USFS Southwest Region
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Dear Sir:

I am hereby filing a list of Formal Objections to the Final Environmental Impact Statement for the Rosemont Copper Project, located in the Coronado National Forest, Nogales Ranger District, Jim Upchurch, Forest Supervisor (responsible party).

I believe I have legal, statutory and professional standing to provide compelling objections to this FEIS. I live near Madera Canyon, about 9 miles from the proposed mine, and well within the areas of environmental concern and impact of the mine. I hold a Ph.D. in geochemistry, and my research over the past 50 years has had a major focus on the kinetics and thermodynamics of chemical interactions between natural waters and various rock types, with a specialization in the isotopic geochemistry of lead (Pb) as a tracer of water-rock reactions. I was a full professor at M.I.T. for 15 years, and a Senior Scientist at the Woods Hole Oceanographic Institution for 20 years (now Emeritus from that institution). I have published more than 230 peer-reviewed papers, and am a member of the American Academy of Arts and Sciences, and the National Academy of Sciences. I am by any measure qualified as an Expert Witness with respect to commenting or testifying on the geochemical aspects of this FEIS.

I provided extensive comments to the Draft Environmental Impact Statement (dated and submitted January 16, 2012; referred to in Appendix G of the FEIS variably as letter # 14126 or # 14273). Responses by the USFS were provided in Appendix G, pdf files # 671, 804, 875, 901, 905 and 906.

In my 10 pages of objections (attached), in each case I have listed my original comment to the DEIS, a synopsis of the USFS response in the FEIS, my resulting objection in detail, and a suggested remedy. Note that not a single one of my original complaints actually got "fixed", nor were they specifically addressed except in generalities. The general "solution" was to acknowledge the complaint, and refer to several 3rd party peer reviews (post-DEIS) of the original data and reports underlying the DEIS. These were typically deemed to uphold the original decisions made in the DEIS. Even in clear matters of "fact", there was no specific admission of error, or attempt at correction. I fully understand what an incredible effort is required to respond to thousands of comments, many of which are lengthy and detailed. Be that as it may, the NEPA process requires this effort, and it stuns me that this FEIS was deemed acceptable as an FEIS.

Best Regards,

Stanley R Hart

Stanley R. Hart

Objections from Stanley R. Hart February 8, 2014

Issue 1. Inadequate or Undefined Physical and Mineralogical Nature of Test Samples.

Hart Comment (Letter #14126 – p. 2):

2. Laboratory Leaching Experiments. Three different types of experiments were utilized by Rosemont to assess the likelihood of leaching of toxic elements from the tailings pile (or from the exposed open pit rocks, or the waste rock piles). Note that some information about the details of these experiments is given in the DEIS appendix materials, other information is derived from provided references, and I have inferred the rest from standard protocols for these tests. While some of the tests conventionally specify a **grain size** for the test rock powder, no such information could be found in the DEIS. **This must be provided in the EIS**. Clearly this is a major variable in the experiments, as leaching of a fine-grained powder will be much more effective than leaching of a coarse-grained powder. Since the copper mineral extraction processes are only effective with very fine-grained powder (probably 20-50 micrometers?), it is incumbent upon Rosemont to show in the EIS that weathering and leaching of such a powder does not lead to a violation of AAWQ Standards.

USFS Response: FEIS Appendix G, File 906. Basically refers the reader to Vol. 2 of the FEIS, which refers the reader to peer-reviews of earlier reports.

