January 18, 2012

Jim Upchurch, Forest Supervisor
Coronado National Forest
c/o Rosemont Comments
P. O. Box 4207
Logan, Utah 84323

Re: Draft Environmental Impact Statement for the Rosemont Copper Project, A Proposed Mining Operation, Coronado National Forest, Pima County, Arizona, September 2011

Dear Mr. Upchurch:

Attached please find comments regarding the Draft Environmental Impact Statement (DEIS) from Pima County and the Pima County Regional Flood Control District, collectively referred to as Pima County in this letter. Pima County previously provided comments on the Administrative version of the DEIS under our Cooperative Agreement with the Forest Service for this project. This current set of 682 comments reflects a broader range of community-related issues, as well as the concerns we have as an affected landowner and as a regulator.

I am impressed with staff work presented herein. County staff generated new data and original analyses on a variety of technical issues for which we have expertise. In addition to providing technical review of the DEIS, staff reviewed a number of Rosemont’s reports that provided the basis for the DEIS conclusions. In addition, reviewing departments collaborated with other professionals on key air, water and geological issues. This work coincided with the holiday season, the County’s participation in the DEIS public hearings the power line siting process, and the public comment period for the Clean Water Act Section 404 permit comment period for the mine.
The Lack of Basic Data Substantiates the Need for a Supplemental EIS

Despite the passage of three years, basic data about some affected resources is either missing or not taken into account by the DEIS. The alternatives analysis is still inadequate and demonstrates that federal agencies have not taken a hard look at ways to avoid and minimize the impacts of this major project, nor have the indirect and cumulative impacts of the project been adequately considered. There are project facilities that are not even described in the DEIS. The engineering design, impact analysis, and mitigation and monitoring are all so grossly inadequate they should have never been presented for public comment, let alone agency review.

In short, the DEIS is so deficient it has short-circuited the public comment process. As communicated in my letter of December 14, 2011, Pima County would like to see the Forest Service issue a Supplemental EIS to provide due process for the affected communities to comment on issues and findings that have been or are ill-defined or unresolved in the DEIS, as well as to provide full disclosure of the project facilities.

The Supplemental EIS should include a backfilling alternative and a new modified pit alternative. Modified pit configurations, as well as complete or partial backfilling of the pit, could significantly reduce long-term environmental damage and other direct, cumulative and secondary impacts (Attachment 1). Because the pit lake will irreparably impact Waters of the United States and area springs for thousands of years, a thorough analysis of the backfill alternatives is justified and prudent.

The Supplemental EIS should also include disclosure of the Arizona Department of Transportation’s $76 million proposal to improve State Route 83 as a connected action and analysis of the impacts that would be caused by this directly related proposal. Currently, the DEIS fails to include this project and provides no quantification of the improvements that would be necessary to mitigate significant transportations impacts to State Route 83. It similarly fails to include actions that would be necessary to mitigate impacts to county and city roads from mining trucks hauling copper and machinery to and from the Port of Tucson.

The Need for Additional Studies Repeatedly Ignored

However, before the Supplemental EIS would be issued, we see the need for additional studies to answer key questions about resources and impacts, especially regarding the following:
✓ Surface water resources
✓ Groundwater-dependent ecosystems and their connections to the project area
✓ Faults and fractures in the vicinity of the mine
✓ The existing directions and rates of groundwater movement
✓ Air quality, especially fugitive dust and ozone
✓ Geochemistry
✓ Socioeconomic impacts
✓ Engineering design
✓ Floodplain hydrology and impacts
✓ Effects to the Ce:wi Duag, considered a traditional cultural place by the Tohono O'odham Nation and possibly others

For the most part, these study requests are not new; Pima County and other cooperators have been requesting these studies be done for months, if not years. To judge from the comments I have seen from other state and federal agencies, Pima County is not alone in feeling that the cooperators' requests for additional study have been ignored in the EIS process. For example, the State Historic Preservation Office also requested that additional documentation be provided to document the traditional and contemporary uses and sacred value of Ce:wi Duag by the Tohono O'odham and possibly other groups. Lacking such documentation precludes full disclosure of how the mine may impact this traditional cultural place and the traditional communities who value this place.

Going forward, Pima County would like to work with the Forest Service to define and review studies through open discussions among the agencies and cooperators with subject matter expertise. We recognize that the federal agencies must retain their individual authorities and discretion in this process.

Flawed Stormwater Models Cause Concern for Human Safety

Because of grave concerns for human safety and welfare, I would like to single out surface water evaluation and floodplain-related studies for special mention. The Pima County Regional Flood Control District states that the rainfall, runoff and sediment transport modeling methods are flawed and underestimate the potential impact of flood events. The District’s comments are based on national standards for rainfall and runoff in this region using the U.S. Natural Resources and Soil Conservation (NRCS) methods and data and standards from the National Oceanic and Atmospheric Administration, U.S. Geological Survey and the Federal Emergency Management Agency (FEMA). These federal standards and methods for flood control, dam safety and surface water quality are extremely relevant for proper evaluation of the DEIS as well as public safety concerns. This in turn affects the safety of the engineering being used to design the Rosemont mine.
These concerns were included in our review of the Administrative version of the DEIS as a Cooperator. The response we received characterized our concerns as “a case of professional disagreement... The purpose of the [floodplain] modeling is not to obtain a Pima County permit or satisfy specific regulatory requirements; it is to analyze impacts for the purpose of the DEIS.” We could not disagree more with this statement as the data used for the DEIS surface water evaluation do not meet the national standards. For example, NRCS standards are to use rainfall values reflective of the centroid of the watershed, not a downstream volume as used in the DEIS, which misrepresents the mean rainfall value of the watershed. Further, for impoundment situations, all federal agencies such as FEMA use critical storm events to evaluate and regulate dam safety design requirements. Our comments are not local regulatory requirements; they instead reflect the various federal regulations and standards for surface water hydrology for the protection of public safety and the environment. For all of these reasons, the Forest Service’s lack of responsiveness to our concerns over surface water hydrology, repeatedly expressed during the EIS, remains a deep concern to us.

Summary

Staff comments, including a list of the contributors and their expertise, are included as Attachment 2. As background to all of our comments, and to ensure you have a complete administrative record for the DEIS, our submittal also includes a disk containing electronic files of previous correspondence as well as related documents substantiating the concerns we express herein (Attachment 3).

I cannot overstate our disappointment with the DEIS. Missing data, lack of meaningful alternatives analysis and minimal efforts to disclose indirect and cumulative impacts all lead to significantly inadequate mitigation and monitoring measures. Furthermore, the fatal flaws in this document are a disservice to this community and trivialize the valid concerns expressed by so many during this process. It is my understanding, however, that you have the ability improve this process through additional study and a Supplemental DEIS. We highly recommend you improve this substantially flawed document.

Sincerely,

C.H. Huckelberry
County Administrator

CHH/mjk
Mr. Jim Upchurch
Re: DEIS for the Rosemont Copper Project, A Proposed Mining Operation, Coronado
National Forest, Pima County, Arizona, September 2011
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CHH/mjk

Attachments

c: The Honorable Chairman and Members, Pima County Board of Supervisors
The Honorable Thomas Vilsack, Secretary, US Department of Agriculture
Corbin Newman, Regional Forester, US Forest Service
Melinda Roth, Forest Service Coordinator, Coronado National Forest
Marjorie Blaine, Senior Project Manager, US Army Corps of Engineers
Larry Voyles, Director, Arizona Game and Fish Department
Hank Atha, Deputy County Administrator for Community & Economic Development
John Bernal, Deputy County Administrator for Public Works
Jan Lesher, Deputy County Administrator for Medical & Health Services
Priscilla Cornelio, Director, Transportation
Carmine DeBonis, Jr., Director, Development Services
Jackson Jenkins, Director, Regional Wastewater Reclamation
Suzanne Shields, Director, Regional Flood Control District
Ursula Kramer, Director, Environmental Quality
Linda Mayro, Director, Office of Sustainability and Conservation
Nicole Fyffe, Executive Assistant to the County Administrator
Julia Fonseca, Environmental Planning Manager, Office of Sustainability & Conservation
Kathy Chavez, Water Policy Manager, Regional Wastewater Reclamation
General Format Inadequacies

1. The DEIS was not ready for release due to organizational deficiencies, in particular:

2. The lack of a Table of Contents with page numbers makes review extremely difficult. It is very hard to find what you are looking for. This is further exacerbated by the fact that all but the most capable computers crash when viewing some of the pdfs due to the large file size.

3. No list of Tables has been provided. Within the text the reader is asked to refer to Figure X, but no page number is provided. One example on page 407 refers to figure 14. Figure 14 is found on page 58, in a different electronic (pdf) file. Page number references should be provided when a figure is not on the pages immediately adjacent to the page on which it is referenced.

4. Throughout the report an incomplete citation style is used providing only name and date. Furthermore tables and narratives lack citations or definitions. Such a large document with different writers for different subject matter must include consistent use of terminology and provide complete citations to facilitate understanding. The DEIS fails in this regard. Numerous examples are provided below.

EXECUTIVE SUMMARY

General

5. The executive summary incorrectly uses the term “may” where impacts are known. As an example, “Issue 4” states that “(p)otential impacts may include loss of riparian habitat”. During the Cooperator’s process, per the agreement the County provided references to maps of Pima County Regulated Riparian Habitat. These maps should be considered to be one of the best sources of local habitat data. If these maps had been included in subsequent analysis as requested by the County, the Executive Summary could have correctly concluded affirmatively that there would be habitat loss. The use of “may” in this context is in error and demonstrates that specific County concerns have not been incorporated into the draft as provided for by the cooperators agreement and NEPA. Without complete inventory of environmental resources the EIS is inherently flawed and cannot begin to quantify impacts or appropriate mitigation. This vague language is repeated in the Biological Resources section of the Summary of Impacts. Therein when quantifying the loss of habitat the word could is used rather than will. As noted in comment 3 no definition of riparian habitat in this context is provided so that it is unclear if the over 213 acres of impacted riparian areas are in fact PCRRH, the proponents or the Coronado’s mapping.

6. The lack of differences between the impacts of the alternatives demonstrates that true alternatives have not been fully considered.

7. The DEIS contains at least two fatal flaws in the construction of its conclusions. First, the wrong parameters are selected to determine the extent of the impacts. Second the data are deemed insignificant if they are a small percentage of the
regional numbers. Such an approach used in a large study area ensures the law of large numbers will dictate an insignificant impact. A good example of these flaws is found in the Summary of Socioeconomic(s) and Environmental Justice Impacts. It states that there will be "no change in the costs of emergency services as a result of population increase...". Hiding impacts based on the large size of the assessment area does not identify or mitigate impacts. The real emergency responder cost impacts is identified in the Public Health and Safety Summary wherein it identifies a change from 30 accidents a year to as many as 107 due to the increase in large truck traffic and yet no cost increases are mentioned here or in the Executive Summary.

8. Impacts have been underestimated, mitigation success overestimated and bonding needs based upon inadequate measures. Performance bonding should be extended at least until the time required for revegetation success per the DEIS or preferably until vegetation has been replaced at current density and size based on monitoring. One of the main purposes of the DEIS and also a decision point for the Forest Supervisor is the adequacy of proposed mitigation, capability to succeed and bonding as assurance. The loss of 16,600 cubic feet of sediment from the watershed associated with all alternatives that have been modeled will increase downstream erosive forces and reduce infiltration. The Soils section also states that: "Reclamation is expected to approach historical vegetation climax conditions after 100 years." This should be accelerated. Pima County requires private landowners to replace riparian vegetation to existing structure within five years (PCC Title 16). While this clearly is not possible on a mine site, the mitigation proposed is woefully inadequate.

This paragraph fails to mention increased traffic-related deaths and injuries that are predicted to occur on area public roadways as a direct result of project-related traffic. The report states that fatal traffic deaths are expected to increase from one every three years to between three to six deaths every three years with the project (page 652). Based on US Department of Transportation guidance regarding the economic value of a life, $5.8 million per statistical human life, an incremental increase of 2 to 5 fatal traffic deaths every three years would equate to a value of $116 million to $232 million over the 20 year mine project.

10. Page x, Issue 11: Socioeconomic Impacts
This paragraph fails to mention the cost of public roadway repairs, maintenance, and replacement that will be required as a result of this project. Pima County estimates the total costs for these mitigation elements at $27.6 million, at today's cost of construction. However, the Arizona Department of Transportation has recently proposed to spend $76 million on State Route 83 improvements, ostensibly to safely accommodate mine-related traffic and truck traffic. The DEIS fails to disclose any cost estimates for roadway improvements.

11. This paragraph fails to mention the cost of public roadway repairs, maintenance, and replacement that will be required as a result of this project. Pima County estimates the total costs for these mitigation elements at $27.6 million, at today's cost of construction, exclusively of SR 83. ADOT's estimate of the cost of SR 83 is $76 million.
12. Page xi, Traffic Impacts
The discussion of mine related traffic is limited to State Route 83 - Sonoita Highway only and does not mention impacts to nearby roadways such as Sahuarita Road or Santa Rita Road.

13. Page xxv, Noise Impacts
The discussion of traffic noise is restricted to nearby residents, but some of the most affected residents may be several miles from the mine site. For a single example, there are approximately 100 residential lots within one-quarter mile of Sonoita Highway along the first .8 miles south of I-10. There is no assessment of traffic noise impacts on these affected populations.

14. Page xxv, Public Health and Safety
The statement "The proposed action would result in traffic increases up to... 356 percent by the end of mine life, with a corresponding decrease in traffic safety" does not convey the magnitude of the increase in traffic hazard. This is addressed in significantly more detail under Chapter 3, Public Health and Safety. The quantified increase is 61 to 107 more traffic crashes per year with two additional fatal incidents every three years. This is a non-trivial effect. There is no discussion of possible safety impacts on roadways other than State Route 83 - Sonoita Highway.

15. Page xxvi, Public Health and Safety
Any hazardous material spill as described will close a highway. The effect will propagate back to the available detour routes. The magnitude of a diversion will depend on the duration and the location of event on the highway. For example, in the case of an event on Sonoita Highway north of the proposed mine entrance; the detour routes are south on S.R. 83 to S.R. 82 (Sonoita), to S.R. 90, to I-10 (Benson), or south on S.R. 83 to S.R. 82, to I-19 (Nogales), to I-10 (Tucson). Either route entails a distance in excess of 50 miles. An event or crash at the S. R. 83 / I-10 interchange could potentially propagate over several states.

16. Page xxviii, Traffic Impacts
The discussion of impacts to level of service is limited to State Route 83 - Sonoita Highway only. There is no discussion of impacts on the identified secondary access route, Santa Rita Road, or on the one mentioned ancillary route, Sahuarita Road. Both of these roads are under the jurisdiction of Pima County.

17. Page xxviii, Visual Resources
The discussion of scenic quality impacts is quantified for State Route 83 - Sonoita Highway only for the proposed action and for several alternatives. What are the scenic impacts to other area roadways outside the Forest, such as Sahuarita Road or Santa Rita Road?

18. ADEIS: Executive Summary/ES-3/line 8-9: Change to "potentially" estimated mine life of 100,000 acre-feet. Rosemont indicates a mine life of 20-years. This would only be true if the mine operated year-round for 20 years. Based upon similar mines in the Tucson Copper Mining District, mines there have been in operation over 45-years.
DEIS: Executive Summary/ESxii. Comment was not added. In addition, the DEIS should disclose an additional 16,000-25,000AF over mine life would be lost due to pit dewatering.
19. ADEIS: Exec. Sum/ES-9/lines 21-22: If specific impacts to the wells are unknown, a systematic evaluation of the 300-350 registered wells in the vicinity of Rosemont production wells is needed to assess what wells could be dewatered based upon the Montgomery West Side Model results. This should be done as part of the mitigation to prepare for dewatering of local wells. Well construction will need to be evaluated to assess if the screens will be dewatered and what wells will needed to be deepened or replaced.

DEIS: ESxiii/para.4: The ADEIS comment was not addressed. The number of wells was changed to 400-450. Further, stating that specific impacts to the wells are unknown is inappropriate and inadequate. A supplemental EIS is needed for a systematic evaluation of the 400-450 registered wells in the vicinity of Rosemont production wells to assess what wells could be dewatered based upon the Montgomery West Side Model results. This should be done as part of the impact analysis and mitigation to prepare for dewatering of local wells. Well construction will need to be evaluated to assess if the screens will be dewatered based on the model, and what wells will needed to be deepened or replaced. This should be stated in the DEIS. Projected impacts to these wells can be made based on estimated model drawdown and screened interval. Screened interval is readily available in the ADWR well registry imaged well information from driller’s reports online.

20. ADEIS: Exec. Sum/ES-9/lines 30-31: If specific impacts to the wells are unknown, a systematic evaluation of the 300-350 registered wells in the vicinity of the pit dewatering area is needed to assess what wells could be dewatered based upon the three model’s east side results. This should be done as part of the mitigation to prepare for dewatering of local wells. Well construction will need to be evaluated to assess if the screens will be dewatered and what wells will needed to be deepened or replaced.

DEIS: ESxiii/para.5: Comment from ADEIS not addressed. Number of wells changed to 500-550. Stating that specific impacts to the wells are unknown is inappropriate, false and inadequate. As part of a supplemental EIS, a systematic evaluation of the 500-550 registered wells in the vicinity of the pit dewatering area is needed to assess what wells could be dewatered based upon the three model’s east side results. This should be done as part of the impact analysis and mitigation similar to the spring impact analysis to prepare for dewatering of local wells. Well construction will need to be evaluated to assess if the screens will/may be dewatered (impacts) and what wells will needed to be deepened or replaced. Projected impacts to these wells can be made based on estimated model drawdown and well construction. Screened interval is readily available in the ADWR well registry imaged well information from driller’s reports online.

21. Groundwater Quality
In the Groundwater Quality section of the Summary of Impacts the statement is made that the heap leach facility “will be encapsulated with waste rock”. The summary should state whether or not such a design been shown to provide effective encapsulation in practice. The statement describes untested proposed mitigation not an impact.

22. Groundwater Quantity
The Well Protection Plan cited in the Summary on Water Quantity is to “ensure that residential water wells in the Sahuarita area remain productive throughout the life of
minerals production operations." The agreement should be extended temporarily to the end of the drawdown impact and geographically to all impacted landowners.

23. Domestic supply wells in Singing Valley are located within one mile of the project site. Homes in this area likely the closest residences to the project area. No fewer than 20 water wells occur along this road corridor and it is reasonable to assume that at least a few of these are used for potable supply by area residences.
CHAPTER 1 – PURPOSE AND NEED FOR ACTION

24. All action alternatives are inconsistent with the Forest Plan. Pima County opposes amending the Forest Plan to accommodate these inconsistencies.

25. The two Coronado Supervisors’ decisions not to request a validity examination for the Rosemont claims should be disclosed and discussed in a SEIS. In response to Pima County’s written requests to examine validity of Rosemont’s claims, the Coronado Forest Supervisors have rejected the possibility of conducting an exam of the validity of claims on federal lands that Rosemont proposes to use for disposal of mine waste. See Forest Service letters dated Dec. 10, 2008 from Ms. Derby; Jan 7, 2009 from Robert Bushuk, and Feb. 25, 2011 from Jim Upchurch.

26. The Forest Service possesses the discretion to conduct such an evaluation, and has undertaken such examinations in the Coronado National Forest in the past that resulted in curtailment of mining operations. The Forest should conduct a discretionary validity exam. The Forest is not precluded by law from doing this. We acknowledge that this is not routine, but a validity examination would be appropriate to address the scoping concerns identified in Coronado’s Scoping Report #2.

27. While a no-action alternative has been included, after the review of applicable laws contained in Chapter 1 Purpose and Need for Action, the no-action alternative is summarily dismissed. At the top of page eight is the following sentence: “The forest supervisor will select the proposed action or an alternative that allows for development of the mineral resource while reducing potential environmental impacts.” This statement clearly puts forth a foregone conclusion. Unfortunately and despite repeated requests by the Cooperators no alternative has been considered in which public land is not used as a permanent tailings dump. While the Forest Service may interpret federal law to indicate that they cannot say no to extraction, eliminating even consideration of an alternative which does not allow dumping on public land demonstrates that the EIS has failed to meet its objective to find the least environmentally damaging alternatives. In a similar vein the four decisions listed for the supervisor to make do not allow broadening the scope to include alternatives not considered. This could include complete backfilling with a bond to cover it, thus minimizing permanent impact to the Forest land, while meeting the primary purpose of extraction.
CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION

General

28. The Forest needs to study and discuss action alternatives which do not require altering the Forest Plan in a Supplemental Environmental Impact Statement (SEIS). Failure to have an action alternative which is consistent with the existing Forest Plan is a sign that the alternatives analysis is flawed.