Objection: The response does not illuminate the question. Under Dust Control (vol. 2, p. 287), it is mentioned that relatively larger grain sizes than normal would be derived from the grinder (80% passing 150 mesh, instead of 250-325 mesh). However, the grain size is dictated by the metallurgical requirements, and cannot be adjusted solely based on dust control issues. This is a crucial point in interpreting the leaching experiments, because the leaching efficiency is a strong inverse function of grain size (see page 6 of Hoag, Sieber et al, 2012). Other aspects of the leaching techniques are also important, but not defined in the FEIS or project record. Was there any flotation fluid present during leaching (the tailings material will certainly contain some flotation fluid)? What is the chemical nature of the flotation fluid? What was the temperature of the leaching experiments (the surface of the tailings piles will be quite hot during summer monsoon rainfall)? While the lithology of various samples utilized for leaching is provided, nowhere is the mineralogy quantitatively specified – i.e. were typical ore minerals present? Both sulfide and oxide? In what modal abundance? This is important because the ore minerals are typically also the host for many of the toxic elements. The issue of mineralogical studies was brought up repeatedly in comments to the DEIS. Peer reviews of earlier reports (e.g. Hoag, Bird and Day, 2012) on the one hand emphasize the need for thorough mineralogical studies, but then state that the earlier reports have done an acceptable job. In fact, the earlier reports contain virtually no quantitative mineralogical studies! By this I mean thin section evaluations aided by electron probe analyses, X-ray diffraction, etc.

Suggested Remedy: Supply the necessary documentation if available, and run additional tests under more realistic conditions. Conduct detailed mineralogical studies. Because these tests provide the basic starting data for the seepage models, and because numerous toxic metals are already exceeding or nearly exceeding AWQS, every detail of the tests must be carefully controlled and documented. Clearly, an amendment to the FEIS must be issued.

Issue 2. Humidity Cell Tests not Presented as Cumulative Values as Required by ASTM Protocol D5744-07.

Hart Comment (Letter #14126 - p. 2 and 3):
1.) Humidity Cell (HC): 1 kg of rock powder is exposed at 25-30°C to alternating humid and dry air, to facilitate oxidation of sulfides and other minerals. This powder is then extracted weekly for 3-4 hours with 0.5 kg of pure water, and this water is analyzed for a range of elements of interest. In the present case, the experiment was continued for 20 weeks.
2.) Meteoric Water Mobility Procedure (MWMP): 1 kg of rock powder is mixed with 1 kg of very weak nitric acid (here pH ~ 5.4), and agitated at room temperature for 24 hours. The resultant solution is separated and analyzed for a range of elements of interest.
3.) Synthetic Precipitation Leaching Procedure (SPLP): 1 kg of rock powder is mixed with 20 kg of very weak sulfuric acid (~ pH 5) and rotated for 24 hours at room temperature. The resultant solution is separated and analyzed for a range of elements of interest.

The HC test results appear to have been pooled in 5-week batches; these showed no detectable levels of Be, Cd, Cr, Pb, Hg, Ni, Se or Tl. Arsenic (As) and antimony (Sb) were above detection limits, but mostly just below or at AAWQ Standards. While these appear to be "long term" tests (20 weeks), each actual exposure of rock to a leach solution was only 3-4 hours. Furthermore, the test data **should have been provided as cumulative amounts extracted,** in addition to "concentrations per each extraction". If this total amount extracted is converted to concentrations with the experimental water/rock ratio of 0.5, then all concentrations will increase by a factor of ~ 20 times, and **many values will then be in excess of AAWQ Standards**. Note that this test is still far from the natural processes that will be taking place in the tailings and leach piles. Some appreciation of this can be gained from the "modified" humidity cell test proposed by Bouzahah, Benzaazoua and Bussiere (2010), which utilized a constant degree of saturation with no drying cycles. Cumulative sulfate extracted was 4.5 times that of the conventional Humidity Cell (e.g. ASTM protocol D5744-07).

USFS Response: FEIS Appendix G, File 906 (Also partly given in File 875 as letter # 14273). Basically refers the reader to Vol. 2 of the FEIS.
From Vol. 2. p. 376:

A variety of comments have been made regarding the sufficiency of the type and number of geochemical tests conducted by Rosemont Copper. Following the public comment period, the Coronado requested opinions from geochemical specialists on a number of these issues:
• It was determined that the number, type, and distribution of samples were sufficient to adequately support the geochemical modeling conducted to date (Hoag, Bird et al. 2012).
• It was determined that the nine samples used to represent the future tailings material were adequate in number and also were geologically representative of the future tailings material (Hoag, Bird et al. 2012).
• Some comments suggested that Rosemont Copper be required to conduct formal, detailed mineralogical analysis of waste rock samples. While this type of analysis may be useful for providing realistic constraints on model assumptions, it was determined that the mineralogy of the deposit was well understood and that detailed work would likely not appreciably change the results or conclusions of the geochemical models (Hoag, Bird et al. 2012). This issue remains a point of scientific uncertainty and professional disagreement, as previously

discussed.
• The EPA raised the concern that the synthetic precipitation leaching procedure (SPLP) results may under-represent concentrations in the geochemical models. This issue had been addressed through the peer review process of the geochemical modeling and was reevaluated in light of public comments. It was determined that the synthetic precipitation leaching procedure data were indeed appropriate for use in the geochemical models (Hoag, Sieber et al. 2012).

Also from Vol.2, page 471, as a monitoring mitigation:

Additional waste rock and tailings characterization (FS-GW-03). During operations, additional waste rock characterization tests, above and beyond those required by the aquifer protection permit, would be required to be conducted on waste rock and tailings. This additional analysis includes requirements for humidity cell testing, whole rock chemistry, and mineralogical analysis in addition to the acid-base accounting and leachate testing already being conducted for the aquifer protection permit.

Also from Hoag, Sieber et al 2012, page 4, regarding use of the SPLC leaching method: "They have also documented that scaling the SPLP results for Rosemont rock materials is not necessary to match the results expected in HCTs because SPLP results for many constituents are higher than those found in the HCT results (Tetra Tech, 2010o)".

Objections: The SPLP leaching test involves a single 24-hour interaction between 1 kg of rock powder and 20 kg of very weak acid. This is to be compared with the Humidity Cell Test (HCT) that leaches 1 kg of rock powder for a few hours each week for at least 20 weeks. Clearly the HCT is more realistic of natural field conditions, whereby the tailings, for example, are only sporadically exposed to rainfall, where the amount of rock exposed to a given volume of rain is small, and where the rock is otherwise exposed to oxidation by air in the interim between rainfall events. One review of the existing Rosemont leach studies (in NFS parlance then, a "peer-reviewed study) had this to say about SPLP tests:

One of the observations from the peer-review by SRK, page 12 ((Hoag, Bird and Day, 2012): "The SPLP results on two tailings samples (Tailings-022807 and Tailings-05 June 2007) were non-detects for arsenic. This may not be relevant as tailings are rinsed thoroughly during metallurgical test work, and therefore leachable concentrations in the test results are expected to be low".

One of the recommendations from the same peer-review by SRK, page 30 ((Hoag, Bird and Day, 2012): "Geochemical modeling inputs should incorporate humidity cell and on site test work results on mined and weathered materials rather than SPLP/MWMP on drill core wherever possible".

ADEQ supports the use of SPLP tests, as that is the standard specified in the Arizona BADCT Mining Manual. However, by Arizona Statute A.A.C. R18-9-A202(A)(8)(a)(i), it must be shown "*That the facility will not cause or contribute to violation of an Aquifer Water Quality Standard at the applicable point of compliance*". Surely the USFS should be more sensitive to Arizona statutes than to the minimum requirements stated in the BADCT Manual.

So it appears that there is significant support for using the HCT as a relevant source of data for input to the Fate and Transport models. However, and most critically, there is no understanding in the FEIS or any of the supporting record that the HCT results are to be aggregated or cumulated, not treated as single week analyses. In other words, the effect of toxic element seepage on the aquifer will depend on the sum of all the leached materials over time, not on the single one-week result of an SPLP test. The ASTM Protocol (D5744-07) for Humidity Cell testing fully documents this in Section 12.9.1, and Equation 8. Using results from Rosemont's own studies (Aquifer Permit Application, Appendix Q, pp. 244-264), samples of arkose and andesite from the Willow Canyon Formation (which makes up 40% of the early waste rock to be removed) were Humidity Cell tested for 35 weeks. Not only were most of the weekly arsenic and antimony values above federal standards for groundwater, when cumulated for 35 weeks the arsenic concentrations were 0.66 and 0.75 mg/L, and the antimony was 0.49 and 0.53 mg/L respectively. These values are 60-90 times higher than federal standards. If used as starting concentrations for the Seepage, Fate and Transport modeling, the results would prohibit granting of an Aquifer Protection Permit. To be clear, I know that such a permit has been in fact provisionally granted, but it is currently under appeal, partly for exactly the issues expressed here. The granting of an APP by ADEQ cannot be used by the USFS as justification for giving Rosemont a pass in the FEIS.