29. The Forest Service has examined alternative locations for waste and tailings disposal, but these vary little by volume. Open-pit copper mining produces large amounts of waste material. Less than one percent of the Rosemont deposit would be copper, molybdenum or other valuable minerals. The rest would be waste, either in the form of barren rock or processed tailings. Furthermore, the volume of rock expands by around 35 percent as it is mined and crushed, a factor which creates more need for waste disposal (USGS 2003, OFR 03-143). Thus Forest Service should examine reducing the dimensions of the pit itself, which generates most of the impacts. Excavation of the pit would destroy 915 acres of the mountainside, and generates the need for disposal on thousands of acres of additional land.

30. This DEIS assumed a 20-year operational life, but the DEIS does not clearly state what happens after the time period is up. The SEIS should tell the reader under what conditions would Rosemont have to renew its operational permit from the Forest, and how periods of inactivity will be defined and treated relative to the overall 25-year term.

31. A serious evaluation of a 40-year operating life should be made in the SEIS. This would be more consistent with how open-pit copper mines have actually operated in southern Arizona. A longer timeframe to operate the mine would allow for amortization of investments over a longer time period and provide a longer term of employment for the region. It could also allow for a much smaller mill and reduce instantaneous energy demands. It might allow for different energy solutions. Evaluate tradeoffs from the standpoint of the environmental effects from a slower extraction of resources.

32. The DEIS cited about the riparian area affected by the proposed mining activities. The riparian areas are recognized along McCleary, Wasp, Barrel Canyon and Trail Canyon Washes. All the riparian areas are classified as Important Riparian Areas by Pima County. The proposed mining activities will significantly affect the riparian habitat along those washes. The DEIS did not show the amount (area) of the disturbance of the riparian habitat.

33. Davidson Canyon contains reaches that are classified as Outstanding Waters of the State of Arizona. Over the period of development, the watershed upstream of the compliance point, in the headwaters of Davidson Canyon, will be modified to retain most of the runoff, which most likely affect the riparian habitat in Davidson Canyon. The proposed plan has the largest impacted area, the largest changes in runoff and sediment concentration, and the most significant impact to Davidson
The DEIS should clearly explain why the plan with most significant impact was selected as a proposed plan.

34. Some alternatives include waste rock storage area outer buttress slopes of 4:1. We have found revegetation unsuccessful on this grade and landscaping to meet code requirements is not allowed on slopes of this severity on private land in Pima County.

35. Page 73 Transportation lists: "Additional items that Rosemont Copper has identified to improve traffic safety include the following." It should be noted that 2 of the 3 mitigate increased hazards. They do not improve safety over existing conditions.

36. Page 73 Upgrades to SR83 identified by ADOT are an indirect effect that should be analyzed by the Forest as part of the SEIS.

37. Page 73 describes "installation and maintenance of wildlife crossing structures (e.g., corrugated metal pipes)." Corrugated metal is not the state of the art in wildlife friendly road crossings. Recent studies have shown wildlife preference for natural bottom concrete arch structures or boxes with sandy bottoms.

38. The Water quality well user agreement should be expanded geographically and temporally.

39. Explanation should be added as to why the mitigation measures beginning on page 77 are not applicable to the preferred alternative.

40. Page 79 states: "It is important to note that the full suite of mitigation measures would not be known until many or most of the required permits have been issued, which often contain required measures intended to avoid or reduce environmental effects." It should also be noted that the scope of permit authority may limit the identified mitigation measures and that appropriate mitigation may be broader for a company that wishes to exceed standards. Mitigation required by permits should be considered the minimum when formulating the monitoring plan and bonding mechanism and this should be reflected in the EIS.

41. Page 81 states: "Once a final decision has been determined, the Forest Service would calculate bond amounts and ensure that adequate bonding is provided." Cooperators should have the opportunity to participate in the determination and any and all subsequent negotiations.

42. The statement that "Rosemont Copper has a legal right to access minerals associated with their claims" is repeated throughout the document. Perhaps they only have the right to cross public land to access claims. Legal interpretations may vary and Augusta Resource's right to utilize mining claims on public land for permanent waste dumps as is proposed have not been sufficiently validated. Adequate alternatives have not been included in the DEIS.

43. Amending the Forest plan to benefit one party undermines the planning process, and the management and conservation of public resources under the control of the Coronado.
44. The DEIS should contain an explanation of the basis for the Supervisor's finding that the amendment is "nonsignificant".

45. An explanation should be provided as to why expansion of other mining operations in the study area is considered a reasonably foreseeable action but expansion of Rosemont's operation to the remainder of their claims and fee title lands is not.

46. Explain what the difference is between the Santa Rita South substation and the Toro substation or switchyard.

47. Identify temporary soil stockpile locations.

48. Identify methods and machinery to be used in transforming the rock into soils for reclamation.

49. Identify the location of the facilities that Rosemont would construct for or with Green Valley Community Water Company.

50. Identify the location of SR 83 modifications.

51. Identify the location and height and design of communications towers.

52. The statement on page 78 that Section 404 mitigation would not be consistent with the SDCP is incorrect. Change to: "Section 404 mitigation would be insufficient to mitigate for the SDCP." SDCP mitigation is not for Waters of the US—the Corps has statutory authority for the Clean Water Act. SDCP mitigation is for impacts that would largely be outside Waters of the US—effects to a much larger landscape. Pima County has estimated that approximately 8800 acres of compensatory mitigation would be needed to conform with the Conservation Lands System guidelines for the SDCP, which are part of the County's general land use plan.

53. Identify the nature of any Port of Tucson modifications that would be made in order to accommodate transportation needs of the Rosemont mine, or stipulate that there would be none.

Permits and Permitting Process

54. Permit conditions: Rosemont is really two mines in one: the first phase uses a heap leach facility to process copper oxides. This phase lasts less than ten years, but causes half of the total disturbance. The second phase is a sulfide mining process that requires a completely different processing facility to be built in a different location. The sulfide operation could be made contingent on meeting performance standards for the heap leach—this would dramatically improve the position of the federal government for negotiating mid-course corrections, especially for those problems which are unforeseen.

For instance, both narrative and quantitative criteria must be met and remain below state standards at all locations before any proceeding with the sulfide operation. If this condition is not maintained throughout the sulfide operation, the company should not be authorized to proceed with any requested modifications of the final mine plan of operations.
Land Exchange or Purchase

55. Page 88, Chapter 2, states that land exchange is outside the scope of this project. Good.

56. Please clarify that no exchanges of land between Rosemont and the federal agencies are part of the proposed action.

Visual Quality

57. The visual quality assessment on page 74 states that: “The project is designed so that it would not be visible from Green Valley, Vail, Sahuarita, Tubac, or Tucson.” It should be mentioned that by exclusion, the mines’ visibility from Sonoita, Elgin and the San Pedro National Conservation Area is taken as an assumption. In fact the mine site will be visible from much of the residential areas of Sonoita and Elgin. Furthermore it will be visible from scenic overlooks along State Route 83 which have been erroneously excluded from the visual assessment. The site will be particularly visible at Mileposts 10-12 and 28 far south of Elgin.

58. Page 74 Visual Quality states that: A perimeter buttress would be constructed with intermediate slopes of 3:1 (horizontal: vertical). In some alternatives there is waste rock storage that has 4:1. Both should be discussed in the Visual Quality mitigation summary.

Visual Resources

59. The Scholefield-McCleary Alternative is credited as having a much higher visual impact. This seems to be because the pit will be visible from the highway. If this is the underlying assumption, then it should be disclosed.

60. To assume the pit is a higher visual impact than the piles is flawed reasoning as the tailings piles simply block the view of the pit in the other alternatives and this is just as great a visual impact. In the Scholefield-McCleary Alternative, the tailings themselves and waste rock will be less visible. Additional description or illustration is needed.

Hydrology

61. Hydrology and sediment calculation methods are not appropriate. Pit (p.24) and Alternative 2, 3, 4, 5, and 6 (p.46-62). The pit and stormwater features were designed by using a 100-yr 24-hr storm (Tetra Tech, June 2007). The DEIS cited that “In general, project water management facilities are intended to have sufficient capacity to handle runoff generated from 100-year, 24-hour storm events”. This indicates that they used 100-yr, 24-hr storm as Probable Maximum Precipitation (PMP). This is inconsistent with local permit standards, and thus there is no demonstration that the mine can meet the local floodplain management ordinance.

62. Additionally, the PMP selection is inconsistent with Technical Memorandum “Rosemont Hydrology Method Justification” (Tetra Tech, January, 27, 2010). In the Memorandum, Tetra Tech selected 72-hr storm for General PMP and 6-hour storm...
for local PMP. Runoff volume produced by the 72-hr or 6-hr PMP is larger than the 100-yr, 24-hr storm runoff volume. The SEIS should explain why the PMPs (larger runoff volume) were not used to size the stormwater management features. Pit diversion channel, permanent diversion channel and ponds should be sized to handle volumes generated by multi-day storms, and estimated by using appropriate parameters. The mine will be closed and many of the drainage features will remain. We need to assume that they will be stable in perpetuity. The current design is inconsistent with federal as well as local standards.

Request:

63. Because of the need to reassess the hydrologic analysis, sediment calculations and the design of stormwater control features provided in the DEIS, a Supplemented Environmental Impact Statement (SEIS) should be provided that includes the following studies:

✓ **Hydrologic evaluation that uses ‘critical’ storms and approved hydrologic methods to design structures for peak flow rates.** Design should adopt the FEMA Criteria for flood peak determination rather than use 24-hr storms. In Pima County, these are peak from Intensity-Duration curves, such as used in PC Hydro, and shorter duration high intensity rainfall events, such as 3-hr storms.

✓ **PMP needs to be reassessed.** Because recent events have shown that rainfall over several days can cause flooding and overwhelm ponds, a more critical (and conservative) evaluation of the hydrology used to design volume control is required.

✓ **Stormwater Control Features including but not limited to Waste Rock Storage Area, Dry Stack Tailing Facilities, and Central Drains need to be redesigned.** Stormwater control features should be designed to store the volume of PMP. PMP should be selected by considering storm events in the past. Runoff volume and peak discharge should be calculated by using methods to meet FEMA criteria. Qualitative analysis is required to ensure the proposed riprap protection will not fail.

✓ **Agreement of Maintenance is required.** The DEIS should clearly explain the method of maintenance during operations and/or post-closure conditions. Citation of the agreement of maintenance is also required.

**Table 3**

64. Major Permits or Authorizations: Pima County Department of Transportation should be added to the table as follows:

1. Pima County has the authority to require a permit to move oversize or overweight vehicles on highways under its jurisdiction. This applies to Kolb Road and Valencia Road in the vicinity of the Port of Tucson where the DEIS has stated railroad traffic to or from the Rosemont project will be transshipped to truck, among others. There is a formal application and fee for these permits (ref. Pima County Code Chapter 10.36).
2. Pima County has the authority to require a permit for any construction within roadway right-of-way under the authority of Pima County. This applies to Santa Rita Road, the identified secondary access to the Rosemont project. Construction includes the activities of utilities (ref. Pima County Code Chapter 10.44)

65. Major Permits or Authorizations: Pima County Department of Development Services also has permitting authorization concerning Scenic Routes (ref. Pima County Code Section 18.77.040. and should be added to the table.

66. Conclusions should fully reflect the information they summarize. On page 40 the concluding sentence of the permits narrative lists PCDEQ along with other agencies having permit authority. This is incomplete per Table 3 in that the table identifies PCRFCD, DSD and the Cultural Resources and Historic Preservation Office in addition to PCDEQ.

Table 8

67. Table 8 is the summary of issues. Accident rates should be added as an issue under Transportation or Public Safety.

68. Table 8, Socioeconomics and Environmental Justice 11A Change in employment over time, accounts for jobs added by the mine but not losses in other sectors.

69. Socioeconomics and Environmental Justice 11A. A definition of negligible change (in tourism) should be provided. Statistical significance and sample design has not been sufficiently or accurately described.

70. Table 8, Alternatives impact summary (p.97-100): Estimated impacts to “Surface Water Quantity” and “Surface Water Quality” are not based on inappropriate hydrologic analysis. Estimated impacts to “Surface Water Quantity” and “Surface Water Quality” are not based on inappropriate hydrologic analysis. The issues of the analyses are summarized in “Chapter 3 _ Water Quantity Comments” and “Chapter 3 _ Water Quality Comments”. Additional comments are summarized above (comments for “Pit (p.24) and Alternative 2, 3, 4, 5, and 6 (p.46-62)”).

71. Surface Water Quality, (p.99): The declaration that recharge from surface runoff will be reduced, but is not quantified, is unacceptable and does not adequately summarize potential recharge reduction as a result of the alternatives. This should be quantified. The reduction in annual runoff was estimated from 23-48% among the alternatives. Based on this information and streamflow depletion studies an estimate of reduced recharge could be made. This information will have a bearing on additional loss to shallow groundwater that was not simulated in the groundwater modeling. Only the effects of the pit were estimated. The groundwater models should use these quantified reductions in recharge to be re-run for better estimates of the drawdown from the impacts of the alternatives.

Water Supply

72. Direct CAP use needs more discussion and consideration as a water supply.
73. The pipeline to Community Water Company should be treated as a connected action.

74. The discussion of water supply cites a conceptual level feasibility study (Stone, 2011) and describes several options and then concludes that the FS has no authority to tell Rosemont what water source they should use. Therefore, it seems the discussion of the conceptual study was unnecessary. However, the EIS is obligated to discuss the impacts of several options and direct CAP use is one very viable option. Direct CAP use was listed as an option but not discussed. Effluent was discussed but dismissed as not fully available. If Rosemont can recharge CAP 20 miles downgradient in the Tucson AMA, it can certainly consider direct delivery and recharge/recovery. A pipeline would need to be built, but certainly Community Water Company and other providers could allow purchase of M&I rights in lieu of Rosemont pumping better quality groundwater from the aquifer. A discussion of the impacts of using potable groundwater versus CAP direct is needed to assess the differences of each option.

75. If CAP is not always available, wells could be used as backup. However, to dismiss CAP as Stone (2011) does because CAP could be unreliable is not acceptable. No reference to ASARCO Copper Mine was made and the fact that they now use 10,000AF/yr of CAP for their ore processing.

Utility Lines (Electrical and Water Supply)

76. A SEIS should disclose that Rosemont Copper has applied for a 50-year lease (ASLD Right-of-Way application 14-115294) in which the proposed powerline would be situated (see Appendix). The ASLD application states that Rosemont will operate and maintain the line, a fact which is not disclosed in DEIS, nor have the pros and cons of pending decisions by TEP and Rosemont regarding ownership been weighed.

77. The Rosemont 138 kv line would have approximately 400 kv excess capacity. The excess capacity power line should be disclosed in the SEIS and analyzed for impacts to Pima County and Santa Cruz County.

78. The location or design of the Rosemont and Santa Rita and Toro substations or switchyard should be disclosed.

79. Alternatives to the substations should be weighed in a SEIS.

80. Alternatives to the provision of electricity at the Toro Switchyard should be weighed in an SEIS.

81. In particular, the reasons for dismissing a Vail Tap should be disclosed in the SEIS.

82. The Forest should study Marshall Magruder's energy alternative which would provide natural gas service to the mine instead of transmission lines.

83. The Admin Draft (p. 19) indicated that in addition to the 138kV line that will supply power to the mine, "... a powerline supported on wooden poles would be constructed to supply electricity to the water supply wells and booster stations."
The DEIS fails to include any discernable reference to this distribution line. In fact, there is no explanation about how power will be supplied to the water supply wells and booster stations. Subsequently, neither is there any disclosure of potential impacts, especially to visual resources, that would be associated with such a distribution line. (The DEIS’ current assessment of powerline visual impacts exclusively pertain to TEP’s 138kV line - p.465.) A distribution line to supply power to the water supply wells and booster stations is not within the scope of TEP’s application to the Arizona Corporation Commission for siting of the 138kV line and therefore needs to be addressed in the Forest Service’s environmental analysis. Any powerline alignments, including backup powerlines, need to be evaluated in the EIS.

84. DEIS (p.38) states “All of the transmission lines alternatives include aboveground 138-kilovolt transmission lines and an associated 14-foot-wide unpaved maintenance road.” It is unclear if the statement on p. 38 “Construction of the pipeline would include an unpaved permanent maintenance road and up to five reservoirs and pump stations” is implying that there will be separate maintenance roads – one for TEP’s 138kV line and one for the water pipeline. Please clarify.

**Reclamation and Closure Plan**

85. Need for an Updated Reclamation and Closure Plan for the Preferred Alternative within a Supplemental EIS:

86. Information included in the DEIS regarding reclamation and closure for the Preferred Alternative is woefully inadequate with respect to management of a industrial complex proposed to leave a permanent footprint on thousands of acres of Forest Service land. Within Chapter 2 of the DEIS, the entire subject is presented and discussed with less than 2 full pages of text (see presentation on pp. 35-36 and 70-71).

87. It appears the Forest Service is uncertain and not able to characterize the type(s) of document(s) which comprises a “Reclamation Plan”, based upon inconsistencies found in multiple references within Chapter 2 of the DEIS:

- Ch 2, p 34: reference to a “mine land reclamation plan”
- Ch 2, p 35: reference to a “final reclamation concept plan”
- Ch 2, p 70: reference to a “mine reclamation plan”
- Ch 2, p 69: reference to a “reclamation plan”
- Ch 2, p 71: reference to a “Rosemont Copper Project Reclamation and Closure Plan”
- Ch 2, p 71: reference to a more detailed “reclamation and closure plan”

These uncertainties are troublesome for both public review of the DEIS at this time, and the ability to develop and implement consistent long-term reclamation and closure standards in the future.

88. The Forest Service states some kind of reclamation plan will be created prior to the final EIS. However, this does not allow for needed public review and input now for this critical aspect of the mine project which will affect the public in perpetuity. The
following statements are found in Chapter 2 of the DEIS (pp. 35 and 71, respectively):

- "The final reclamation concept plan, which would be completed prior to the publication of the final EIS (FEIS), would focus on design of the facilities with closure goals in mind."

- "A more detailed reclamation and closure plan would be developed specifically for the final selected action alternative."

Even the promised reclamation plan has only vaguely-stated component requirements, such as "Manage operations to minimize environmental impacts", "implement concurrent reclamation practices", "Use appropriate technology to minimize the generation of impacted water", "Revegetate reclaimed surfaces", etc. This does not inform the public, who must live with the mine impacts indefinitely, about the actual reclamation activities planned for the Preferred Alternative.

89. The USEPA also found troubling the approach used by the Forest Service to address reclamation within the DEIS (Agency Review of the Internal Working Draft of the Rosemont Copper Project DEIS, July 2011):

- "The PDEIS indicates that the Reclamation and Closure plan would be completed "prior to the publication of the FEIS". EPA feels that this is not an appropriate approach to Reclamation and Closure. NEPA is intended to consider the entire life and potential impacts of a proposed action. Experience has shown that reclamation and closure is a key issue and may represent the greatest area of public liability, if not public interest, and is of major importance in regulatory decision-making. Improper or poorly executed Reclamation and Closure can and has led to severe and irretrievable environmental impacts at other mine sites, including those in the state of Arizona. EPA therefore considers Reclamation and Closure to be an absolutely critical component of the DEIS. The DEIS should contain a detailed discussion and summary of the Reclamation and Closure Plan and the ways in which the Plan will address and prevent potential post-closure contamination (including issue specific measures to the extent feasible)."

Requests:

90. Within a Supplemental EIS (SEIS), provide the following documents in order to present the Preferred Alternative in a more thorough and complete manner:

- Provide an UPDATED RECLAMATION AND CLOSURE PLAN for the Preferred Alternative

- Provide within the Updated Reclamation And Closure Plan a description and details of Concurrent Reclamation for the Preferred Alternative, specifically showing the mine project progression at Mining Years 1, 2, 3, 4, 5, 10, 15, 20, and Ultimate Closure, including progression of the facility stormwater management system during the active mining operational life.

- Provide CLOSURE STORMWATER MANAGEMENT PLANS for the Preferred Alternative
Alternative, which clearly shows perimeter drainage channels, surface water flow direction, planned retention / detention basins and pools on the final cover system and disposal mound side slopes, and all planned Perimeter Containment Areas where surface water will be trapped against the base slope of the tailings and waste rock disposal mounds, for the reclaimed and closed mine site.

✓ Provide a RECLAMATION REVEGETATION PLAN which clearly details for the Preferred Alternative, on plan view, all final grade areas for the entire Tailings and Waste Rock Disposal Mounds which will be revegetated with a growth media substrate. Also clearly show all final grade areas which will be completed with waste rock riprap on the upper surfaces and sideslopes (scree).

✓ Successful vegetation establishment on final cover slopes will require an initial application of growth media, and repeat applications as warranted due to slope erosion and rilling. Provide a description, application methodologies, and supporting engineering details which demonstrate the placement of soil growth media on the waste rock side slopes of the Tailings and Waste Rock Disposal Mounds both during progressive reclamation and for slope repairs and revegetation operations.

✓ Provide an updated RECLAMATION and CLOSURE COST ESTIMATE for the Preferred Alternative.

91. In Chapter 2 of the DEIS under Post Closure Monitoring (pp 79-80), the following statements are made:

- "All reclaimed sites would be monitored twice a year for a period to be determined, in order to evaluate the success of the reclamation work. Any areas not meeting reclamation goals would be analyzed to determine the underlying problem, which would be addressed with a modified plan."

- "In addition, there would be quarterly monitoring of groundwater for a term to be decided by the closure requirements specified in the aquifer protection permit and required by the Arizona Department of Environmental Quality."

- "Surface water would be monitored as required in the Arizona Pollutant Discharge Elimination System program following cessation of mining operations."

Within the Draft Monitoring Plan (Appendix C of the DEIS), the following statements are made under Introduction:

- "This monitoring plan should be considered to be the framework of a plan that specifies monitoring requirements, responsible parties, and funding."

- "It is fully expected that a more robust and detailed monitoring plan will be presented in the final environmental impact statement (FEIS) and record of decision (ROD)."
Within the Draft Monitoring Plan, under T. PostClosure Monitoring, the same statements provided in Chapter 2 of the DEIS under PostClosure Monitoring noted above are repeated, with responsibility and funding attributed to Rosemont Copper.

Even within Rosemont Copper’s 2007 Reclamation and Closure Plan, all encompassing Long-Term Operation, Maintenance, and Monitoring Costs are identified as $346,800 on Table 13-4. The only mention of any post-closure activity in Table 13-3, Reclamation Activities Summary Table, is under Miscellaneous Items which includes a “Post-Closure Monitoring” activity which “includes a technician and analytical test work.”

- Clearly, any specifics regarding post-closure operations, maintenance and repair are completely lacking in the DEIS. To address areas not meeting reclamation goals “with a modified plan” means very little, and is not informative to the public as part of the DEIS review. Furthermore, there is no indication of the expected time period associated with the conclusion of Rosemont’s responsibilities and the transfer of these responsibilities to the Forest Service.

- The bottom line: It is evident that neither Rosemont Copper, nor the Forest Service, are fully considering or preparing for post-reclamation operations and maintenance, and the associated costs, for the massive industrial complex.

Requests:

Within a Supplemental EIS (SEIS), provide the following documents and information in order to present the proposed Rosemont Copper mining project in a more thorough and complete manner for the public. Demonstrate the methodologies and responsibilities to assure continued function of all engineered facilities considered essential to meet reclamation standards.

- Provide a POST-CLOSURE OPERATIONS and MAINTENANCE PLAN for the Rosemont Copper mining project, to account for a period which extends to at least 100 years after site reclamation activities are completed.

- Within the requested Post-Closure Operations And Maintenance Plan, identify the specific responsibilities of Rosemont Copper, and anticipated methodologies / equipment / personnel, required for the maintenance and repair of the following facilities:

  - Upper and perimeter slopes of the Tailings and Waste Rock Disposal Mounds: During the mine post-closure period, identify the means and methods to repair erosion, rilling and incision damage to reclaimed slopes, including equipment and operating personnel. Identify the location of borrow soils to be used for these operations.

  - Revegetation of final cover slopes: During the mine post-closure period, identify the means and methods to be utilized to revegetate slopes which have become damaged, or have failed to meet the revegetation standards specified in the FEIS. Specifically describe how the side slopes of the
Tailings and Waste Rock Disposal Mounds will be remediated with additional soil growth media, new plantings, temporary irrigation systems, etc.

- Management and removal of invasive vegetative species
- The facility stormwater management system, including repair and cleanout of surface and perimeter channels, side slope stilling basins and downchutes, detention and retention basins and ponds, diversion berms, cleanout of the perimeter containment areas to prevent stormwater from infiltrating into the Tailings and Waste Rock Disposal Mounds, etc.
- Maintenance of the proposed flow-through drain system, which as discussed in detail in a separate comment, will require perpetual maintenance to hopefully achieve functional operation by removal of sediment blocking the 3 entrances of the flow-through drains.
- Conformance with air quality standards through application of surface dust-control measures, surface and slope repairs, sediment removal, etc.
- Contingency planning for remediation of contaminated site and off-site surface water and groundwater
- Repair and maintenance of surface water and groundwater compliance monitoring systems.

92. With respect to the requirements of the EIS program, during the 100 years following the completion of post-mining site reclamation, provide the estimated timing for the transfer of post-closure responsibilities from Rosemont Copper to the Forest Service / US taxpayers.

Post-Closure Uses of the Tailings and Waste Rock Disposal Mound

93. Chapter 2 of the DEIS under Reclamation and Closure (p. 36) includes a short paragraph on post mine land use:

- “Postmine land use on National Forest System lands would follow the forest plan that is in place at that time. Postmining/closure reclamation objectives for Rosemont Copper’s private property could include dispersed recreation, wildlife habitat, and ranching.”

Section 3.1 - Proposed Post-Mining Use of the Land - of Rosemont Copper’s Mined Land Reclamation Plan (September 2008) includes the following statements:

- “Current and proposed post-mining recreational activities include horseback riding, hunting, prospecting, all-terrain vehicle and motorcycle riding, four wheeling, hiking, and bird watching.”
- “The post-mining use for this facility will include on-going ranching. Much of the top and side surfaces of the Rosemont Ridge post-mining landform will be ideal for grazing once vegetation is established.”
The Forest Service must carefully consider the types and timing of post-closure uses of the mining site, particularly with respect to the tops and side slopes of the Tailings and Waste Rock Disposal Mounds. The DEIS acknowledges that the successful establishment of vegetation on the thousands of acres of mounded mining waste products may take a century or more.

94. Recreational motorized vehicle use on the reclaimed disposal mound surfaces will break down the thin soil cover system and lead to damage of the cover system by rilling and incision, and soil erosion, during stormwater runoff events. In turn, this will promote infiltration of surface water into the underlying tailings and waste rock.

- Consistent with the objectives of a redesigned top surface for industrial disposal mounds, post-closure public uses must be carefully considered and controlled. As an example, grazing should be considered only in disposal mound surface areas which have achieved successful, sustainable vegetative cover which can handle cattle movement and vegetation consumption.

95. Consistent with the need for and objectives of a re-designed upper surface which mimics natural landforms, the ultimate use of the reclaimed disposal mounds should also incorporate, to the maximum extent possible, existing site uses.

- In general, motorized vehicles are confined to lowland drainages and limited secondary roads. Wildlife has free rein at all elevations but likely survives best in areas limited to passive public recreational use, i.e. hiking.

- The side slopes of the Tailings and Waste Rock Disposal Mound should also be designed to promote and support desired site uses. As with most Sonoran desert hill and ridge country, this usually includes separation of motorized vehicle use from critical wildlife areas, controlled parking at a lowland locations, and walking/hiking/birding opportunities available from the parking areas.

Requests:

96. Within a Supplemental EIS (SEIS), provide the following documents and information in order to present to the public the proposed Rosemont Copper mining project in a more thorough and complete manner:

- Provide a PRELIMINARY POST-CLOSURE SITE-USE PLAN for the Rosemont Copper mining project within the SEIS

- Per the discussion above, include the following elements, at a minimum, within the Preliminary Post-Closure Site-Use Plan:
  - Detailed discussion of the actual site uses which will be considered for the closed mine site
  - Prepare a Preliminary Site Use Master Plan, which details possible uses of the site which are consistent with long-term reclamation objectives, including the successful establishment of vegetation on a thin soil cover over waste rock.
As part of the Preliminary Site Use Master Plan, identify potential uses of the site both spatially across the > 5 square mile reclamation area and with elevation in consideration of the side slopes and upper surfaces of the 500 – 600 foot high Tailings and Waste Rock Disposal Mounds.

As part of the Preliminary Site Use Master Plan, identify how varied post-mining site uses, including public recreation, cattle grazing, and wildlife habitat, can coexist on the closed industrial facility.

Mine Monitoring and Compliance

97. Include Concurrent Reclamation as Formal Category in the Mining Monitoring Plan: Concurrent Reclamation is touted by Rosemont Copper as “one of the key initiatives for the Rosemont site,” within their July 2007 Reclamation and Closure Plan. Graphical representations outlining concurrent reclamation activities and areas for the mining site are provided in Figures 3 – 11 of the plan, showing layouts for mining years 1, 2, 3, 4, 5, 10, 15, and 19.

98. Within the Reclamation Plan section of Chapter 2 of the DEIS (p.71), the Forest Service states:

- “The Rosemont Copper Project Reclamation and Closure Plan’s approach to reclamation is to exceed regulatory requirements by employing reclamation activities concurrent with mining operations.”

However, within the DEIS Draft Monitoring Plan (Appendix C), the only mention of reporting for reclamation activities is found in a single sentence in Section I., Visual Resources, below a discussion on building colors:

- “Rosemont Reclamation Plan reporting shall include numbers such as total disturbance, reclamation activities completed and contemplated, and a report on successful reclamation.”

Although the Monitoring Plan is in draft form, incorporation of monitoring ongoing concurrent reclamation activities as an afterthought in Visual Resources is woefully unacceptable.

Request:

99. Within a Supplemental EIS (SEIS), revise the draft Monitoring Plan in order to present to the public the proposed Rosemont Copper mining project in a more thorough and complete manner:

✓ Update the Draft MONITORING PLAN to include CONCURRENT RECLAMATION as a formal category / section in the plan

✓ Require an ANNUAL CONCURRENT RECLAMATION REPORT to be prepared by Rosemont Copper in conjunction with the annual Comprehensive Monitoring Report.
Within the ANNUAL CONCURRENT RECLAMATION REPORT, include requirements for: a description of concurrent reclamation activities performed the previous year with supporting plan figures, with documentation and quantification of areas where rock buttresses or caps were installed, where stormwater management system structures were constructed, where soil growth media was installed over rock buttress and caps, and where vegetation was planted.

Within the ANNUAL CONCURRENT RECLAMATION REPORT, require descriptive summaries with supporting plan figures for the cumulative status of concurrent reclamation activities at the mining site, including summaries and figures which describe areas where reclamation activities are characterized as successful, areas where reclamation activities are not considered successful and require further reclamation operations.

Expand the Comprehensive Monitoring Report into a Comprehensive Monitoring and Compliance Report: Table 3 within Chapter 2 of the DEIS (p. 40) lists major permits or authorizations applicable to the proposed Rosemont Copper Mine, including three pages of federal, state, and county permits / authorizations. An interagency task force would be formed to administer the approved MPO (Chapter 2, p. 44).

On an annual basis, a Comprehensive Monitoring Report will be prepared by Rosemont Copper summarizing the monitoring efforts for the previous year. The report will be reviewed at a meeting between Rosemont, the Forest Service, and the interagency task force.

However, in contrast to detailing only annual “monitoring, reporting, and recordkeeping”, the Comprehensive Monitoring Report should be expanded into a Comprehensive Monitoring and Compliance Report, to be reviewed annually at a meeting between Rosemont, the Forest Service, and the interagency task force.

In this manner, in addition to facility monitoring results, the interagency task force would also address the large number of “PLANS” that have been promised by Rosemont Copper and formally included in federal, state, and county permits and authorizations.

To this end, as part of the Final Monitoring Plan, a Master Compliance Plan List of all promised PLANS included within the EIS, the 404 permit, the Aquifer Protection Permit, and all other mining permits should be compiled, and systematically reviewed by the interagency task force.

The interagency task force, which should be supplemented by appropriate community landowners and professional members, should also thoroughly review the mine site and mining operations as part of the annual compliance meeting.

Request:

Within a Supplemental EIS (SEIS), revise the DEIS in order to present to the public compliance monitoring for the proposed Rosemont Copper mining project in a more thorough and complete manner.
Within the DEIS Monitoring Plan, include provisions for the annual preparation of a COMPREHENSIVE MONITORING AND COMPLIANCE REPORT.

Compile a Master Compliance Plan List of all PLANS promised by Rosemont Copper within all mine federal, state, and county permits and authorization

Include the Master Compliance Plan List within the EIS Final Monitoring Plan and within the Comprehensive Monitoring And Compliance Report with requirements for annual review by the interagency task force

Supplement the interagency task force with appropriate community representatives from nearby the affected area of the Santa Rita Mountains (Tucson, Sahuarita, Sonoita) and professional representatives as needed to adequately assess all technical compliance requirements.

Financial Assurance and Bonding

Reclamation Bond and Trust Fund Documents

105. The Financial Assurance section of the DEIS (< 1 page in length) contains very little tangible information, other than to say a reclamation bond will be prepared “that would provide adequate funding to allow the Forest Service to complete reclamation and post-closure operation, maintenance activities, and necessary monitoring for as long as required to return the site to a stable and acceptable condition” (Chapter 2, p. 80).

- The Forest Service also notes in the DEIS that “Rosemont Copper has submitted calculations in section 13 of their aquifer protection permit application, which includes all reclamation costs, including bonds for the Forest Service, Arizona State Mine inspector, and Arizona Department of Environmental Quality. These calculations have not yet been reviewed by the Forest Service.”

Responsibilities of Forest Service and Rosemont Copper After Mine is Closed

106. As part of the determination of a Forest Service Reclamation bond, it is necessary to identify the specific responsibilities of the Forest Service and Rosemont Copper during the mine post-closure period, in particular during the 100-yr period following the end of mining. With respect to the requirements of the EIS program, during this period the public needs to know the estimated timing for the transfer of post-closure operation and responsibilities from Rosemont Copper to the Forest Service / US taxpayers. Please disclose this.

To this end, as expanded on in another DEIS comment, a Post-Closure Operations and Maintenance Plan should be prepared to identify the specific responsibilities of Rosemont Copper, and anticipated methodologies / equipment / personnel, required for the maintenance and repair of the following facilities:

> Upper and perimeter slopes of the Tailings and Waste Rock Disposal Mounds: (means and methods to repair erosion, rilling and incision damage to reclaimed slopes, including location of borrow soils to be utilized)
Revegetation of final cover slopes: (means and methods to revegetate slopes which have become damaged or fail to meet revegetation standards specified in the FEIS)

Management and removal of invasive vegetative species

Facility stormwater management system (means and methods to repair and cleanout surface and perimeter channels, side slope stilling basins and downchutes, detention and retention basins and ponds, diversion berms, and prevention of stormwater infiltrating into the Tailings and Waste Rock Disposal Mounds).

Perpetual maintenance of proposed flow-through drain system to strive for functional operation by removal of sediment blocking the entrances of the flow-through drains

Conformance with air quality standards through application of surface dust-control measures, surface and slope repairs, sediment removal, etc.

Repair and maintenance of surface water and groundwater compliance monitoring systems.

Contingency Planning and funding for remediation of contaminated surface water and groundwater, both onsite and off-site

**Funding Needed for Groundwater and Surface Water Contamination**

107. Rosemont Copper is responsible for compliance with aquifer water quality standards at the downgradient edge of the mine’s pollutant management area, per the requirements of an ADEQ Aquifer Protection Permit. This must be demonstrated by systematic groundwater sampling from the mine compliance monitoring well system. Should it be found that Rosemont Copper is contaminating the bedrock or alluvial groundwater systems, they would be responsible for remediation or mitigation of the groundwater through corrective action.

108. At first glance, from a project permitting perspective, it appears there will be abundant time for the systematic collection and analysis of groundwater monitor well data in order to determine if ground-water contamination has occurred and to respond with appropriate mitigation strategies.

- However, because of low hydraulic conductivity in the bedrock aquifer and fracture-flow conditions, it is entirely possible that any groundwater contamination in bedrock might not be observed for many tens or even hundreds of years.

- Rosemont Copper would be completely out of the picture, as their APP groundwater monitoring program in bedrock would have been terminated by ADEQ based upon a number of successive sampling results indicating no groundwater contamination.
• When bedrock groundwater contamination became apparent either within site monitoring wells or in regional public or private wells, the responsibility for cleanup would lie squarely with the landowners, the federal government and US taxpayers.

• Groundwater treatment / cleanup (on-site and off-site) would not only have a high capital cost, but would also have a significant annual operating and maintenance cost for an indefinite period of time.

109. Similarly, there is a reasonable need, based upon the track record of metal mines both within the US and worldwide, to prepare for long-term degradation of surface water and associated treatment activities.

110. Under the Long-Term Operation, Maintenance, and Monitoring section (pp. 23-24) within the Forest Service Training Guide for Reclamation Bond Estimation and Administration, For Mineral Plans of Operation authorized and administered under 36 CFR 228A, USDA-Forest Service, April 2004, maintenance activities, including water treatment facilities, are discussed:

• “For work described as being costly, long-term, or open-ended, different methods of cost analyses and types of bond instruments may need to be considered.”

• “In recent years, trust funds have been investigated as a means to fund such long-term future costs.”

Rosemont Copper offers assurances that absolutely every proposed permanent facility for the proposed mine (massive Tailing disposal mound, massive Waste Rock disposal mound, open pit and pit lake, heap leach pads,) will not cause environmental contamination of on-site and offsite bedrock and soil earthen materials, groundwater systems, and surface water systems.

111. Rosemont Copper's ironclad promise for perpetual cleanliness of a 6-square mile industrial complex is not a reasonable expectation by the affected public.

• Due to the significant probability of groundwater and surface water contamination from the Rosemont Copper mining operation and mounded waste mining products, the Forest Service should create a separate fund to be used solely for the purpose of long-term maintenance needs and water treatment at the mining site.

• Within the post-closure era, should groundwater or surface water contamination be detected within the Rosemont Copper mining project area or beyond the mining area but as a result of mining operations, the fund would be utilized to implement remediation technologies and resources (delete towards) for cleanup of the affected environment and communities. (delete this sentence: This would include contamination of soils and drainages along Hwy 83 from spills of acids, fuels, etc.)
112. The USEPA also commented on the shortcomings of the DEIS to adequately characterize bonding requirements for all mine reclamation work, Forest Service takeover of reclamation activities at the site if needed, and funding for long-term operations and maintenance activities (Agency Review of the Internal Working Draft of the Rosemont Copper Project DEIS, July 2011):

- "In addition to a description of the closure and reclamation plan, EPA recommends that the Draft EIS identify the bond amounts for each closure and reclamation activity at all of the proposed project facilities. The Draft EIS provides the public the opportunity to weigh in on the adequacy of the bond amount. The viability of the bond can be a critical factor in whether a project is environmentally acceptable. Therefore, this information should be disclosed in the DEIS. The DEIS should also discuss whether and how the Forest Service can modify the bond during the course of operations if temporary, long-term, or perpetual treatment and/or remediation needs are discovered during operations. Identify who would be responsible for any post-closure cleanup actions should they be necessary. In addition to determining the actual cost of reclamation, the bond calculation should consider the extra expense of taking over reclamation at a critical time during operations, such as at the end of heap leach operations prior to additional mining accomplishing encapsulation of the acid spent ore, during wet periods when the water balance is high and surplus water must be treated, or when environmental or reclamation measures have not been successful in controlling pollution and must be redone. The Draft EIS should describe bonding requirements or other measures that the Forest Service will have in place to ensure funds would be immediately available should the mine operator or its insurer be unable to fund the required reclamation or closure activities.

- The Draft EIS should also discuss whether long-term post-closure operations and maintenance may be necessary, describe these activities, indicate the projected costs for these activities, and discuss any requirements the Forest Service would impose on the mine operator to establish a trust fund or other funding mechanism to ensure post-closure care. The financial assurance necessary to fund post-closure activities must be kept current as conditions change at the mine, and the Forest Service should ensure that the form of the financial assurance does not depend on the continued financial health of the mine operator or its parent corporation. The Draft EIS should include a general description of the trust fund intended for long-term post-closure care. The mechanics of the fund are critical to determining whether sufficient funds would be available to implement the post-closure plan and reduce the possibility of long-term contamination problems. The discussion in the DEIS should include the following information:
  - Requirements for timing of payments into the trust fund;
  - How Forest Service would ensure the trust fund would be bankruptcy remote;
  - Acceptable financial instruments;
  - Tax status of the trust fund;
  - Identify the trust fund beneficiaries; and
• Identify the operator with responsibility/liability for financial assurance at this site.

• If a long-term trust fund will be part of the proposed project, EPA believes this information is essential in the DEIS because it could make the difference between a project sufficiently managed over the long-term by the site operator, or an unfunded/under-funded contaminated site that becomes a liability for the Federal government. In the absence of an appropriate guarantee, EPA could consider a project unacceptable if it could result in unmitigated impacts exceeding environmental standards on a long-term basis.”