Suggested Remedy: Further leach testing is unnecessary, as the existing data are already sufficient to be used as starting values for new seepage, fate and transport modeling. This will almost certainly show massive exceedances for As, Sb, Tl, Pb, Cd, and possibly other toxic elements. There is no way to "mitigate" this problem except to fully line the tailings and waste rock storage facilities with a geo-membrane system. The FEIS and ROD must be amended to reflect this reality.

Issue 3. Many Deficiencies in Analytical Protocols, Reporting of Results and Failures to meet AWQS.

Hart Comment (Letter #14126 - p. 3):

The MWMP and SPLP experiments are quite similar, differing only in the choice of leaching acid, and the water/rock sample ratio chosen. In principle, the SPLP results can be expected to be up to 20 times lower than those of the MWMP tests, simply due to the dilution effect of using 20 times more solution per weight of rock powder. As with the HC tests, because of the short duration of the test, most of the results are near or below detection limits. Note that in general the blanks and detection limits of the analytical methods utilized by SVL Analytical were substantially lower (factor of 10) than the AAWQ Standards concentrations. However, for thallium, the detection limit was much higher than the AAWQ limit; for antimony, the detection limit was the same as the AAWQ value; for arsenic, the detection limit was only half of the AAWQ limit. This is clearly too close for comfort with these three important toxic elements.

Looking only at the MWMP results, which will always be higher than the SPLP results, the elements Be, Cd, Cr, Pb, Hg, Ni, Se are generally well below AAWQ Standards. The upper limits given for thallium was 7 times the AAWQ standard, so Tl cannot be eliminated as a problem. Similarly, antimony had a detection limit 3 times the AAWQ Standard, so is potentially a problem. Arsenic had a similar problem in tests on the 2010 samples, but was below the AAWQ Standard for tests on the 2007 and 2008 samples. So, even given the short duration and questionable applicability of the various leaching tests to natural situations, several toxic elements were shown to be above AAWQ Standards. This issue cannot be sanitized with summary statements such as "Potential seepage from dry-stack tailings is expected to meet current Arizona Aquifer Water Quality Standards" (DEIS page 295).

USFS Response: FEIS Appendix G, File 875 and 906. Basically refers the reader to Vol. 2 of the FEIS, which then refers to and summarizes several peer-reviews of earlier reports (e.g. Hudson and Williamson, 2011; SWCA Revised Analysis, 8/25/13; Rosemont Copper, 2012f). These peer-reviews are in general critical of the way in which analytical data are presented, and sometimes critical of the quality of the data itself. But the peer-reviews may then conclude that the original reports provide adequate justification for the conclusions drawn – the FEIS then translates this final finding into the FEIS without actually trying to fix anything, or even deem something unacceptable.

Objection: The data reporting status has become even more confused since the DEIS was issued! Even casual readings of the FEIS and associated peer-reviews reveal this situation. Dissolved concentrations are not always distinguished from "total" concentrations, entries in a data table (e.g. table 71, vol.2 FEIS) are frequently listed as "not present", the meaning of which is given as "either not detected and therefore not modeled, or was below detection limits in the modeled seepage". There is no excuse for allowing this kind of ambiguity. There are still cases where the detection limits are above the AWQS (or other applicable standards). For example, the EPA drinking water standard, and the AWQS for thallium is 0.002 ppm, yet various data tables may range in detection limits for Tl from 0.0001 to 0.050 ppm! Where exceedances are provable, the FEIS may actually assert that these are not common, and not significant given a larger body of values that meet a standard. An exceedance is an exceedance, and simply must be dealt with! It cannot be "averaged out" by some manipulation with other data.