Requests:

113. Within a Supplemental EIS (SEIS), present to the public specific details regarding the financial assurance requirements of the Forest Service, including Reclamation Bond and Trust Fund documents:

✓ Prepare a Post-Closure Operations and Maintenance Plan to identify the specific responsibilities of Rosemont Copper, and the Forest Service, required for the maintenance and repair of at a minimum those facilities identified in the above discussion.

✓ Update the Reclamation Closure Cost Estimates provided in Section 13 of the 2009 APP Application to accurately reflect the Preferred Alternative, and account for all post-closure operation identified within the Post-Closure Operations and Maintenance Plan requested above.

✓ In addition to the Forest Service Reclamation Bond, establish a Long-Term Operation, Maintenance and Monitoring Trust Fund for the proposed Rosemont Copper Mine, as discussed in the Forest Service Training Guide for Reclamation Bond Estimation and Administration (2004).

➤ Due to facility long-term monitoring and maintenance needs which will be performed by hired private parties, including (1) the significant probability of long-term surface water and/or groundwater contamination from the Rosemont Copper mining operation, together with the associated long-term monitoring needs, and (2) the known long-term monitoring and maintenance needs for the stormwater management and final cover systems, (delete: analyze the establishment of) establish a $25,000,000 trust fund to appropriately manage these eventual needs.

➤ Establish the Trust Fund, modified bond instrument or the equivalent by no later than Yr 5 of mining to assure both fund establishment and adequate fund growth.

Barrel Alternative

114. Unfortunately, the Preferred Alternative is not presented in any meaningful detail within the DEIS. There is insufficient definition of the Barrel-only Alternative to allow a meaningful review of environmental impacts resulting from implementation
of this preferred alternative. Figure 14 of the Forest Service DEIS (Chapter 2, page 58), shows only a simplistic layout view of this alternative, void of any grading plans or stormwater management system information for the massive tailing and waste rock disposal areas.

- For an enormous industrial complex which is proposed to permanently impact thousands of acres of Forest Service land, the lack of design plans to adequately review this alternative from development, closure, post-closure, mitigation, and cumulative impacts perspectives is unacceptable.

**Request:**

115. Within a Supplemental EIS (SEIS), provide the following documents in order to present the Preferred Alternative in a more thorough and complete manner:

- Provide a GRADING AND DRAINAGE PLAN for the Preferred Alternative, with appropriate sections and details for development of the tailings and waste rock disposal mounds

- Provide a STORMWATER MANAGEMENT PLAN for the Preferred Alternative, which clearly shows perimeter drainage channels, surface water flow direction, planned retention / detention basins and pools on the final cover system and disposal mound side slopes, location of Compliance Point Dam(s), and all planned Perimeter Containment Areas where surface water will be trapped against the base slope of the tailings and waste rock disposal mounds.

- Provide PHASING PLANS which show the development sequencing of the mine for the Preferred Alternative, to include at a minimum clear development and reclamation activities for the following periods of mining: 1yr, 2yr, 5yr, 10yr, 15 yr, 20yr, and 25 yr

- Provide both MINING and POST-CLOSURE SOIL MANAGEMENT PLANS (see comment under SOILS category.

- Provide a RECLAMATION and CLOSURE PLAN which specifically addresses and details, for the Preferred Alternative, progressive reclamation sequencing over the life of the mine and an updated reclamation and closure cost estimate.

**Deed Restriction Needed for McCleary Canyon as Part of the Barrel Alternative (Preferred Alternative):**

116. Within the 1st paragraph under Specific Elements of the Barrel Alternative, the Forest Service states: "Prohibiting mine tailings or waste in McCleary Canyon permanently maintains its contribution of surface water flow to the Barrel Canyon drainage system, .......".

- As part of the Preferred Alternative, the Forest Service is formally stating that: (1) in the future, mine tailings and waste materials will be prohibited in McCleary Canyon, and (2) the contribution of surface water flow from the remaining natural and reclaimed portions of McCleary Canyon will be
permanently maintained into what remains of the Barrel Canyon drainage system.

Request:

✓ Place a DEED RESTRICTION on all Forest Service land within the portion of the McCleary Canyon watershed which will remain natural or be reclaimed (Plant Site) if the Barrel Trail Alternative is implemented. The deed restriction area is delineated on Figure X).

✓ The Deed Restriction must specifically state that mine tailings and waste materials will be permanently prohibited in this portion of McCleary Canyon, and that surface water flows from this portion of McCleary Canyon will be permanently maintained into the Barrel Canyon drainage system.
117. Alternative 6 of the Appendix containing Section 404(b)(1) alternatives refers to a modified pit alternative. The applicant dismissed this alternative in part for stormwater-related stability issues. The Forest and Corps should evaluate a new Modified pit alternative that would address stability using either engineering solutions or dewatering. The new modified pit alternative, or a combination of open-pit and underground mining should be developed by a qualified consultant that is not paid by Rosemont Copper or Augusta Resource.

118. The Pit Slope figure below is from Augusta Resource’s Updated Feasibility Study dated January 14, 2009 and depicts the maximum slope angles. It can be seen from this figure that much waste and impact is generated from a pit design that encroaches into the east into design sectors 12 and 10, which have dramatically lower stable slope angles. An elongated pit design is indicated, perhaps combined with underground adits and shafts in later phases. This would reduce the potential for bankruptcy of the company in the early years of mine operation by reducing the amount of overburden to be removed before revenues could be realized from the heap leaching.

![Pit Slope Design Sectors and Maximum Slope Angles](image)

119. As shown in the Ultimate Pit visualization provided by Rosemont Copper below, the existing pit does not provide for all mineral resources to be used. Orange is the
pit, yellow is the oxide ore, and red is the sulfide ore. Similarly, the modified pit should also not be excluded for the mere reason that not all of the deposit would be encompassed by a smaller, narrower pit.

120. A modified pit alternative that incorporates a later stage underground mine to exploit deeper sulfide ore could reduce the vulnerability of Augusta to going bankrupt by reducing the volume of barren rock to be moved. Rosemont is at present using borings and geophysical surveys to better define the sulfide deposits below the pit.

121. In 2005, Augusta Resource had a narrower pit design that minimized the encroachment of the pit onto Forest land. This pit configuration also had fewer impacts to Forest land. The figure shows the boundaries of the 2006 pit in black relative to the patented lode claims owned by Augusta Resource in orange. Again, while this particular pit configuration may have had stability issues, the search for an optimal pit design that reduces impacts while preserving some opportunity for economic feasibility should continue.
122. A new, optimized modified pit design is likely economically practicable if avoided direct and indirect costs, both economic and ecological, are considered. The discussion of tradeoffs for Alternative 6 in the DEIS Appendix B must not rely solely on the consideration of avoidance of direct impacts of the pit, as it does in the WestLand 404(b)(1) analysis. The WestLand analysis states the loss of over a billion dollars in revenue, but Table 5 on which the analysis is presumably based, identifies over $780 million dollars of avoided costs, so the net loss in revenue would be $327 million, undiscounted, much less than a billion dollars! The revenue projections in Table 6 do not support the contention on page 57 that the losses are “unreasonable”. When considering the discount rate, a total of $29 million dollars in lost revenue was identified in Table 5. WestLand’s analysis is biased. The information presented for Alternative 6 supports the notion that a modified pit configuration would likely be economically practicable.

123. Reduced operating costs should also be weighed against the reduced income from the altered pit configuration, and the timing of those avoided costs. The Forest should require an unbiased party to quantify the avoided or minimized impacts that would be generated from the reduced volume of waste and tailings. The study should also consider and quantify where possible reduced indirect and cumulative impacts on Forest land resulting from the modified pit, for instance, the benefits of less dewatering, reduced drawdown associated with a smaller and likely shallower pit, and reduced pit lake size. The benefits of a reduced pit lake size include less long-term water loss to pit evaporation and less water irretrievably lost to an unusable pit lake.

Central Drain

124. Central drains were designed by using inappropriate hydrologic analysis (Rosemont Central Drain Sedimentation Analysis, Tetra Tech, 2010). As cited in the Memo, the drain systems are supposed to be designed to convey the Local and general PMP events. The PMPs used to size the central drain is inconsistent with the results of Technical Memorandum “Rosemont Hydrology Method Justification” (Tetra Tech, January 27, 2010). In the Memorandum “Rosemont Hydrology Method Justification” (Tetra Tech, January 27, 2010), Tetra Tech selected 72-hr storm for General PMP and 6-hour storm for local PMP. Runoff volume produced by the 72-hr or 6-hr PMP is larger than the 100-yr, 24-hr storm runoff volume. However, the central drains were designed by using a 100-yr 24-hr storm, as explained in the DEIS. Tetra Tech should explain why the PMPs (larger runoff volume) were not used to size the stormwater management features.

125. In addition, the hydrologic analysis to size the drains is not based on the methods recommended by Pima County. The issues are mainly related to Precipitation (using smaller precipitation), Rainfall Distribution (using inappropriate distribution), Runoff Curve Number (using smaller CN), Time of Concentration/Lag Time (using the method not be recommended by Pima County), Rainfall Losses (using lower CN), Rainfall Run-off Volume, Peak Flows, and Runoff Volume. The detail of the
comments is summarized in "Chapter 3 _ Water Quantity Comments". Because the sediment calculations used to design the central drain includes substantial issues, the design of the drains should be revised (see "Chapter 3 _ Water Quantity Comments", "Chapter 3 _ Water Quality Comments", and "Chapter 3 _ Soil Comments"). It is uncertain if the capacity of the drain is enough to carry PMP storms.

126. The underdrains common to all alternatives are a fatal design flaw. Listed as common to all the alternatives is a surface water management plan with underdrains to be "located along the major drainages underlying the facilities. In other words, the majority of drainages will be covered in perpetuity.

127. The entrances to flow-through or "underdrains" will be shrouded by 3.5:1 (H:V) tailings closure slopes 400 ft high covered with one foot of soil capping material. A steady progression of finer materials will be eroded from these 1400-foot long run slopes. In addition, watershed surface flows will bring sediment-laden stormwater to the entrance of the underdrains, to be constructed with 12-inch minus rock sizes.

128. At these locations, Rosemont Copper envisions the development of a stormwater attenuation pond, which is estimated to hold up to 400+ ac-ft resulting from a 100-yr precipitation event. Water storage in the pond is predicted to last up to one month in duration following significant storm events, with water surface elevations rising to heights which significantly cover the South Flow-Through Drain feature. Upgradient sediment collected during storm events will settle in the attenuation pond and over time retard the transmission of water into the sub-drain. The accumulated sediments will likely clog the entrance to the drain during the post-mining period and render the flow-through drain non-operational. This situation might be reasonably expected at the entrance to all the flow-through drains, particularly in association with adjacent stormwater basins.

129. Specific examples where sizable sub-drain systems, such as those proposed beneath the Tailings and Waste Rock Disposal Mound, that have been successfully implemented at mining sites for periods of 10-20 years, 20-40 years, and 40+ year have not been provided to us as requested; and we suspect they are not available from Rosemont.

130. Furthermore, there is a question about maintenance of the drains. Neither the DEIS nor the Technical Memo (Tetra Tech, August 31, 2010) did not discuss about the necessity of maintenance over time. Will the public be left with the job of dealing with a clogged system where stormwater will pond above the drains and eventually move around the tailing/waste rock system creating enormous erosion problems? The drains are most likely clogged by sediment from upstream over time, and the drains will lose a function to convey storm flow and sediment. As mentioned above, it is uncertain if the central drains have enough capacity to handle the volume of “possible maximum storms” due to an underestimated runoff estimate. The DEIS should address the maintenance issues during operations and/or post-closure conditions. Clear explanation about the maintenance and agreement of the maintenance are required.

Tailings and Waste Rock
131. Please disclose how the Forest Service estimates the volume of space needed for disposal. We are concerned that the volume created by the action alternatives may be greatly underestimated. We read of coefficients of expansion on the order of 30 to 35% for open pit copper mining, but in analyzing the MPO landform relative to the pit volume, we get something like 21% expansion. This is a significant issue for the DEIS because expansion of volume caused by excavation is the primary driver of impacts on the landscape. A difference of this magnitude could cause hundreds if not a thousand acres of additional impact.

MPO Landform as provided by Coronado Forest to County = 28,432,115,978 cu ft

Pit Volume as estimated by Pima County = 22,728,427,703 cu ft

Landform – Pit = 6,031,183,698 cu ft

Expansion = 6,031,183,698 / 28,432,115,978 = 21.2 %

Some qualifications on the above analysis:
1) Pima County does not have access to the actual information used by Rosemont to estimate the volume of waste and tailings they will generate and any compaction factor they applied.
2) The pit volume doesn't account for the whole of the existing landscape in the pit boundaries (or maybe it accounts for more).
3) These are estimates derived from modeling with a 10m resolution DEM, not true engineering numbers.

132. In consideration of long-term/permanent surface water availability for the downstream Davidson Canyon, a supplemental EIS regarding the effects of damming and covering the watershed by Rosemont Copper in order to create the Tailings and Waste Rock Disposal Mound is needed. The DEIS has stated (Table 69, p.300) that this proposed system will reduce downgradient flow by as much as 23% (Scolefield-McCleary) to 35% (Barrel) to 53% (Proposed action). Why is the primary drainage from Wasp and McCleary Canyons, and probably much of the surface and western side of the proposed disposal mounds, restricted and not open for permanent surface water passage downstream to Davidson Canyon, a Water of the US and Arizona Outstanding Water?

133. We had suggested the following alternative in 2009 to the USFS and Rosemont and it was largely ignored and not even dismissed as part of an alternative. This alternative would reduce impairment to the Waters of the US and supplant a fatally flawed design fraught with all kinds of future drainage and potential pollution problems.

134. The Tailings and Waste Rock Disposal Mound could be separated into two distinct mounds, allowing permanent surface water flow through an open constructed canyon (along the general alignment of the existing Wasp – Barrel Canyon drainage or the Scholefield Drainage (depending upon alternative), from the vicinity of the proposed Mine Plant site area on the west to the proposed Compliance Dam on the east). Except for surface water lost to the mine pit
footprint and associated limited watershed, the majority of the remainder of the existing site watershed stormwater could then be collected via positive drainage off existing and constructed topographic surfaces.

135. The considerable excess material volume from the creation of a constructed canyon can be utilized in the creation of natural-looking ridge and hilly terrain on the upper surfaces of the two tailings / waste rock disposal mounds. Due to the direct connection between the project watershed and flow into Davidson Canyon, Rosemont Copper must diligently monitor for, and perform timely remediation of, incidents of surface and subsurface contamination during the active operational period for mining operations. On-site basins would be required to capture sediment before final surface water release to the proposed Compliance Dam and downstream. Downgradient reductions in flow will be mitigated.

136. The waste rock storage and dry stack railing facility were designed to contain 1000-yr, 24-hr storm or 500-yr, 24-hr storm. As mentioned above, runoff volume produced by the 72-hr or 6-hr PMP is larger than the 100-yr, 24-hr storm runoff volume. Issues related to the selection of the PMPs are summarized in "Chapter 3 _ Water Quantity Comments".

137. The analysis for the "Waste Rock Storage Area and Dry Stack Tailings Facility" was based on the Technical Memos (AMEC, April 2, 2010, Tetra Tech, April 5, 2010, April 12, 2010). Tetra Tech used ARS method (Robinson et al., 1998) to design the rock chutes. The ARS study was based on the flume experiment using rocks with median sizes (D_{50}) from 15 to 278 mm (0.6 to 11 inches). According to the Tetra Tech's Technical Memo, it appears that the D_{50} used for the analysis is 16.2 inches. This is outside the range of the rock size used for the ARS experiment. The ARS paper clearly noted that "caution should be exercised if equation 1 or 2 is applied outside the data base from which they were developed". Tetra Tech should provide qualitative analysis to show the proposed riprap protection will not fail.

138. Waste Rock Storage Area was designed by using inappropriate hydrologic analysis (See "Chapter 3 _ Water Quantity Comments"). The drain systems are supposed to be designed to convey the Local and general PMP events. The PMPs used to size the central drain is inconsistent with the results of Technical Memorandum "Rosemont Hydrology Method Justification" (Tetra Tech, January 27, 2010). In the Memo (Tetra Tech, January 27, 2010), Tetra Tech selected 72-hr storm for General PMP and 6-hour storm for local PMP. Runoff volume produced by the 72-hr or 6-hr PMP is larger than the 100-yr, 24-hr storm runoff volume. However, Tetra Tech did not use those PMP storms to design the Waste Rock Storage Area. Tetra Tech should explain why the PMPs (larger runoff volume) were not used to size the stormwater management features.

Pit Backfill

139. Pit closure with pit backfill needs reconsideration based on the overwhelming information that protection and restoration of the public resources would be implemented. This needs to be done in a Supplemental DEIS, not the FEIS. The USFS should consider any alternative that reduces the need to permanently place mine waste materials in major water courses and waters of the United States.
(WUS). Using a closure design that places a significant amount of overburden and waste rock back into the mine pit would constitute one of the "...practicable alternatives to the proposed discharge, that is, not discharging into the waters of the U.S..." in accordance with 40 CFR 230(5)(c). Furthermore, the placement of mine waste in waters of the U.S. may conflict with state surface water quality regulation found in A.A.C. R18-108(D) stating, "surface water shall not contain solid waste such as refuse, rubbish, demolition or construction debris, trash, garbage, motor vehicles, appliances, or tires." The restrictions on discharge expressed in 40 CFR 230(10)(b)(1) would seem to discourage alternatives that may violate Arizona state water quality standards.

140. Backfill of the pit is technically practicable and may be economically feasible, since it has been practiced at other mine sites. This closure design is more frequently being incorporated into mine plans of operation because of more stringent regulations regarding mine pit lakes and water quality impacts, such as in California. Backfill of the pit is a reasonable alternative because it offers a rational method to significantly reduce the amount of waste that must be disposed at surface facilities at the proposed mine site. It logically follows that such an approach would lessen impacts in specifically identified areas of concern in the 404B.1 Alternatives analysis and USFS Rosemont DEIS, such as recreation and wilderness, cultural resources, livestock grazing, surface water quantity and quality, and visual resources.

141. The open pit is probably the single most damaging feature of the entire mine proposal. It would lower the regional aquifer by about 2000 feet within the pit. After closure, the mining company would stop dewatering and the pit would begin to fill with water (see figure below). Continued evaporation from the pit-lake surface removes water directly from the aquifer as the geographical extent of the drawdown spreads into surrounding areas. The impacts of the pit lake would continue for thousands of years, affecting areas as distant as upper Cienega Creek in the Las Cienegas NCA, and before that, areas closer to the pit lake, such as Box Canyon, Davidson Canyon, and Empire Gulch.
142. Unless filled with rock or other geologic materials, the pit will become the center of a permanent drawdown cone with the lake forming in the unbackfilled pit. Evaporation would prevent the pit lake from filling up to the original water table, therefore groundwater would flow forever into the pit lake from all directions. In addition, the water quality of the pit lake will likely exceed water quality standards (DEIS, Chapter 3, Table 68 at 293). Alternately, complete or partial backfilling the pit with waste rock / tailings materials would eliminate the long-term loss of groundwater to evaporation and thus greatly reduce or eliminate the indirect impacts to offsite streams such as Cienega Creek and Empire Gulch, Box Canyon, Davidson Canyon and possibly certain springs from groundwater depletion.

143. In addition, it would reduce the irretrievable direct impacts to an acreage that is much less than the suggested referred alternative (Alternative 4-Barrel Canyon Only), allow for less impacts to Class IV and V riparian habitat and total riparian habitat, have significantly less reduction in annual downgradient stormwater flow and overall reduce significant environmental impacts.

144. Furthermore, the data presented in Chapter 3, water quality, p. 292 indicates the pit water will be of acceptable water quality: “Geochemical Modeling indicates that no constituents exceed Arizona Aquifer Water Quality Standards” If water were to accumulate as part of a pit lake, from evapoconcentration several surface water quality standards would be violated including silver, cadmium, copper, lead, mercury, selenium and zinc (p.294, DEIS). Based on this information it becomes apparent that pit filling would be expedient to prevent formation of a pit lake and achieve many other mitigations, including reduction of impairment to streams, restoration of downgradient shallow water levels and habitat restoration, visual improvements, restoration of original topography of the area and avoidance of harm to wildlife using the lake.

145. Partial pit backfill is briefly discussed (p.85 of the DEIS). However, to include this in the FEIS does not give the public the opportunity to adequately review this option. A supplemental EIS is needed.

146. In addition, a reference is needed citing that an estimated 14% of the waste rock could be placed back in the pit and still maintain the hydrologic sink. Myers (2010) provides a transient modeling run filling the pit with waste rock / tailings materials. The results indicated that, after a very long period of time (700 years after mining) that the system eventually results in the re-establishment of a flow-through that resembles the existing condition between the Rosemont and Upper Davidson Canyon Watersheds. Thus, a hydrologic sink based on the model can be maintained with full pit backfill for several centuries. This report was sent on June 8, 2010 to acting Forest Supervisor Reta LaFord, but no response has been received.

147. The DEIS identifies the following water quality issues associated with a closure design which includes a pit lake configuration:

The mine pit lake water quality could exceed standards for silver, cadmium, lead, copper, mercury, selenium, and zinc. Silver is known to be a bactericide and is toxic to aquatic species.
Cadmium is highly toxic to wildlife, is carcinogenic and teratogenic, and can have sublethal and lethal effects at low environmental concentrations. It affects respiratory functions, enzyme levels, muscle contractions, growth reduction, and reproduction. Cadmium is known to bioaccumulate in the food chain. Lead is carcinogenic and adversely affects reproduction, liver and thyroid function, and disease resistance. The main potential ecological impacts result from direct exposure of algae, invertebrates, and freshwater fish and amphibians. It can be bioconcentrated from water but does not bioaccumulate. Copper is highly toxic in aquatic environments and affects fish, invertebrates, and amphibians. A portion of mercury released into the environment is transformed by abiotic and biotic chemical reactions to organic derivatives, such as methylmercury, which bioaccumulates in individual organisms, biomagnifies in aquatic food chains, and is the most toxic form of mercury to which wildlife are exposed. Risks from selenium are primarily associated with aquatic species. Selenium is a bioaccumulative pollutant, and aquatic life is exposed to selenium primarily through diet. Risks stem from aquatic life eating food that is contaminated with selenium, rather than from direct exposure to selenium in the water. Zinc can adversely affect growth, survival, and reproduction in aquatic species.

148. Considering these potential water quality problems with the pit lake, it is surprising that the Forest Service is not including in the EIS an evaluation of an alternative that would obviate these environmental risks. In Chapter 2, pages 84-85, of the original DEIS, the Forest Service summarized the rationale of the Line Officer in dismissing Backfill of the Open Pit as an alternative:

Complete backfill of the pit was considered. Under this scenario, waste rock that has not come into contact with process water would be placed back into the pit. The bottom of the pit that is excavated to remove copper ore is lower than the surrounding groundwater, and a pit lake would eventually form, causing groundwater to flow into the pit. Under the current modeling, more water would evaporate from the pit than would come in through rain or existing groundwater. This would create a "hydrologic sink." The benefit of maintaining a hydrologic sink is that potential contaminants entering the surrounding groundwater would tend to flow into the pit and be contained.

Creation of a hydraulic sink is considered to be an acceptable and desirable condition, as it protects groundwater chemistry should pit water become contaminated. Protection of groundwater is required by the Clean Water Act. The Best Available Demonstrated Control Technology Manual published by the State of Arizona includes the permanent hydraulic sink as an acceptable method of ensuring groundwater chemistry and therefore complying with the Clean Water Act. Backfilling the pit with "clean" waste rock could create a flow-through situation where
groundwater would flow through the pit lake, thereby eliminating the hydraulic sink and increasing the risk of detrimental impacts to groundwater chemistry from potential contaminants in pit lake water.

In addition, stockpiling clean waste rock during mining operations would likely increase the footprint of mine related facilities. Pit refill could not begin until mining operations were completed, would likely increase the number of years that activities at the mine site would occur, and would extend the time frame for accomplishing reclamation. Concurrent reclamation could not occur. Effects on most resources would increase in duration, and resource use (fuel, electricity) would increase. For these reasons, complete backfill of the pit was eliminated from further consideration.

149. The Forest Service may have overlooked some considerations in making this dismissal of the pit backfill approach as a separate alternative for the EIS. We offer the following list of reasons that backfill of the open pit mine should be considered as an alternative under NEPA:

1) The FOREST SERVICE created the Barrel Alternative because it is an approach that shifts the footprint of mine waste facilities in a way that certain land use areas are not affected. The DEIS states, “The forest supervisor has chosen the Barrel Alternative to be the preferred alternative. Factors influencing the decision include preservation of resource values in McCleary Canyon, including recreation, riparian areas, and wildlife species habitat and movement corridors, as well as avoidance of waters of the United States and cultural sites in McCleary Canyon and other areas.” Backfill of the pit is an approach that has a profoundly different reduction in the surface footprint that mine waste would occupy over the long term.

2) The Forest Service created the Barrel Trail Alternative presumably because it reduces some visual impact and allows a more naturally varied topography in the reclaimed condition. The DEIS states, “The Barrel Trail Alternative was developed to respond to the issues regarding potential impacts on visual resources and the surface water component of water resources. Alternative 5 places all tailings and waste rock in upper Barrel, Trail, and Wasp Canyons. This alternative is similar to the Barrel Alternative in that it also permanently avoids placement of mine waste in McCleary Canyon. However, this alternative incorporates a more varied topography to more closely replicate a natural landform than the other action alternatives.” Backfill of the pit is an approach that has a profoundly reduced long-term visual impact and offers opportunity for recovering much of the natural landform after temporary waste rock storage is eliminated from the surface at closure.

3) The Forest Service DEIS erroneously regards the closed condition at Rosemont with a pit lake and hydrologic sink as a necessary component of closure. In the DEIS, it appears that the primary reason the Forest Service is reluctant to consider backfill of the pit as a separate alternative is that such an approach might disturb the hydrologic sink. However, neither the Aquifer Protection Permit application submitted by Rosemont nor the Draft Permit developed by ADEQ relies on a hydrologic sink as passive containment in the BADCT for the facility design. The Arizona statute allowing use of a hydrologic
sink, A.R.S. §49-243(G), requires that the passive containment be approved by the Director. No demonstration or approval of passive containment has been made. Therefore, there is no compelling need with respect to impact on groundwater quality to maintain the hydrologic sink by leaving a lake in an unfilled open pit at closure.

4) Arizona law encourages returning mining overburden to the mine site by providing an exemption from Aquifer Protection Permitting for this practice at A.R.S. §49-250(B)(5), as long as the material has not been subjected to any chemical or leaching agent or process of any kind.

5) The Forest Service should consider any alternative that reduces the need to permanently place mine waste materials in waters of the U.S. Using a closure design that places a significant amount of overburden and waste rock back into the mine pit would constitute one of the "...practicable alternatives to the proposed discharge, that is, not discharging into the waters of the U.S..." in accordance with 40 CFR 230(5)(c). Furthermore, the placement of mine waste in waters of the U.S. may conflict with state surface water quality regulation found in A.A.C. R18-108(D) stating, "A surface water shall not contain solid waste such as refuse, rubbish, demolition or construction debris, trash, garbage, motor vehicles, appliances, or tires." The restrictions on discharge expressed in 40 CFR 230(10)(b)(1) would seem to discourage alternatives that may violate state water quality standards.

6) Backfill of the pit is technically practicable and may be economically feasible, since it has been practiced at other mine sites. This closure design is more frequently being incorporated into mine plans of operation because of more stringent regulations regarding mine pit lakes and water quality impacts, such as in California. Backfill of the pit is a reasonable alternative because it offers a rational method to significantly reduce the amount of waste that must be disposed at surface facilities at the proposed mine site. It logically follows that such an approach would lessen impacts in specifically identified areas of concern in the DEIS, such as recreation and wilderness, cultural resources, livestock grazing, surface water quality, and visual resources.

7) Identifying the option of partial pit backfill as a mitigation measure should not preclude using full and/or partial backfill to formulate a reasonable alternative, as well. The NEPA process is not so limiting that it excludes sound technical approaches from being used in whatever manner offers a full range of alternatives and the best options for mitigation.

8) It is possibly true that stockpiling clean waste rock during mining operations for eventual pit backfill could increase the footprint of mine related facilities. However, without fully developing this alternative, the Forest Service is not able to quantify how much more disturbed area would be involved in this option. Also, dismissing the alternative simply on the basis of creating a bigger footprint ignores the long-term possibility of reclaiming land used for temporary storage back to near-natural conditions. It is likely that land used for temporary waste storage would respond to reclamation efforts faster than land permanently covered with mine waste. To truly consider a full range of options, there is a need to weigh short-term versus long-term impacts of the various alternatives. This type of comparison is not possible without identifying an alternative that utilizes pit backfill and fully quantifying/evaluating its prospects.

9) The Forest Service contends that backfilling the pit and allowing groundwater to flow through pit material would increase the risk of detrimental impacts to groundwater chemistry from potential contaminants in pit lake water. However,
if the pit is filled, there will never be a pit lake configuration to accumulate contaminated water. Literature on pit backfilling notes that one major advantage of filling a mine pit is that oxidation of surrounding wall rock is kept to a minimum, thereby reducing metal mobility in the environment, including groundwater.

**Request:**

- The Forest Service should add another alternative using a pit backfill approach for full technical evaluation and weighing environmental risks and all impacts required in the EIS process.

![Mine Plan of Operations](image1)

This Pima County figure illustrates the Mine Plan of Operation (left) and a complete backfill alternative (right). The MPO waste rock and tailings disposal mounds footprint is reduced from 2,640 acres to 400 acres, an 85% reduction. The MPO surface disposal volumes for the waste rock and tailings disposal mounds is reduced from ~830M to ~215M cubic yards, a 74% reduction. Other complete and partial backfill alternatives are possible.

**Practicability of the Open Pit Backfill Alternative**

150. Open-pit mining is commonly used in the copper industry to exploit low-grade ore deposits. Such methods create very large excavations and in the process the volume of the material recovered from the pit increases by 25 to 35%. Less than 1% of the volume generated by the Rosemont project would be marketable metallic substances. Thus, the open pit proposed will generate large volumes of waste.
all alternatives listed by the Forest Service in the DEIS, the open pit itself is not to be reclaimed.

151. Over thirty years ago, Congress required surface coal mines be backfilled as an element of reclamation. Backfilling is also used, voluntarily, in some underground mines. In 2003, California’s state Mining and Geology Board evaluated reclamation of open pits from metallic mines. They found that none of the open pits that had been created since 1976 had been reclaimed, despite having a reclamation standard to return land to usable condition and protect public health and safety. The Board found that many of the pit lakes, where present, were found to have elevated levels of metals of concern to human and other life.

Because open pits were not being reclaimed, the State of California adopted a new requirement to backfill new metallic mines to a level “not less than the original surface elevation” unless there remains insufficient volume of materials (Public Resource Code Section 3704.1 Performance Standards). Financial assurances are collected to assure backfilling and grading required. This standard remains in effect today.

In the state of Nevada regulations require the following with respect to pit lakes:

3. Bodies of water which are a result of mine pits penetrating the water table must not create an impoundment which:
   (a) Has the potential to degrade the groundwaters of the State; or
   (b) Has the potential to affect adversely the health of human, terrestrial or avian life.
   (NAC 445A.429)

If these criteria cannot be met, mine closure must incorporate an alternative approach, such as partial or complete backfill of the pit.

152. Pit backfill was been completed in Ladysmith, Wisconsin following open-pit copper-gold mining. The mine’s open pit was backfilled and the site returned to its original contours. Notice of closure was filed with Wisconsin DNR in 2001. As a result of backfilling, over 10 acres of wetlands were created and clusters of trees and prairie grasses were planted to provide habitat for wildlife. At the request of local governments, 32 acres of the site were set aside for industrial use and leased for subsequent industrial development purposes.

153. In Arizona, backfilling of open pit mines is practiced voluntarily, and has been previously evaluated in NEPA deliberations. For instance, partial backfilling was considered as an alternative in EISs for both the Carlota and Dos Pobres mines. In the case of the Carlota mine, Tonto National Forest, partial backfilling was advantageous enough to the company that it was incorporated into the preferred alternative voluntarily. Partial backfilling is used in certain areas of the mine at Morenci. At Pinto Valley there is precedent for the open pit being backfilled with reprocessed tailings.

154. Based on representations made by Rosemont Copper, it is anticipated that several billions of dollars of profit might result from operation of the proposed mine. If so, partial or complete backfilling would likely be financially and technically
feasible, particularly in consideration of the waste rock and non-acid generating material characterizations provided by Rosemont.

155. An argument that some future technology might make the processed Rosemont tailings material economically viable would be a very weak argument, at best. Energy costs for processing increase dramatically as concentration declines. Even should new technology dramatically decrease energy costs, the metal content of waste rock and tailings materials from the proposed Rosemont project would still be substantially less than the nearby Peach-Elgin, Broadtop Butte and Copper World mineral deposits owned by Rosemont.

Mitigation

156. Mitigation is totally inadequate to address effects. Deed restrictions should be to prohibit valley fills elsewhere in the watersheds owned by Rosemont copper.

157. Pima County has requested approximately 8800 acres of compensatory mitigation for the Mine Plan of Operations.

158. Below are some principles for the selection of lands used as compensatory mitigation that Pima County has previously recommended:

**Lands protected as compensatory mitigation should be:**

1) in the area of direct effect or as close as possible to the area of direct effect; and
2) adjacent to other protected lands; and
3) protected in perpetuity with legal instruments that secure minerals and water, and other land interests; and
4) managed for protection of land and water; and
5) monitored to assure the mitigation intent is being met; and
6) accessible to the public (at least by means of foot); and
7) located within the Maeveen Marie Behan Conservation Lands System (CLS); and
8) a total acreage that is consistent with the CLS guidelines for mitigation (~8800 acres)

**Based on these principles, the ideal compensatory mitigation lands would include (in no particular order):**

1) portions of the Santa Rita Experimental Range adjacent to the Coronado National Forest;
2) private lands located inside or adjacent to the Santa Rita units of the National Forest, especially in Pima County close to the mine
3) Rosemont’s fee-owned lands in or adjacent to the Santa Rita unit of the Coronado National Forest;
4) private and state trust lands along Barrel and Davidson Canyons, including lands owned by Rosemont, and state trust lands which are part of Pima County’s Bar V Ranch.

**Principles for waters for compensatory mitigation:**
1) springs and perennial streams (if their existence is not threatened by the
mine itself; and
2) inside other protected land areas; and
3) protected in perpetuity with legal instruments that secure minerals and water;
and
4) provide habitat for listed or candidate species; and
5) managed for protection of land and water;
6) monitored to assure the mitigation intent is being met;
7) Mitigation for water impacts to the Cienega Basin can include the purchase of
the one-acre Vail diversion dam and associated water rights along Cienega
Creek.

If insufficient compensatory mitigation land is available from the ideal lands, then
County preferences in order of priority are:

1. State and private lands in the Santa Rita unit at similar elevation, including
the private lands at the mouth of Madera Canyon;
2. State and private lands adjacent to BLM and County land in the Empire
Mountains. The Empire Mountains are an important recharge area in the
Cienega Basin. Possesses extensive outcrops of limestone, includes mine
claims. Land is situated close to the mine and at a similar elevation.
Includes lands in the area of visual effect. Several land owners in the area
have approached Pima County with interest in selling.
3. State and private lands adjacent to BLM and County land in the piedmont of
the Whetstone Mountains. Land is situated close to the mine and at a similar
elevation. Includes lands in the area of visual effect.
4. Private lands along Agua Verde Creek south of the Rincon Mountains. Land
includes riparian areas similar to those which would be affected along
Davidson and Barrel Canyons. Is close to or adjacent to protected lands.
CHAPTER 3 – GEOLOGY, MINERALS, AND PALEONTOLOGY

159. The DEIS has some language regarding pre-construction surveys for paleontological resources, but this is insufficient because it is unlikely that new paleontological resources will be discovered during this phase of the project. Rather, a qualified paleontological monitor(s) should be present full-time during grading/excavation of native geological deposits that have been assigned a high and moderate paleontological resource sensitivity rating. The monitor should have access to active excavation operations and inspect fresh cut slopes and borehole sidewalls and spoils for exposed fossil remains or traces. As with major cave discoveries (comment below; 176), there should be a more detailed protocol developed prior to the discovery of any significant paleontological resources such as macrofossils.

160. Validity of the existing claims was a major public issue identified in content analysis of the scoping comments, and it has repeatedly been requested by Pima County. The Forest should explain why they decided not to exercise their discretion to conduct such an examination in light of the public concerns regarding such.

161. Rosemont borehole geologic descriptions have noted tremolite in the host rock in the Rosemont project area. The Forest must consider the potential for asbestiform minerals to be released into the atmosphere during excavation. Only the fibrous forms of tremolite and several other minerals may contribute to asbestosis or other lung impairments, however there has been nothing to define the occurrence and risks of asbestiform minerals in the Rosemont NEPA process.

162. Identify the potential to concentrate naturally-occurring radioactive materials during processing.

163. The assumption that uranium and other radioactive materials will not require consideration is unwarranted. A SEIS should identify likely concentrations and mobility of radioactive materials in the tailings.

164. Economic recovery of the minerals is assumed in the DEIS. Identify the circumstances under which tailings would be milled finer to enhance recovery.

165. Faults and fractures are inadequately characterized in the DEIS. Inadequate characterization of faults and fractures affects the validity of the assumptions about rates and directions of groundwater movement. This should be corrected in a SEIS.
The map above shows geological information compiled by Pima County. Faults surveyed by Anamax were digitized from the 1977 Rosemont EIS. Faults identified by AZGS were obtained in digital format. Spring locations came from Pima County's springs inventory. Lineaments in blue were mapped by Dr. Robert Casavant based on 1:24,000 BLM stereo-photographs provided by AZGS. 'ROS_Line' lineaments mapped by Julia Fonseca, M. S. geology, based on 10 m hillshade, 2002 color orthophotography and 2006 color orthophotography.

There is often not a one-to-one correspondence between lineament and published faults, but the map shows a correspondence in terms of regional stress patterns. Published faults are shown as discrete lines, when in fact they may be more consistent with diffuse zones of surface lineaments—especially in areas where the deformation has a translational (and rotational) component to it. This is one such area.

In the general N-trending basin-and-range extensional fabrics, the NW-oriented bends and/or terminations in the range-bounding faults may represent long-lived, and now inherited, basement-controlled conjugate shears.
167. This map compares Casavant’s lineaments to the stream network mapped from the same stereophoto pairs. The stream network was mapped because headwater drainage features (essentially first-order reaches) are highly influenced by neotectonic elements because the stream power is lower. The downstream, higher-order reaches carry more material and surface expressions of underlying structural or stratigraphic discontinuities can get masked or over run by greater deposition and erosional power. If higher order streams do match with known or suspected geology discontinuities or projections of them, this is significant and should be investigated. This work identifies numerous alignments between headwaters streams and lineaments and fault data. Also notable is Barrel Canyon's anomalous linearity and alignment with both lineament and fault data.
The map below compares Casavant's lineaments to local geology.

Taken as a whole, this work suggests that the faults and fractures in the area may not be undercharacterized, while other groundwater-dependent ecosystems may not be affected. Predicted quickly than predicted, while other groundwater-dependent ecosystems may not be affected.

170. Text on pages 112-114 and 116 fail to address the mine in question.

171. Text fails to disclose the decision of the Forest Supervisor to reject a discretionary validity exam, or impacts resulting from that decision.

172. The geology section should disclose impacts to geology from the activities on the west side of the Santa Ritas.

169. Furthermore, the re-contouring of the piezometric surface, performed independently by Dr. Casavant, provides another line of evidence of structural complexity not represented in the hydrogeologic framework for models of water movement. Furthermore, re-contouring of the piezometric surface, performed independently by Dr. Casavant, provides another line of evidence of structural complexity not represented in the hydrogeologic framework for models of water movement. Furthermore, re-contouring of the piezometric surface, performed independently by Dr. Casavant, provides another line of evidence of structural complexity not represented in the hydrogeologic framework for models of water movement.

168. This work compares Casavant's lineaments to local geology.
173. Geology, cumulative effects. The submittal of the proposal to develop the Blue Jay mine indicates the likelihood that over the 30 year term this would be developed.

174. There is related exploration by Rosemont in the area for a deeper sulfide deposit—exploitation of this resource should also be considered, along with Peach-Elgin, Copper World and Broad Top. In fact the potential for development of these other prospects affected the siting of the Rosemont project facilities. All should be considered reasonably foreseeable.

175. The Forest’s interpretation of reasonably foreseeable is unreasonably narrow.

176. Mitigation for caves encountered during mining should include documentation of cave features in a detailed protocol that is disclosed in a SEIS.

177. Geological faults mapped by Anamax and included the 1977 Rosemont DEIS should be included in the Forest’s SEIS or revised DEIS. These faults are portrayed above.

178. The extent to which the Santa Rita mountains are a barrier to groundwater movement should be constrained with geophysical investigations. The existence
of cross-mountain faults in the 1977 DEIS suggests some potential for cross-
mountain impacts in the vicinity of these structures.

179. The above map is an excerpt from the Empire Ranch Bedrock map, Arizona
Geological Survey OFR-09-05, v.1.0 In hot pink TKq is the dike that is considered
to be a geological barrier influencing groundwater movement by Tetratech. The
map shows the dike is discontinuous in nature. If this DEIS continues to rely on the
assumption that this dike influences movement, then the basis for that assumption
in the face of geological evidence to the contrary needs to be disclosed.