The situation with arsenic is a complete muddle, because of the discordance between AZ standards and Federal standards, and therefore because of the persistent issue of labeling groundwater different from surface water. The USFS has completely abdicated their responsibility here, and allowed Arizona, through ADEQ, to put the FEIS in an untenable position. The USFS has a stated policy of recognizing the general connection between surface water and groundwater, and they should assert this as a guiding principle. Drawing a distinction between a shallow alluvial aquifer and a regional groundwater aquifer is not a distinction in "connectivity" but only one of time scale on which the connectivity operates. To conclude, for example, that the lower Davidson Canyon is not hydraulically connected to the regional aquifer is incorrect (FEIS vol. 2, p. 539). The application of the Anti-Degradation" criteria would then place very stringent limits on As in Davidson Canyon, as the base flow As levels are all below even drinking water standards.

Suggested Remedy: The sensible way forward is make the aquifer and surface water As standards the same, and then apply the "connectivity principle" to both the Outstanding Arizona Waters "Tier 3 Anti-Degradation criteria", and to the modeling of the impacts of arsenic (and other toxic elements) on the aquifer arising from the Rosemont mine.

And here is what should have been a show-stopper for the FEIS, from Page 549, Vol. 2: "Furthermore, based on discussions with ADEQ on preliminary drafts of the FEIS, it was made clear to the Coronado that the responsibility and jurisdiction for assessing whether the mine meets anti-degradation criteria lie with ADEQ. The person seeking authorization for a regulated discharge to a tributary to, or upstream of, an Outstanding Arizona Water (in this case Rosemont Copper) has the responsibility to demonstrate to the State of Arizona that the regulated discharge will not degrade existing water quality in the downstream Outstanding Arizona Water. This demonstration by Rosemont Copper, and determination by the State of Arizona, has not yet been completed." This disconnect between ADEQ and Coronado must be first resolved, and then given consideration, either by amending the FEIS, or by issuing a negative ROD.

Issue 4. Lack of a Microbial Component in Leach Tests

Hart Comment (Letter #14126 - p. 3):

1. Biological Issues. Note that all three experimental leaching tests were strictly inorganic (abiotic). It is well known that the presence of organic acids and active biological processes can increase weathering and leaching rates of some toxic metals by huge factors (e.g. White and Brantley, 1995; Erel et al., 1990; Stille et al, 2011). Therefore, in actuality, the results from the leaching experiments discussed here should all be viewed as lower limits, with the leaching rates under field conditions certainly higher, and probably much higher.

USFS Response: FEIS Appendix G, File 906. Basically refers the reader to Vol. 2 of the FEIS, without any mention of a biological component in the leaching experiments. There is also no mention in Vol. 2, or any of the post-DEIS reports or references in the project record. Note that there are references to "biological treatments" or "bioengineering", particularly in Hudson and Williamson, 2011, but these refer to attempts to clean up dirty waters with biological sequestration – this is NOT what we are talking about in this present argument.

Objection: It is absolutely clear that this issue has been totally ignored, despite my initial comments on the DEIS. While it might appear convenient to dismiss the problem by claiming there is no significant active microbial activity in the dry Rosemont "desert", this would be an incorrect assessment, or at the very least an assessment demanding robust validation.

There is in fact no information whatsoever regarding microbial activity in the tailings discharge, or in the aging tailings pile. From a regulatory perspective, the Arizona Mining Guidance Manual (BADCT) is clear: "The Arizona Administrative Code (A.A.C.) R18-9-A202(A)(4) requires that a summary of the known past facility discharge activities and the proposed facility discharge activities be conducted to indicate all of the following:

- The chemical, biological, and physical characteristics of the discharge;
- The rates, volumes and frequency of the discharge for each facility;
- The location of the discharge."

For a small sampling of the voluminous literature on the subject of microbial acceleration of rock leaching, there is a reference list of 17 scientific papers given at the end of this filing (Banfield and Nealson, 1997; Barker et al, 1998; Bennett et al, 2001; Bouzahzah et al, 2010; Drever and Stillings, 1997; Hausrath et al, 2009; Hesketh et al, 2010; Kalinowski et al, 2000; Liermann et al, 2000; Liermann et al, 2005; Neaman et al, 2004; Roden, 2008; Santelli et al, 2001; Santelli et al, 2009; Santelli et al, 2011; Staudigel et al, 1998).

Suggested Remedy: Aside from lining the tailings piles with a full geo-membrane, there is no way around this problem except to run more experiments under well-designed and carefully executed conditions. There is a huge literature on this subject that should provide guidance to designing useful experiments. Because these leaching tests provide the basic starting data for the seepage models, and because numerous toxic metals are already exceeding or nearly exceeding AWQS, every detail of these tests must be carefully controlled and documented. Without these tests, the existing Infiltration, Seepage, Fate and Transport modeling is absolutely incomplete and cannot be used to certify protection of the aquifer. The FEIS then must be considered inadequate, and a negative ROD must be issued.

Issue 5. Lack of Leach Test Data on Oxide Ore Lithologies.

Hart Comment (Letter #14126 - p. 3 and 4):

4. Sample Selection Issues. There is a lack of clarity regarding the selection of the samples that were used in the leaching tests. For example, the "2010 samples" were chosen to comprise the five major rock types making up the sulfide ore material, plus one composite sample representing the actual mixture of rock types to be mined during years 4 to 7. There appears to be an intention to focus on the sulfide ores, and no direct mention is made regarding leach tests of the oxidized ore. This material will be primarily mined in preproduction, and in years 1, 2 and 5, and will be intentionally strongly leached in a heap leach facility (where seepage can be captured). However, some parts of the sulfide ore will also contain oxidized ore minerals that will end up on the tailings pile after sulfide extraction, and these may have a drastically different behavior during the various leach tests. If leach tests of this material have been performed, they should be discussed. If not, either tests should be made, or reasons given as to why they are not needed.

USFS Response: FEIS Appendix G, File 906. Basically refers the reader to Vol. 2 of the FEIS. However, the FEIS does not address this issue at all, nor does any of the peer-reviews or reports of record.

Objection: With the proposed plan to eliminate the heap leach facility, the problem of leaching and seepage from the oxide ore becomes even more critical. The samples that have undergone leach testing to date do not obviously include oxide ore (and in fact it is not clear that any of the leach samples actually are "ore grade, either oxide or sulfide – see Attachment D, Hudson and Williamson, 2011). While it may be argued that the oxide mineralogy is closer to being "in equilibrium" with near-surface oxygenated conditions, there is no *a priori* way of translating this into quantitative "leachability" information.

Suggested Remedy: As recommended under Issue 4, one possible remedy here is to do additional leach testing of drill core composites that accurately represent both the oxide material that may be stockpiled, and the mixed oxide/sulfide ore grade material that will end up on the tailings piles. These tests must include Humidity Cell tests that have an active microbial component, the data must be cumulated according to ASTM protocol, and this must then be used as "starting values" for new seepage, fate and transport modeling. This effort will almost certainly lead to a finding of aquifer contamination, and the only remedy for this is a fully lined geo-membrane system (in other words, treat the waste rock, storage rock and tailings in the same way as had been proposed for the heap leach facility). Note that such a liner system would likely pre-empt the need for any further leach testing.

Issue 6. Numerous Problems with the Infiltration, Fate and Transport Modeling.