180. The geological origin of springs should be evaluated. This issue is significant to
understand which springs and streams outside the mine’s direct footprint might be
affected. The geological setting of springs also reveals information about the
aquifer that would improve the geological framework for the groundwater model.

181. The SEIS should disclose that the Rosemont area provides recharge to Box
Canyon (see Errol Montgomery figure below).
minerals at Brockport Bluff, Copper World and Peck-Chipin.

186. Cumulative impacts on minerals should include exploration of deeper sulfide deposits that underlie the Rosemont deposit, and exploration of other deposits south of the proposed mine, including those located on BLM land south of Helvetia (Slickrock Spring, ZackerENDORF Spring). There is no geological information about springs west of the mine such as the Zackerendorf Spring.

187. As pointed out by the late Fred Tarsus, a local geologist, if the Rosemont ore deposit contains little more than the proven reserves situated beneath about hundreds of feet of almost barren, leached rock, then the mine, if allowed to begin, should be required to analyze all the data relevant to the proposed mine, including hydrogeology, aquifer characteristics, and geological and mining plans. Without this information, the potential impacts are speculative.

188. There is no geological information about the geological origin of this spring, or any others, south of the proposed mine. Without geological information, the impacts on the Rosemont deposit cannot be assessed.

189. Indirect impacts will be significant, and the conclusions in the EIS, with regards to indirect impacts, will be questionable. Hydrogeologically, the Rosemont deposit may be affected by springs on BLM land north of Helvetia (e.g., Zackerendorf Spring) and springs at Brockport Bluff, Copper World and Peck-Chipin.

190. The proposed mine will affect the hydrogeological conditions of the Rosemont deposit, and the potential impacts will be significant. The proposed mine will affect the geological conditions of the Rosemont deposit, and the potential impacts will be significant.

191. The proposed mine will affect the hydrogeological conditions of the Rosemont deposit, and the potential impacts will be significant. The proposed mine will affect the geological conditions of the Rosemont deposit, and the potential impacts will be significant.

192. The proposed mine will affect the hydrogeological conditions of the Rosemont deposit, and the potential impacts will be significant. The proposed mine will affect the geological conditions of the Rosemont deposit, and the potential impacts will be significant.
CHAPTER 3 - SOILS

General

187. The soils analysis should identify impacts to soils from the activities on the west side of the Santa Ritas.

188. The statement that "no indication of caves or open spaces was found in project drill cores" may be true but the conclusion that the rocks are unlikely hosts for subsequent cave formation is not supported by the borehole logs in evidence in Rosemont's technical reports. In fact, the presence of anhydrite suggests the potential for cave formation. And the lack of recovery in some areas suggests the potential that large voids were encountered.

Sediment Yield

189. DEIS cited Best Management Practice (BMP) will be applied to control soil loss. However, there is no Technical Memos or quantitative analyses to support the effectiveness of BMP. DEIS should provide quantitative analysis to show the effectiveness of BMP.

190. Quantitative analysis of long-term stability of tailing and waste piles should be required. DEIS mentioned that qualitative assessments were performed. However, there are no detail results or explanation of the assessments in the DEIS. DEIS should provide the information of "Qualitative Analysis". Additionally, qualitative assessment is not enough due to safety concerns. Quantitative assessment is required to address long-term safety concerns. DEIS mentioned that Qualitative evaluation of alteration of soil productivity and soil development was analyzed. However, there are no detail results or explanation of the assessments in the DEIS. DEIS should provide the information of "Qualitative Analysis".

191. The DEIS used PSIAC method to estimate sediment yield from the Rosemont site. The District has previously noted that the PSIAC method (Pacific Inter Agency Committee - PSIAC, 1968) used for this analysis is inappropriate because it is a scoring method that does not explicitly recognize site conditions and changes in site condition resulting from disturbance (like mining) in the analysis. PSIAC is developed for planning purposes by Pacific Southwest Inter Agency Committee for watershed basins of larger than 10 square mile (PSIAC, 1968). The watershed area is 8.2 sq mile for the Baseline condition and 1.9 sq mile for the post-mining condition. Because it does not recognize the effect of site disturbance, it cannot be used to evaluate alternatives that specifically involve evaluating the impact of site disturbance. Additionally, the impacts of the projects on sediment yield were estimated simply based on changes in the contributing watershed areas. It is questionable if sediment yield would proportionally decrease with decreasing contributing watershed area.

192. While Tetra Tech has defended the PSIAC method (Tetra Tech, August 18, 2011), their defense of the methods is flawed in the following ways:

193. Lack of Documentation for their Claims of Success: Tetra Tech claimed that over the 30 years Tetra Tech has highly satisfactory results of sediment estimation by
using PSIAC (Tetra Tech, August 18, 2011). However, Tetra Tech did not provide any supportive data. Are there any comparisons between estimated and measured sediment data? The Tetra Tech's "successful results" statement is not reasonable unless they can provide results that can support their assessment. Tetra Tech should explain why PSIAC is appropriate to estimate sediment yield at the Rosemont site or revise sediment calculations. Tetra Tech also should explain why the post-mining sediment will be reduced as a function of a watershed size.

194. *The sources Tetra Tech cites for documenting the appropriateness of the PSIAC method for this purpose, actually show the contrary:* While the District concedes that the PSIAC method has been proposed for use on watersheds smaller than the 10 sq. miles, the two studies cited by Tetra Tech (Rasely, 1991; Renard and Stone 1982 [Tetra-Tech neglected to mention the co-author Stone]), clearly state that the PSIAC method is inappropriate for site level assessment:

>'The method developed by the Water Management Committee of PSIAC (1968) was intended for broad planning rather than specific project formulation where more intensive investigations are required.'


'It should be emphasized that the PSIAC sediment yield procedure is quite different from the Universal Soil Loss Equation, USLE, (Wischmeier and Smith, 1978) because the USLE evaluates on-site soil disturbance in relationship to agricultural cropland, which is the gross soil erosion in an individual soil and farm field setting, while the PSIAC sediment yield procedure rates sediment delivery from rangeland and mountainland which is net soil loss in a watershed hydrologic unit setting.'


This quote from Rasely, 1991 clearly indicates that PSIAC is meant to be used on undisturbed rangelands and mountainlands, while other methods, such as USLE, are appropriate for assessing the impacts of disturbance. Furthermore, the District contacted Ken Renard (co-author of Renard and Stone, 1981), who re-iterated that the PSIAC method is inappropriate for estimating erosion from mine sites. Therefore, the two sources identified by Tetra Tech as justification for the use of PSIAC method for evaluating the impact of the Rosemont mine actually state that PSIAC is an inappropriate method for evaluating impacts of mining on erosion and soil loss.

As such, there can be no-doubt that the PSIAC method is inappropriate for evaluating the impacts of the different mine alternatives. Therefore, the soil loss, sedimentation and sediment yield evaluations need to be re-done using a method that is appropriate for mine sites.
Additionally, the method to calculate runoff volume for the sediment concentration is not reliable because of the parameterization issue, mainly with the inappropriate selection of annual rainfall (too low. See comments for "Surface Water Quantity").

195. The RUSLE model should be used instead of PSIAC to evaluate soil erosion impacts: The Revised Universal Soil Loss Equation (RUSLE) should have been used to evaluate the erosion impacts of the alternatives. Tetra Tech itself has cited the Revised Universal Soil Loss Equation (RUSLE) as an appropriate tool for evaluating the post-closure soil loss (Tetra Tech, March 11, 2010), noting that specific guidance has been developed for its use on mine reclamation (Toy and Foster, 1998). However, these calculations and the RUSLE model results were not cited in the DEIS, and must not have been used in the alternatives analysis. RUSLE is a defensible model for evaluating the impacts of mining on erosion and should be used instead of the PSIAC model, which is inappropriate for mine sites.

Summary of Effects by Issue Measures by Alternative (P.139-140)

196. Table 12 summarizes the estimated impacts of proposed and alternative plans. However, there are no detail explanations to support the estimated impacts of proposed actions. DEIS should clearly state references to support the results.

197. Sediment delivery to Davidson Canyon, Cienega Creek or other streams and washes: It is not clear how those sediment amounts were calculated. DEIS should provide how the sediment was calculated.

Estimated Soil Salvage Volumes (p.145-146)

198. DEIS cited that revegetation success has reportedly observed within the proposed pit area. First, this is not correct. DEIS referred "Reclamaiton and Closure Plan, Rosemont Copper", Tetra Tech, 2007 as a supporting document. However, we cannot locate the report. According to the other report done by Tetra Tech (Tetra Tech, June, 2007), greenhouse and on site testing is on going but there are no results or any data to support "successful revegetation". DEIS should not include unreliable information. Vegetation recovery is important for erosion control and slope stability. The detail and results of the UA revegetation testing study should be added to DEIS.

Soil Productivity Directly Lost to Mine Activities (p.147)

199. Table 16 shows that the proposed action is the largest soil productivity loss among the other alternatives. DEIS should label the Forest’s preferred alternative in this table.

Sediment Delivery during Construction and Operation (P.147)

200. Issues related to the sediment calculation methods

The methods to estimate total suspended sediment are problematic. The estimates for sediment yield calculated with the PSIAC method are unreliable (as described above “Sediment Calculation”), and the methods used to estimate runoff peaks and volumes (see Chapter 3 _ Water Quantity Comments), the suspended sediment calculation (which derives from dividing sediment yield by
runoff volume) are flawed. Therefore, the values shown on Table 92 are not reliable.

201. Maintenance issue

DEIS did not clearly cite how the compliance point dam will be maintained over time. Maintenance (e.g. sediment removal) will be required to maintain the storage area. As mentioned above, central drains should function in perpetuity, but sediment (such as airborne dust) will be present and has the potential to clog beyond the period Rosemont operates the mine.

202. Impacts to downstream is required

DEIS cited that "sediment delivery to the downstream watershed is expected to decrease from baseline conditions during mine activities, while suspended sediment concentrations are expected to remain relatively unchanged. It is not clear why suspended sediment concentration will remain "unchanged" (p.147). DEIS should explain the reason.

Assessment of Revegetation Potential of Waste Rock and Tailings and Expected Progress of Plant Communities and Reclamation Efforts (P.148-151)

203. According to Survey of Salvage Topsoil Resources, Rosemont Copper (Tetra Tech, June, 2007), "soil at the project site is sandy loam with some sandy clay. These soils are located throughout the project site and have potential for use in reclamation. However, these sandy soils have low water holding capacity which limits re-growth potential." Also, the survey found that "overall organic matter content is low throughout the project site with the upper 12 inches generally having the highest organic matter content and the alluvial washes generally containing moderately high levels of organic matter. In addition, the phosphorus, nitrate, and potassium concentrations were generally low." The results of the soil survey indicated that the soils in the project site need special consideration for a reclamation plan due to the susceptibility to water and/or wind erosion, high clay content, low nutrient, and low water holding capacity. The DEIS should include "on-site" testing and use the results to assess the effectiveness of revegetation.

Requests:

204. Because of the inadequate information provided in the DEIS, a Supplemented Environmental Impact Statement (SEIS) should be provided that includes the following studies:

✓ A soil erosion assessment that specifically recognizes the impact of mining is needed: The DEIS recognizes the need to estimate the erosion from existing conditions and post-mining conditions (p 336), but then does not provide soil erosion assessment, and instead provides the results of a scoring method for sediment yield, which does not assess soil erosion. A soil erosion method that specifically recognizes the impact of mining, such as RUSLE (Toy and Foster, 1998) is needed. Rosemont's consultant, Tetra Tech has recognized this need in some of it's correspondence to Rosemont (Tetra Tech, March 11, 2010).
✓ **Sediment Transport Analysis:** A sediment transport analysis which considers the physical processes of sediment entrainment, transport and deposition as a function of flowing water rate will provide an estimate of how sediment will move in response to different events and provide a better assessment of what areas are likely to scour and which might experience degradation. A model, such as HEC-6 or HEC-RAS would be more appropriate than the models used in the DEIS.

✓ **Geomorphic Analysis of Impact of Flow Regime Change Impacts:** Given the importance of the Davidson Canyon as an Outstanding Waters of State of Arizona understanding the potential of the change in flow regime on to change the integrity of the Davidson Canyon corridor through degradation or deposition of sediment.

✓ **Evaluation of Revegetation Effects:** Since revegetation is such a critical part of mine reclamation, analysis using on-site conditions is required.

**Need for Mining, and Post-Closure, Soils Management Plans**

205. Within Chapter 3, Vol 1 of the DEIS, under the *Mitigation Effectiveness* section of Soils (p 157) the following reclamation "goals" are provided:

- "...and a revegetation program on mine waste rock and mine tailings."

- "...tailings stack, which would include a surrounding rock and soil buttress seeded for revegetation."

- "In order to enhance revegetation efforts, specifications and goals for the salvage, storage, and reuse of growth media (topsoil) from disturbed areas would be developed, with the goal of providing sufficient cover on all disturbed areas to be reclaimed. Unless otherwise specified, Rosemont Copper would provide for a minimum of 1 foot of growth media cover over final waste rock slopes, waste rock surfaces, waste rock benches, completed tailings buttress, water diversion fill slopes, plant site fill slopes, construction laydown areas, facility plant site following final removal of equipment, and temporary roads. The areas to be revegetated would be contoured, graded, prepared, and seeded."

- "Storage of growth media would require placement of growth media stockpiles in locations that are protected from mining operations and associated activities, stable, isolated from surface water, gently sloping, and well drained. Stockpiles would be revegetated with native species no later than the first growth season following construction to minimize erosion."

- "Sediment control structures would be installed or other best management practices implemented as needed to protect growth media from loss. Finally, growth media stockpiles would be used quickly during concurrent reclamation to minimize the length of storage time."
Four soil salvage documents have been prepared by Tetra Tech for Rosemont Copper:

- Survey of Salvage Topsoil Resources for the Rosemont Mining Area – Revision 1 (November 2010)
- Survey of Salvage Topsoil Resources (June 2007)
- Storage Area Soil Salvage Estimates (June 2007)
- Operational Area Soil Salvage Estimates (June 2007)

Section 3.3 of the Survey of Salvage Topsoil Resources (2007) contains the following statements:

- Soil salvage at the Rosemont site will be affected by the topsoil physical and chemical characteristics and by the physiographic position on the landscape and equipment available for salvage.

- The topsoil and subsoil horizons in the Project area exhibit the most alteration from the parent material and are the substrates most suitable for use as plant growth media.

- The primary chemical property limiting salvage is nutrient content. Nutrient content is variable throughout the survey area, but the pit site exhibited the highest nutrient levels and other qualities that make them suitable as plant growth media.

**Concern for Availability of Suitable Growth Media for Concurrent Reclamation**

206. As noted above as stated in the DEIS, almost all areas of the mining site, except for planned side slope scree locations, will be covered with a minimum 1 ft of soil growth media.

- However, Rosemont may not even intend to use one foot of soil for this purpose. In the Tetra Tech July 2007 Reclamation and Closure Plan, on Figures 17 and 18, the proposed application of soil growth media is constrained in a number of places with the term "as needed".

207. A Soil Map Unit Delineation is provided in Figure 1 of the Survey of Salvage Topsoil Resources for the Rosemont Mining Area – Revision 1. The map clearly shows the overwhelming majority of topsoil reserves to be located in the southern half of the proposed mine disturbance area, in the vicinity of the planned Waste Rock Disposal Mound. Some lesser soil resources are located in the east half of the planned Open Pit area.

- As noted in Section 1 of the Storage Area Soil Salvage Estimates report: "The life cycle of the mine will result in the continuing growth in size of the waste rock and dry tailings storage areas. A close association of the salvage soil and facility expansion allows the reclamation operations to be managed without the use of intermediary soil salvage stockpiles."
• However, a review of disturbed and covered areas over the first half of the mine's operational life indicate the distribution / availability of suitable soil growth media for concurrent reclamation will be problematic at best.

208. Information provided on Figure 3 from both the 2007 Storage Area Soil Salvage Estimates and 2007 Operational Area Soil Salvage Estimates reports demonstrates that by Yr five of operations, approximately 75% of the site's surface topsoil resources will have been removed through excavation (open pit) or covering (heap leach pad, waste rock disposal mound, tailings disposal mound, surface roads, plant site).

• Over 90% of the site's mapped surface topsoil resources considered to be at least 0.5 feet thick will have been removed through excavation or covering by Yr 10 of operations, based upon a review of Figure 4 from both reports.

• In fact, based upon a review of the General Facility Layout at Year 10 of Operations (Figure 9 of the Reclamation and Closure Plan - Tetra Tech 2007), only about 40% of the entire Tailings and Waste Rock Disposal Mound is considered to be either reclaimed or under reclamation at this time.

• Not only are there limited topsoil resources available on-site in Year 10, but there are limited soil resource areas of any kind remaining on the entire mine site (see attached Figure 2).

• Rosemont Copper has not prepared topsoil / subsoil excavation and stockpiling plans to demonstrate the adequacy, or professional management, of project soils from the onset of mine operations through the end of the reclamation period.

209. Apparently, Rosemont Copper is planning on deep excavation of weathered bedrock materials from both within, and to the north and northwest of, the Plant Site in an area classified as having Opportunistic Salvage Only. Besides the generation of soils with degraded topsoil suitability, the significant topographical alteration required for this excavation task will itself ultimately require formal surface reclamation activities.

• As noted on page 19 of the Training Guide for Reclamation Bond Estimation and Administration, For Mineral Plans of Operation authorized and administered under 36 CFR 228A, USDA-Forest Service, April 2004 (Reclamation Bond Training Guide), within Earthwork:

"The operator should be required in the POO to regularly submit an accounting of stockpiled materials such as subsoil, and topsoil so that the reclamation review calculations are based on factual data rather than conjecture. It is incumbent on FS personnel to ensure that the operator is stockpiling any such materials as the mine is developed and that the stockpile volumes are accurate. We do not want to have to 'mine' needed reclamation materials from another site in order to reclaim the mine."

57
Request:

210. Within a Supplemental EIS (SEIS), provide the following documents in order to present the Preferred Alternative in a more thorough and complete manner:

- Prepare a **Mining Soils Management Plan** which clearly addresses the aerial extent and use of site soils throughout the mine's operational life and through the completion of mine closure and reclamation activities. Define the ultimate disturbance area of mine closure operations which will require surface revegetation remediation.

- As noted in the DEIS: "growth media stockpiles would be used quickly during concurrent reclamation to minimize the length of storage time." Per the discussion above, this statement requires quantification. Accordingly, as a formal part of the **Mining Soils Management Plan**, provide a clear aerial and
sequencing representation of on-site Soils Excavation, Stockpiling, and Use for progressive reclamation goals for mining Years 5, 10, 15, 20 and Complete Reclamation.

✓ Given the soil conditions described above for Year 10 and beyond, describe how weathered bedrock (soils with close association with the parent material and with limited nutrient content) will be amended for suitability to successfully establish vegetation across the entire 3 square-mile upper surface of the Tailings and Waste Rock Disposal Mound.

✓ Revise the Reclamation Closure Cost Estimates provided in Section 13 of the 2009 APP Application to reflect the increased costs after Year 10 associated with complicated soils stockpiling and management, and the addition of appropriate soil amendments to non-topsoil materials to be used for remediation, including weathered bedrock. Also include the costs associated with final reclamation / remediation activities for all proposed soil / weathered-bedrock borrow areas.

✓ Prepare a Mining Post-Closure Soils Management Plan, which clearly details all post-closure soil borrow areas and methods to be utilized for repair of erosion, rilling and incision damage of the final cover slopes of the massive Tailings and Waste Rock Disposal Mound. With an estimated revegetation reclamation period of possibly 100 years or more, the determination of suitable and adequate soil borrow sources is a critical component of long-term facility maintenance.

✓ As part of the Mining Post-Closure Soils Management Plan, clearly identify what parties will perform the post-reclamation surface and slope work, the equipment to be used, and the techniques to be utilized to revegetate zones of the disposal mounds upper surface and side slopes.

Mitigation Effectiveness

211. As stated in the DEIS (p.157), revegetation is one key aspect of the reclamation plan. The DEIS cited that Rosemont Copper would provide for a minimum of 1 foot of growth media cover over final waste rock slopes. It is unclear how the media can be stabilized on steep slopes. The DEIS should explain the detail.

212. The DEIS says that after 100 years (presumably 80 years after mine closure), the site is expected to be comparable to historic climax conditions. Rates of natural revegetation are affected by the area of the original disturbance and the ability of flooding to rework the surface. The Rosemont mining landscape is large at over 4,000 acres of disturbance. It would not be subject to natural flooding processes and it would be windy, factors which would limit natural revegetation processes. Although annual rainfall should favor revegetation, the soil condition will not necessarily be conducive to retaining soil moisture in the root zone. The DEIS conclusion that comparable conditions will be attained after 100 years is unwarranted.

213. I agree with the DEIS conclusion that the geochemical composition of tailings and waste rock piles may not support native vegetation (See DEIS, Executive Summary at vii see also, Chapter 3 at 137). In fact, based on the information at hand, I am very concerned about reclamation prospects. The size of the waste
rock would range from less than 0.2 feet to three feet in size, with median sizes around 0.6 feet (Tetratech 2010 Waste Rock Material Characterization). A thin topping of this coarse material on top of waste or tailings with large void spaces will prove inadequate to provide a stable substrate for vegetation to establish, or to hold moisture for the growth of plants. Furthermore, the tests that Rosemont conducted showed that the predominant material within this group is the type that generated the least productive plant growth. In addition, small-scale revegetation plots have been constructed by Rosemont with carefully prepared substrate and mulch treatments worked into the top six to eight inches of soil (Rosemont Copper University of Arizona Revegetation Study presentation by Holly Lawson). However, these test plots do not simulate the conditions that would be present in large-scale reclamation. Dry-stack tailings would have less residual water and more void space than soil or conventional tailings, factors which could make revegetation more difficult.

214. DEIS states that based on the research conducted by the University of Arizona, use of the selected seed mix could potential result in revegetation on waste rock and tailings piles that could "approximate native vegetative conditions". (See DEIS, Chapter 3 at 149). The seed mix does not approximate native vegetative conditions. The proposed seed mix contains only ten species; this would not restore the diversity of plant life that characterizes the existing site. There are presently hundreds of species of plants on thousands of acres that would be destroyed. By contrast, the UA study identified seven grass species, one perennial herb and one shrub for the seed mix (Rosemont Copper, 2009; University of Arizona Reclamation Test Plots). The site is presently a combination of juniper, oak and mesquite woodland and grassland, the exact plant composition of which varies greatly from place to place. The UA seed mix lacks variation and no effort is proposed to mimic plant community diversity or even to revegetate any tree canopy components.

215. Several species of native vegetation now found on site in large numbers are excluded from the list of species expected under the success criteria. This includes riparian species listed as part of Pima Counties Riparian Habitat (RRH) Mitigation Guidelines. Throughout the cooperative process the County has requested that Regulated Riparian Habitat Maps adopted by the Board of Supervisors should be consulted. Because this section lacks citations it is unclear if the riparian habitat disturbance data used in the DEIS includes these areas. The revegetation criteria should reflect density and species standards adopted and enforced by Pima County. Absent specific on-site mitigation for disturbed RRH the County offers developers the option to submit a Habitat Conservation Plan which may include on and offsite mitigation. Such plans may be particularly appropriate for linear utility and road projects. The species list forming the basis of success criteria should be expanded to include those listed by the county along with rectifying the density requirements. Furthermore the Voluntary Preservation Plan referred to in ADEIS responses should be discussed in some detail.

216. On page 150 notes that a study by Fehmi (2007) did not recommend planting Junipers or Mesquite. The reasoning should be explained or modified. In regards these particular species, it appears that the Coronado may consider these invasive, however evaluation of regional geography shows this to be a northern outpost of Madrean Evergreen Forest prevalent in ranges immediately to the south. While mesquite invasion of grasslands following overgrazing is well documented,
juniper is not invasive in this habitat. Furthermore riparian and aspect associated
large mesquites are also not invasive here. Reliance on studies funded by the
proponent is not scientifically sound.

217. The assumption that oak and cedar were not present in the historic landscape is
unwarranted as sufficient quantities of both were present in the late 1800s and
early 1900's to be noted on the Stock Valley historic map below. This map is the
Restoring oak and cedar (juniper) to the mined landscape should be an objective of
reclamation.

Slope

218. Under the discussion of "Expected Progression of Plant Communities and
Reclamation Efforts" the statement is made with no citation provided that "In
general, reclamation of flat areas is more successful than sloped areas, and
southern slopes are more successful than northern slopes." At this elevation with
the varied topography that exists, vegetation densities and sizes are greater on
northern slopes due to the increased water availability, higher ambient moisture,
and cooler temperatures. As noted elsewhere (rainfall) the application of weather
variables within the DEIS does not seem to be locally calibrated. While it is unclear
if this contributes to underestimation of the effort required for successful mitigation
or lowers the threshold for success unreasonably, it is clear that the extent of
mitigation required and sufficient bonding to cover it has not been sufficiently quantified to facilitate the supervisor's determination of an appropriate bond and that site characteristics have not been accurately assessed.

219. Variation in the percentage and aspect of slope is one of the generators of biodiversity. By creating microclimatic conditions, crenulations in the slope create difference moisture regimes in rock and soil substrates. The existing variation in slope and aspect is tremendous, see figure below which evaluates percent slope and shows that many ridges are oriented in different directions. The FEIS should acknowledge loss of soil-moisture variation due to simplification of the mined landscape.

220. Landforming techniques would reduce the loss of variation in slope and aspect.

![Existing Conditions (% slope)](image)
CHAPTER 3 – AIR QUALITY

General

221. Character of tailings. The revised air modeling and FEIS should disclose that tailings will be a nonplastic sandy silt, with an average of 63 percent passing No. 200; these characteristics dispose the material to wind transport. http://www.rosemontcopper.com/assets/docs/reports_10-8-10/aguifer_protection/rosemont_response/technical_response_part2/attach8.pdf

222. Smelting assumption. The air quality section should disclose assumptions regarding where smelting impacts to air quality. If the smelting would occur in Arizona or northern Mexico, then air quality impacts should be disclosed.

223. Stormwater control system as a source of dust. The perimeter ditches and peripheral detention basins, as well as the on-surface evaporation ponds should be included in the model as sources of dust, as well as grading operations.

224. Reclamation as a source of dust. Air model should reflect that reclamation of the outer slopes of the dry stack TSF will begin the “first year of operations” and that will cause dust emissions as the area is contoured and topsoil and waste rock is added to configure the area with ridges and swales.

225. Soil mixing as a source of dust. We read in the reclamation description that there will be 4.5 million cubic yards of soil and rock “mixed” on site to create “soil” for reclamation use. Please disclose the methods and amount of emissions in an SEIS. The timing of the fugitive dust emissions and location of the emissions from this source also unclear.

226. Model assumptions and soil operations assumptions. Please disclose whether any of the air quality emissions from soil salvage, transport and stockpiling were identified and evaluated in the model.

227. Tailings Storage Emissions. Rosemont has grossly underestimated PM emissions from the Tailings Storage pile (TDS10). If the correct Tailings Storage emission factor were to be used in the AERMOD projections then the PM levels would be even higher than already predicted.

228. AERMOD PM10. Even overlooking the Tailings Storage error, Rosemont still underestimates PM10 by ignoring its own observations. AERMOD PM10 predictions show that the NAAQS will be exceeded when added to the observed average PM10, as required. Rosemont incorrectly dismisses a high PM10 observation, but it is not free to ignore reality.

229. Inappropriate Background. Rosemont does not understand the meaning of “background”. For this EIS, Rosemont is required to model future pollutant levels and then to add these estimates to the existing pollutant levels, i.e., on top of the current “background” levels found in the immediate area. Instead, Rosemont selects the lowest possible pollutant level it can find, sometimes in pristine areas hundreds of miles away from the proposed mine site, and then adds this “background” level to predicted Rosemont emissions. This mistake is made for
PM and for NOx, amongst other pollutants, and calls into question all the air quality model results.

230. Model Resolution and Domain. Rosemont's air quality models do not appear to use sufficiently high spatial resolution to account for the effects of the complex terrain on air flow patterns. Nor do the boundary conditions for the model appear to have been set far enough upwind to account for the effects of topography.

Tailings Storage Emissions

231. The planned Tailings Storage pile (called TDS10) is the equivalent of existing mine tailings near Green Valley where finely-ground, sandy material is permanently stored, and where very significant dust storms can occur on windy days. The Rosemont Tailings Storage pile will cover an area of 1500 acres, and it will be in continuous operation for the next 20 years so it is especially important to correctly estimate particulate matter emissions from this source.

232. Rosemont relies on an EPA document (AP-42, Section 13.2.5; November, 2006) to calculate PM10 emissions, but makes a number of serious mistakes while doing so.

1. The effect of wind strength is incorporated through the concept of wind speed at the surface, the surface friction velocity (m/s). Rosemont erroneously uses the surface threshold friction velocity ($u^*$) for coal dust instead of using the value for mine tailings, thereby significantly underestimating tailings emissions.

   Rosemont used $u^* = 0.43$ m/s instead of $u^* = 0.172$ m/s, the value actually measured for copper mine tailings at Hayden, AZ (Nickling and Gillies, 1987). A lower value means that it is easier to create dust from mine tailings than from coal dust.

2. The tailings pile erosion potential function, $P$, is calculated from:

\[
P = 58(u^* - u^*_{th})^2 + 25(u^* - u^*_{th})^2 \text{ g/m}^2
\]

Using Rosemont’s value for $u^* = 0.567$ m/s (which is questioned below), and the correct threshold friction velocity of $u^*_{th} = 0.172$ m/s results in $P = 18.9$ g/m². Rosemont calculated $P = 4.5$, just 24% of the correct value. $P$ represents the amount of dust that could be liberated by a wind event whose speed at the surface, $u^*$, exceeds some critical value $u^*_{th}$ for that particular material (tailings).

3. The PM10 emission factor (EF) is calculated from:

\[
EF = k \left( \sum_{i=1}^{N} P_i \right) \text{ g/m}^2/\text{y}
\]

To estimate PM10, which constitutes just a fraction of the total dust generated, the particle size multiplier, $k$, is set equal to 0.5. $N =$ "number of disturbances per year". So, $N = 1$ for a single disturbance in a year. The PM10 emissions factor for this Tailings Storage pile is estimated to be:

\[
EF = 9.45 \text{ g/m}^2/\text{y}
\]

\[
EF = 84.2 \text{ lb/acre/y}
\]
Multiplying this by 1500 acres of tailings gives annual PM$_{10}$ emissions of:

$$EF = 126,600 \text{ lb/y}$$

$$EF = 14.5 \text{ lb/h}$$

This is four times higher than Rosemont's emission estimate of 3.45 lb/y.

4. In these calculations, Rosemont assumed that each year the number of disturbances $N = 1$ because "the tailings storage area will only be disturbed when tailings are added". This statement makes no sense at all. It appears that Rosemont has not interpreted $N$ correctly. $N =$ the number of disturbances of the tailings pile that are expected each year, and the "disturbance" is the wind, not the addition of tailings. The addition of fresh tailings every day ensures a steady supply of erodible material for the wind to disturb so there is no shortage of material.

The single event EF calculated above must be multiplied by the expected number of windy days each year. For the sake of this argument, I arbitrarily define "windy" as an hourly maximum wind speed $\geq 7$ m/s, and then after examining the meteorological data gathered by Rosemont at their site, I assume an average of approximately 3 windy events each month (36 events/y), i.e., $N = 36$. When the PM$_{10}$ EF is multiplied by this number of events then every year the tailings are expected to emit:

$$EF = 522 \text{ lb/h}$$

$$EF = 2286 \text{ ton/y}$$

This is 150-times the Rosemont estimate.

Defining "windy" to be $\geq 7$ m/s is generous since Nickling and Gillies (1987) report a measured value closer to 5 m/s for Arizona mine tailings. Also, the hourly average wind speed is always lower than the short term wind gust and will therefore also underestimate the PM$_{10}$. In other words, this estimate of 522 lb PM$_{10}$/h is probably very conservative.

5. Rosemont use just one value of wind speed, the "fastest mile" ever recorded over a three year period of 10.7 m/s, to represent the effect observed wind speed. This value is twice as high as the threshold wind speed reported by Nickling and Gillies (1987) for Hayden mine tailings (5.11 m/s).

6. Because of their erroneous application of the equations to estimate PM$_{10}$, Rosemont's PM$_{2.5}$ estimates are therefore also incorrect.

7. According to the EPA document (AP-42, Section 13.2.5; November, 2006), "Calculated emissions represent intermittent events and should not be input directly into dispersion models that assume steady-state emission rates." However, AERMOD is a steady state model. AP-42 should not have been used with AERMOD.

AERMOD PM$_{10}$

233. Rosemont monitored PM$_{10}$ at the proposed mine site for three years in order to establish the background level. EPA requires that the average of the highest 24-hour value recorded during each of three years is to be used as the 24-hour maximum PM$_{10}$ background level.
However, Rosemont ignored its highest observed PM$_{10}$ value declaring it to be an anomalously high outlier. Justification for ignoring its own data is erroneous. Rosemont's own statistical analysis (a linear regression with a R$^2$ value of unity) shows that the high value is not an outlier. It is clearly a valid member of the normal population distribution of natural PM$_{10}$ observations. The high value may not be ignored simply because it will occur only infrequently, anymore than one ignore the risk of a flood simply because it will occur once every hundred years. To reiterate, the high value is a naturally occurring value that is expected to occur again and that must be included when calculating the 3-year average background PM$_{10}$.

234. The National Ambient Air Quality Standard (NAAQS) maximum 24-hour PM$_{10}$ of 150 µg/m$^3$ will be exceeded when the correct average PM$_{10}$ is added to Rosemont's predicted PM$_{10}$ emissions (which are erroneously low anyway, see above).

235. The EPA provides no guidance for selecting outliers. Indeed, their guidance makes it clear that a high background should be used to provide for a worst case analysis. Rosemont may not simply ignore inconvenient observations.

PM$_{2.5}$

236. Rosemont uses Saguaro National Park (East) IMPROVE PM$_{2.5}$ data as "background" so as to minimize the relative impact of the mine on visibility, but they switch to Chiricahua National Monument IMPROVE PM$_{2.5}$ data as "background" when they want to demonstrate a low total expected PM$_{2.5}$. This blatant switch of "background" sites occurs within a single paragraph (page 7 of the Revised AERMOD Modeling Report...", April 4, 2011).

NO$_2$

237. Rosemont fails to understand the meaning of "background", as mentioned before. They use NO$_2$ data from Alamo Lake (250 miles distant), instead of data from Tucson, which is upwind of Rosemont and which will contribute significant amounts of background NO$_2$ to the site. Rosemont uses a value of 24.5 µg/m$^3$, but should instead use a value closer to 60 µg/m$^3$, which is more representative of Tucson.

238. The EIS observes that the expected NO$_X$ increase risks causing an ozone exceedance in Pima County. This is important because the County is already on the verge of exceeding the NAAQS ozone standards and may soon be required to undertake expensive remedial action. Ironically, the highest ozone levels are consistently observed at Saguaro National Park East, close to Rosemont.

239. Addition of even small amounts of NO$_X$ to the atmosphere could significantly increase ozone concentrations, especially under the NO$_X$-limited conditions which most likely prevail in the vicinity of Rosemont.

240. The photochemical reactions involved in ozone formation are complex and nonlinear. Ozone yields are dependent upon both the absolute concentrations of NO$_X$ and VOCs and also upon the ratios of these species. Thus, increased ozone production might occur downwind of this new rural NO$_X$ source as a result of mixing with biogenic VOCs produced in downwind forests including Saguaro National Park East, Chiricahua National Monument, and the Galiuro Wilderness.
Injecting even small amounts of NO\textsubscript{x} into this NO\textsubscript{x}-starved air could have a disproportionally large effect on ozone levels.

Wind Speed

241. When modeling dust emissions, Rosemont uses the 1-hour average wind speed which underestimates the speed of wind gust speed. It is the much higher "instantaneous" wind gust, not the 1-hour average that lifts dust into the air. Using the 1-hour average will underestimate the amount of dust produced by the tailings.

AERMOD Modeling Domain

242. The mine will be constructed in the eastern foothills of the Santa Rita Mountains. The complex terrain will have a dramatic effect on air flow patterns and on the dispersal of pollutants downwind. So it is critical that the spatial resolution in the model be sufficiently high to accurately resolve all important topographic features. It is also critically important the modeled domain extend far enough upwind to establish unperturbed boundary conditions. However, it is not clear if the model was set up taking these factors into account.

243. Meteorological data collected on-site show the dominance of winds coming from the west, no doubt these are the down slope winds caused by the steep topography of the Santa Rita Mountains. Observed wind speeds can approach 20 m/s which is more than twice the threshold velocity necessary to generate dust from mine tailings. These strong westerly winds will transport dust and other pollutants across eastern Pima County and into remote parks and wilderness areas degrading visibility and air quality.
CHAPTER 3 – GROUNDWATER QUANTITY

244. The DEIS does not acknowledge the distinctions among the groundwater models in relation to the federal obligations under the Endangered Species Act. The constant-head or general-head boundaries in the Tetratech and Montgomery models allow much inflow and outflow to the Cienega basin. This has the effect of reducing the modeled impacts to the east side of the Santa Ritas, where U. S. Bureau of Land Management, Forest Service and Pima County all manage endangered species habitat. The Tetratech model is least protective or conservative of the habitat of endangered species, allowing over 24,000 acre-feet of movement across model boundaries as shown in the table below to satisfy the water resource impacts caused by the project.

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245. The DEIS says the Pima County model was not peer-reviewed. This is not true. Stan Leake, a well-known modeler with U. S. Geological Survey, reviewed Myers’ initial model, including boundary conditions.

246. Pima County requests the Forest Service to conduct its own internal “peer review” of the County model, as was done with the other two. This should have been done already—there was sufficient time.

247. Table 61: A chemistry and isotope study for springs is needed to confirm discussion from Tetra Tech (2010a) and WestLand Resources Inc (2011C) reports. Most of these report evaluations are based on field reconnaissance and not recent chemical and isotopic data. Montgomery during extensive aquifer testing sampled wells for isotopes but did not sample nearby springs for isotopes and other tracer type constituents from the monitored springs. This is an oversight and additional pump testing with tracers and isotopic sampling needs implementation to show connection of pumped wells and springs. This should be included as part of a supplemental EIS. It is standard operating procedure for the Forest Service to require testing of assumptions about hydraulic connectivity between proposed pumping locations and effects upon springs and streams in the National Forest.

248. The basic data about the position of the aquifer north and northeast of the mine site are lacking. There are springs and wells in the area that should provide the necessary information to inform the SEIS model conclusions. Inferences that can be made from the groundwater level data about directions of flow are a fundamental basis for understanding the potential effects of the mine upon Davidson Canyon and springs outside the permit area, including within the National Forest.

249. Based on Hargis and Montgomery’s 1982 monitoring data, and a re-mapping of the limited data presented in Montgomery and Associates 2009 by Robert Casavant, it appears that M&A’s regional groundwater contour map may show
erroneous flow directions. The two figures below compare Casavant's interpretation with Montgomery and Associates interpretation.
The interpretation by Casavant suggests that the aquifer is structurally influenced and that there may be preferential flow directions that are not easily represented in a grid model.

According to Casavant, "the recontoured data exhibits a dominant NE component (minor NW trend) of structural control on the groundwater distribution and levels located east of the range crest. The distribution of a natural spring in the NE corner of the map area (Scholofield Spring) may also lend its location to the intersection of a major NE fault zone and intersection with a minor NW fault. These fault sets dominate the Rosemont pit area and have described elsewhere in the range as undergoing repeated reactivation associated with structural inversion of the area. The characteristics and reconstruction of fault fabrics, structural kinematics, and published papers on the tectonic evolution of Santa Rita mountains points to a history of strike-slip deformation and repeated fault reactivation, both which link to episodic hydrothermal upwelling, groundwater infiltration, and associated dissolution, mobilization and reconcentration of rock and minerals. What all this implies is that for many faults zones in the Rosemont proposed area--some mapped, others not--they are likely to still be transmissive to great depths and distances from the area, depending on individual fault segment orientations, lengths and infill history. The NE- and NW-oriented fault sets in the Santa Ritas are both prone to dilation (transension) during the current east-west B&R extension that is taking place today, and therefore, are most likely to be conducive to long-term surface infiltration and groundwater recharge within both upland and flank areas (on both sides of the current range crest)—which may be driving current artesian behavior of some water wells, as well as the hidden and under-characterized storage and transport of groundwater along and within long-lived fractured aquifers long after proposed mining takes place in the region."

In conclusion, additional data collection and interpretation are needed to better understand the geology, piezometric surface or surfaces in the area, and directions of flow. This work should be done by the Coronado National Forest and cooperators.

250. The SEIS must disclose the assumed amount, location and effects of dewatering wells and any associated pipeline. It is unclear what assumptions have been made by the Coronado in the DEIS regarding this issue.

251. The SEIS should state how much water will be removed from the pit via sump pumps and from wells in the mine vicinity. The disposition of both quantities of water should be identified.