Hart Comment (Letter #14126 - p. 5):
5. Flow modeling issues. In addition to the inapplicability of the laboratory experiments, the hydrologic "sink" or "trap" created by the open pit is frequently cited as a factor in sequestering groundwaters contaminated by seepage from the tailings pile. While there is unquestionably a local "sink" produced by the open pit, there must also be a flow gradient driving groundwater off the property. This was perhaps not revealed by the modeling because the boundaries of the hydrodynamic model may have been set too close to the Rosemont property. With the bottom of the pit eventually reaching about 3000', there will be a hydrodynamic gradient toward any distant surface elevation below 3000'. The question isn't whether flow will be driven in such a direction, but whether the flow will be important. This will depend on the permeability of the intervening formations. The flow model needs to be adapted to address this issue, and at least demonstrate that such flow will be inconsequential. There is a statement on page 291 that appears to admit that groundwater beneath the tailings stack will move northward and eastward (away from the open pit). If true, and if this groundwater exceeds AAWQ Standards due to seepage from the tailings pile, or the open pit itself, then regional aquifer contamination is possible. Quantitative modeling must be used to deny this possibility, using more realistic input "seepage" water concentrations than those discussed above.

A further issue with the flow modeling is the fact that it was done assuming homogeneous porosity/permeability (porous media assumption). **No models were run in which the presence of high permeability hydrologic paths were included.** In fact, the DEIS admits (pages 217-223) that there were difficulties in calibrating the model on the west side near the mine pit, because a porous flow model was used where fracture flow conditions were involved. The geology of the ore body is well delineated, and there are numerous steeply dipping shear zones and through-going faults contained within the ore body, and to a lesser extent within the bedrock underlying the area where the tailings piles will be located. **These will clearly provide pathways for more rapid dispersal of toxic metal solutions into the groundwater.** I understand fully the computational difficulty of running multi-scale permeability models, and it is likely that the existing modeling does meet BADCT standards. However, as the burden of proof is here upon Rosemont, at least **a few flow models containing heterogeneous high-speed paths must be run**, in particular using the major know faults and shear zones. This information should then also be used to re-consider the locations of the monitoring wells.

USFS Response: FEIS Appendix G, File 905. For the first paragraph of my DEIS comments here, the reader is referred to Vol. 2 of the FEIS, where general comments are included about groundwater flow, and seepage modeling. These comments are then documented by reference to numerous "peer reviews" of the prior project record (O'Brien, 2013; Hoag, Bird et al, 2012; Hoag, Sieber et al, 2012; Rosemont Copper, 2012f; SWCA 2013k; Hudson and Williamson, 2011). Largely, these reviews re-iterate information existing at the time of the DEIS, and add very little substantive response to my DEIS comments.

For the second (and very important) paragraph of my DEIS comments here ("A further issue . . ."), **I could find no USFS response whatsoever in any of the Appendix G files.**

Objection: The infiltration, seepage, fate and transport modeling are still incomplete and fail to address numerous important issues. When initial tailings and waste rock are emplaced (first several years), they will be thin, un-compacted, and will not have the hydraulic conductivity profiles that were modeled. There will be no "cone of depression" from the open pit, thus all groundwater flow will be "downhill", and not captured by the open pit. As the tailings pile builds up, it will be variably compacted by dust-control measures, and will not have a homogeneous permeability structure. It will certainly not start out with the extremely low hydraulic conductivity that was chosen for the modeling. Likewise, the underlying alluvium and bedrock will have many high permeability paths. None of this complexity has been actually modeled. The FEIS tries to circumvent this failure by repetitively mentioning one of the outcomes that arose from the preliminary modeling effort, namely that the total seepage from the tailings pile would be only 8 gpm. This indeed sounds trivial, but to "put it in context", this is 4.2 million gallons per year!

Suggested Remedy: Run a full 3-dimensional Infiltration, Seepage, Fate and Transport model, with moving boundaries, presence of flow localization both in the tailings pile and in the substrate, rainfall that mimics the 3-day 13" black swan events that have actually occurred in SE Arizona, etc etc. Because the simplistic modeling that was used for the DEIS and FEIS already shows substantial seepage, and the leaching tests already show some AWQS exceedances (and there will be many more if the aggregated Humidity Cell test data is used), the full 3-D modeling suggested here will undoubtedly indicate major contamination of the aquifer. A negative ROD must be issued, and the FEIS remanded until Rosemont can consider the economics of a full geo-membrane liner under at least the tailings pile, and possibly under the waste rock pile as well.

• all of these are attached as hard copies.

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- please keep these references with Hart's cover letter and 10 pages of objections.