252. If there is to be a pipeline to convey the water from the pit or dewatering wells, then the alignment of the pipeline relative to Forest lands should be disclosed.

253. Intermittent streams identified by Pima County have not been included in the DEIS analysis, but should be included as information about the position of the water table.

254. Reporting of pumping and changes to groundwater levels to the Forest Service should be required annually as a condition of using Forest land. This is important
to the evaluation of change during the time period that will elapse between the Draft and Final Environmental Impact Statements. Exploitation of the groundwater has already begun, via extraction from Rosemont's privately owned wells, but we have no way of knowing how much. There is no requirement for reporting use or water levels to the state. However, the Forest Service can require reporting in exchange for the permission to use Forest land to transport the water via truck or pipeline, and in fact should require this reporting per FSM standards.

255. The SEIS should disclose how much groundwater has been used already at the site since the MPO was accepted by the Forest.

256. On page 215 the DEIS makes the conclusion that it would be "prohibitively expensive and time consuming" to collect data from existing water supply wells. The Supervisor is required to identify an appropriate and sufficient bond. The DEIS is required to identify impacts and mitigation. Without data on existing wells the costs of replacing existing wells as needed cannot be known. Existing well data is readily available. As a cooperator the County will be happy to assist the proponents or Service in identifying this data if they are unable to do so. Cost is not a limitation of the DEIS. The DEIS must identify all impacts and appropriate mitigation. It is unreasonable to believe that collecting such data would be a greater cost than the millions spent already on public relations campaigns. These costs should not be considered exorbitant.

257. On page 217 The DEIS recognizes the limitations of the groundwater modeling methodologies used (treating faults and fractures as porous media over regional scales) thusly: "Such models are less acceptable for analyzing fate and transport over shorter distances...". The lack of locally specific modeling or use of well data for baseline and long term evaluation identification of impacts, costs and mitigation needs leaves the assessment inaccurate and incomplete. This speaks directly to the Corps authority to identify the least damaging alternative and the Supervisors' responsibility to identify sufficient mitigation and bonding and is inadequate for those purposes.

258. The DEIS does not acknowledge the distinctions among the groundwater models in relation to the federal obligations under the Endangered Species Act. The constant-head or general-head boundaries in the Tetratech and Montgomery models allow much inflow and outflow to the Cienega basin. This has the effect of reducing the modeled impacts to the east side of the Santa Ritas, where U. S. Bureau of Land Management, Forest Service and Pima County all manage endangered species habitat. The Tetratech model is least protective or conservative of the habitat of endangered species, allowing over 24,000 acre-feet of movement across model boundaries as shown in the table below to satisfy the water resource impacts caused by the project.

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259. The DEIS says the Pima County model was not peer-reviewed. This is not true. Stan Leake, a well-known modeler with U. S. Geological Survey, reviewed Myers' initial model, including boundary conditions.

260. Pima County requests the Forest Service to conduct its own internal "peer review" of the County model, as was done with the other two. This should have been done already—there was sufficient time.

261. On page 219 under the discussion of calibrating the Montgomery groundwater models, the assessment states: "On a regional scale the porous media model is reliable for predicting water level impacts, but on the scale of individual well the model may not fully reflect the individual fractures that supply water to that well." Then on page 220 in the summation of Montgomery model limitations and usability it is concluded that "...the model may not be appropriate for use elsewhere in the basin without additional revision." The same conclusion is drawn on page 223 in relation to the Tetra Tech model. Furthermore it is stated that the Tetra tech models "nearest" the pit "should be used with caution" (pg 222). Thus the DEIS has concluded that the models used are not appropriate for assessing regional or site specific impacts.

262. On page 234 the DEIS identifies subsidence occurring at the base of the alluvial fan emanating from the northwest side of the ridge to be mined. The DEIS further recognizes that groundwater withdrawals associated with the mine will further contribute to this subsidence. No evaluation is presented to show the relative impact of the mine versus other committed withdrawals. Yet the groundwater withdrawal mitigation proposed is to recharge CAP water in an entirely separate basin that will have no impact on the area directly impacted by mine related withdrawals. Reasonably Foreseeable Actions have not been adequately accounted for to facilitate identification of sufficient or effective mitigation.

263. Cumulative impacts have not been adequately addressed. Page 253 the DEIS states that the groundwater cone of depression formed by the pit would not stop expanding for up to 7000 years. The pit would remain a hydraulic sink forever. Additional claims and deposits owned by Rosemont suggest they will expand this pit within the timeframes modeled. Additional deposit extraction should be considered a "reasonably foreseeable future actions".

Groundwater Quantity West of the Santa Ritas

264. Table 47 - Water resources within a 3-4 mile radius of the Sahuarita well fields will be impacted. The annual drawdown will impact the following Pima County facilities.

- NRPR owns a well that provides irrigation water to the Sahuarita District Park and adjacent Edge Charter High School playing fields. Declines in the water levels could require Pima County to replace the well at significant cost and there will be increased pumping costs due to the additional lift required by the declining groundwater level
- RWRD owns 2 non-exempt groundwater monitoring wells at the Green Valley WRF. These wells are used for aquifer protection permit compliance purposes.
Declines in water levels could require Pima County to replace the wells at significant cost

- PCDEQ owns one non-exempt wells and two exempt monitoring wells at the Sahuarita Landfill. The monitoring wells are used for aquifer protection permit compliance purposes and for dust control. Declines in water levels could require Pima County to replace the wells at significant cost and there will be increased pumping costs due to the additional lift required by dropping the groundwater level.

265. Impacts on County facilities can be avoided or reduced if Rosemont does not use groundwater for their operations.

266. Table 48 – A water recovery permit from ADWR will be required if Rosemont intends to recover stored water from the permitted underground storage facility it is proposing to recharge CAP water.

267. Figure 34 shows the Rosemont well fields to be in the area most affected by subsidence. Increased groundwater pumping in this area would likely cause additional subsidence. There impacts could be mitigated if Rosemont were not using groundwater for their mining operations.

268. The discussion of the impacts of the No Action alternative says groundwater levels in the Upper Santa Cruz Sub-Basin would continue to decline because of existing groundwater withdrawals. However, it neglects to state the two municipal water providers have CAP allocations and are actively seeking to bring their allocation to the area. Furthermore, Freeport McMoRan is taking CAP water. The groundwater withdrawals for agriculture are also expected to decrease as the area converts from agricultural land uses to residential land uses.

269. The DEIS should disclose assumptions made regarding the future groundwater conditions as affected by the Southern Arizona Water Rights Settlement Act (e.g. incidental and direct recharge, restoration of the Santa Cruz River riparian area, and the buffer zone for wells.

270. The proposed water supply pipeline should convey CAP not pumped groundwater, in order to minimize impacts upon Sahuarita and other affected communities.

271. The predicted changes in groundwater levels in the Upper Santa Cruz Sub-Basin fails to note the efforts of the Upper Santa Cruz Users and Providers Group to address the groundwater declines by bringing renewable water resources to the area.

272. When assessing public supply wells in the west area (Table 53) well screens are not listed. Some of these shallower wells (300-500 feet), which are mostly owned Pima County, may be affected, but well screens and current water levels are left out of the table, not allowing for a more comprehensive assessment. Table 53 needs revision to include current depth to water and well screen interval.

273. The threshold of significance for impacts to wells is listed as being ten feet, but no rational is given. A drawdown of ten feet is significant enough to cause affected
well owners to replace groundwater wells with ones that reach deeper into the aquifer at a significant cost to the affected well owners. This includes several wells owned by Pima County within the four-mile impact zone of the Rosemont well field.

274. Figure 36 does not show the full impact of the publically owned and private wells that will be affected by the proposed action. This information should be available from ADWR’s well registry.

275. The maximum extent of drawdown greater than ten feet reaches into the San Xavier District and the impacts to the District could affect water rights settlements. These impacts should be assessed.

276. Groundwater modeling requested by the USFS indicates that the cone of depression will deepen, expanding between 100 and 140 years after pumping stops, and that this ten-foot drawdown is projected to expand an additional one to two miles laterally before reaching equilibrium affecting additional public supply wells, private wells and groundwater quality monitoring wells. The number of wells impacted by the proposed action is unacceptable.

277. Comments made in the ADEIS noted that Pima County monitoring wells would be impacted by the projected drawdown and that they would likely require replacement to continue groundwater monitoring required by ADEQ. This DEIS does not address these impacts.

278. The DEIS mentions that the effect on land subsidence is expected to continue, but it fails to mention that the area within the Rosemont well field is in the Green Valley land subsidence feature as mapped by ADWR using InSAR Data (see http://www.azwater.gov/AzDWR/Hydrology/Geophysics/GreenValleySubsidence.htm) Additional groundwater pumping can be reasonably expected to result in additional subsidence. A acceptable mitigation measure would be for Rosemont to use direct CAP water instead of groundwater.

279. Table 61. There are several springs that could experience drawdown of up to ten to one hundred feet. At this rate, there would be adverse impacts to the wildlife and habitat that depends on these springs.

280. Cumulative Effects. The DEIS fails to mention that Green Valley Domestic Water Improvement District has a CAP allocation of 1,900 acre-feet.

281. The new groundwater storage facility mentioned is actually a groundwater savings facility owned by Farmers Investment Company (FICO). FICO has stated they are not willing to allow the use of their facility to store water on behalf of Rosemont Copper or Augusta Resource

282. Mitigation Effectiveness. The effectiveness of Rosemont's offsite CAP recharge to mitigate project impacts should be discussed and compared to direct use of CAP water for mining operations.

283. Mitigation of Pima County's compliance wells that will need to be replaced as a result of Rosemont's groundwater pumping should be included. Rosemont should also be required to replace Pima County's groundwater well that irrigates the
Sahuarita District Park. This well will be rendered inoperable as a result of declining groundwater levels attributable to Rosemont’s groundwater pumping in the Sahuarita well field.

284. Rosemont offers to recharge as close as possible to the mine supply well field; however, there are no available recharge sites currently available in this area.

285. To the extent practicable, Rosemont offers to balance CAP storage credits with water to be pumped from mine supply well field with the intent to maintain a surplus inventory of storage credits. The EIS should discuss how these credits will be acquired and identify what legal instruments would be used to store and recover the water.

286. If CAP recharge is a mitigation measure, the SEIS should disclose where recovery of the stored recharge credits would occur.

287. Rosemont’s commitment to offset groundwater pumping in this area with CAP storage credits is limited by phrases such as recharge will occur as close as possible and to the extent practicable. With CAP subcontractors using their full CAP entitlement, it is questionable there will be CAP storage credits available. Rosemont has only stored 45,000 acre-feet of CAP water to date, less than half of the water supply needed for the 20-year water supply needs of the proposed mine. The discussion of mitigation effectiveness should disclosure these limitations.

288. Table 62. The impact to the Sierrita sulfate plume was considered and the DEIS notes minor changes in the gradient or groundwater levels would occur in the area. The DEIS assumes that mitigation pumping by Sierrita would control migration of the plume. However, we have no commitment from Sierrita that they are willing to accept responsibility for mitigation pumping caused by Rosemont’s actions.

Groundwater Quantity East Side of the Santa Ritas

289. Groundwater flow into the mine pit will result in an irretrievable loss of water from the Davidson Canyon/Cienega Basin aquifer. The impacts to groundwater dependent ecosystems and subsidence in this basin are not addressed.

290. Page 206, paragraph 2
Regarding impacts of the mine on wells, the use of the word “could cause” is too tentative. Pumping of mine supply water “will” cause reduced groundwater availability to existing wells and water users. This is based on the simple relationship that the Montgomery model on the West side and the three groundwater models established on the east side: that water-level declines will occur in the tens and hundreds of feet. The EIS needs to establish what wells, based on well screening and depth, will be dewatered and need replacement. The east side wells may not be able to be replaced and the mine may have to supply water to the well owners in perpetuity. The same needs to be done for springs and spring flow. If a spring is to be buried or it is predicted that water levels will decline over one foot, then it “will” be affected. The DEIS is tentative in evaluating the projected impacts to domestic wells in the
vicinity of the proposed mine supply wells and the proposed pit despite ADWR registered well construction information, including screening, that ADWR mandates from drillers for all wells drilled in the area. We must assume worst case that the wells affected within the 5 to 100 foot drawdown contours on the east and west sides of the proposed mine will lose availability to water since the DEIS is speculative at best in assessing the impacts to downgradient wells. A table is needed for the Cienega/Davidson Basin listing domestic residential and stock wells. Because of the potential fractured flow and uncertain flow pathways in this area, all wells within the one-foot contour after 20-years and 150-years should be listed as potentially affected.

291. Page 266, Effect on Well Owners
Numerous well driller reports from the ADWR registry for Singing Valley and Hilton Ranch Road wells are available to examine for well screen intervals. These wells can be identified as potentially susceptible to dewatering based upon the groundwater modeling and projected drawdown contours in the area. They need to be identified and recorded as future impacts from the Rosemont proposed pit and dewatering. We must assume due to the tentative nature of the statement that worst-case all 500-550 of the wells impacted by the 10-foot drawdown contour will be affected and would lose access to available water. Conversely, as with the spring assessment where a decision was made regarding probable mine impact, ADWR registered wells could be assessed regarding depth and screening to make a more quantitative assessment regarding how many wells will, may or probably will not be affected. Adequate well construction data are available from ADWR driller’s logs. Neglecting this data is not acceptable practice and should be rectified.

292. Page 277
Direct Use of CAP is not addressed.
The mitigation measures for CAP outlined in this section do not address a commitment by Rosemont to use CAP directly when a pipeline is extended to this area. Rosemont should be required to use CAP directly when a pipeline is completed from the CAP terminus to the Sahuarita area. CAP water is less potable than the local Green Valley/Sahuarita groundwater that is currently being used for potable use. Other mining operations (ASARCO) in the Green Valley area are now using CAP in lieu of higher quality, more potable groundwater. In addition, impacts to the potable wells in the Rosemont well field vicinity will be diminished.

293. Page 277
Use of pit water as mitigation not addressed. The DEIS indicates that Rosemont would replace human-made water supply structures lost related to the mine. This mitigation does not address loss of numerous spring and wells and loss of shallow groundwater which in turn will result in loss of habitat. The mitigation plan falls way short of compensating damages to lost springs, stock and domestic wells and lost habitat due to dewatering of shallow groundwater areas.
294. **Page 277**
On a real-time basis, the pit dewatering water should be released to the Davidson Canyon watershed to mitigate anticipated loss of shallow groundwater to riparian vegetation and down-gradient wells. Groundwater discharge from the pit or pit dewatering should be monitored for water quality to insure suitability as replenishment water to down-canyon areas. The mitigation operation could be included within the Forest Service NEPA Record of Decision.

295. **Page 277**
Pima County's earlier request for a well owner mitigation Plan for East side has not been addressed. Rosemont Copper needs to develop a Mitigation Plan to develop a binding residential well plan for Hilton Ranch Road and Singing Valley Road residences. By end of mining the mine pit will have caused drawdown on these residential wells to over 5-feet based on the consultant's model. The agreement should include well replacement or permanently supplying water to the residents in the event a new well is not feasible due to dewatering of the aquifer.
CHAPTER 3 - GROUNDWATER QUALITY

296. **Page 282, first bullet item.**
A supplemental EIS is needed prior to the FEIS to allow for review of the peer-reviewed geochemistry reports, especially since changes have been made to the reports which may have a being on the DEIS results.

297. With regard to modifications of the water systems in the groundwater protection zone near Sahuarita, Any water purveyor who provides water to 15 connections and/or 25 people, 60 days out of the year is by EPA definition a "Public Water System" and falls within the regulator scheme. These small water systems are regulated by PDEQ for the operation and maintenance of the system. PDEQ would be the review agency for any physical changes to the water system required. They would also fall within Pima County Code, Title 7 permitting process.

298. More isotopic work is recommended to understand the contribution of high-elevation recharge in the limestone units of the Santa Rita Mountains to discharge at key sites outside the mine footprint. What is the relationship of recharge in the Rosemont area to Barrel and Davidson Canyon underflow and to discharge at Empire Spring? Sulfate (S and O) isotopes have been found to be the most diagnostic in our area for understanding groundwater contributions to base flow (Gu et al. 2008, and other studies).

299. **ADEIS Chp. 3/GW Quality/p.10/table3.3**
The constituents listed did not contain certain secondary drinking water standards of which sulfate and TDS are primary indicators of tailing pond and tailings seepage. These indicators need listing with a comment on the concentrations resulting from the seepage studies. Seepage from tailings in the Tucson Copper Mining District has contaminated the aquifer with narrative standards of TDS and sulfate to the point where public supply wells have been contaminated and replaced.
DEIS, Chp3, P.288, Table 64: **TDS and Sulfate not listed in table.** TDS and sulfate are again not presented even though they have numeric secondary standards and are regulated at several nearby mines with narrative standards. In addition, nine samples are not representative of the vast size of tailing material to be disposed on the site. Finally, the description of the solvent liquid is not described and is lacking. Full disclosure of the solute solution is needed.

300. **ADEIS, Chp3 3/GW Quality/p.10/P.12/lines 16-18.**
Indicators of tailings seepage are not mentioned here. A discussion of sulfate and TDS and any other seepage tracers need discussion here.
DEIS Chp3, Water Quality p287: **Tailings Seepage indicators not addressed.** Most sulfide ores have indicators that include Sulfate and TDS. These need inclusion. Since this material is sulfide ore, characteristic soluble indicators include sulfate and TDS. These constituents were noticeably absent from any analyses of tailings and waste rock seepage.

301. **ADEIS3/GW Quality/p.10/P.16/lines 26-27.**
A discussion of whether the seepage from the dry-stack tailings can meet secondary drinking water standards is needed. Some of these constituents are narrative standards in Arizona. DEIS, Chp 3 GW Quality, Table 64. Table 64 is lacking of a full suite of constituents, including secondary constituents and organics. Full disclosure of a fuller range of potential constituents is needed. Page 284 lines 6-7 discuss narrative standards and impairment to the aquifer for existing or future uses. This includes drinking water. Sulfate and TDS are secondary standards where narrative standards would apply. Yet nowhere is this disclosed to the reader. The surface water section, Tables 94 and 96 show predicted TDS and sulfate, but do not indicate if the seepage is driven by rainfall or by the solute in the damp tailings. This information is needed in the groundwater Quality section and should be discussed.

302. Proposed contaminant control technologies reliability and impacts have not been fully identified or assessed. This method relies on their estimation that suitable ore will only be available in the first six years of operation. Page 287 however states that" (a)ccess to collect and treat the heap leach seepage after encapsulation has not yet been determined. A definition of “access” should be provided. More public lands may be required than has been disclosed. Furthermore these requirements may change the impacts of the alternatives.

303. Page 289 states that “technology and techniques used (to collect and treat heap leach seepage) are not known at this time.” It is stated that these will be part of the APP. Impacts cannot be assessed and mitigation identified without this information. The biologic system relied on to reduce seepage below standards has not been identified.

304. The use of precipitation geochemistry baselines from 200 miles away as described on page 292 is questionable. As acknowledged in the DEIS Organ Pipe National Monument is not part of the same biome and it is influenced by significantly different weather and land use patterns than the site.

Design of Heap Leach

305. Encapsulating the heap leach pad and ponds within the waste rock storage area is not an identified BADCT alternative nor is it a typical approach to closure for such facilities. This part of the design is deserving of greater technical scrutiny and evaluation. Particularly important is to maintain access to heap drains and pond until full drain-down is complete and the operator can verify that no additional discharge is occurring. The MPO indicates that seepage will continue beyond closure for the heap facility. However, Arizona’s statutory definition of clean closure requires that the operator eliminate “to the greatest degree practicable, of any reasonable probability of further discharge.” It will be difficult to verify the closed condition if this facility is buried under tailings.

- Examples of burial of a heap leach facility by tailings to achieve closure should be included in the EIS. If examples of this type of closure configuration are not available, then perhaps it is not appropriate to include a technology that is not demonstrated.
306. Demonstration of meeting Aquifer Water Quality Standards for the heap leach facility is dependent on an **engineered biologic treatment system**. There is no mention of such a system in the Rosemont APP application and the recently released draft APP does not discuss such a system under the BADCT or closure requirements. The SEIS should either strike the reference, or provide a design of the system for review.

307. Without a design for engineered biological treatment system to review, it is uncertain whether such a system would perform as described. The Forest Service should not defer until the closure process the plans for such a key component of this facility. Without review of a plan for this biological treatment process, the EIS cannot include an unequivocal assurance that AWQS will be met. The Forest Service should require that Rosemont submit a preliminary design for this system.

308. The Forest Service should identify appropriate criteria for the biological treatment system to meet upon its construction, so that its performance can be demonstrated prior to capping with tailing.

309. Furthermore, the EIS should identify other examples or analogs of the engineered biological treatment approach in the mining industry.

**Design of Tailings and Flow-Through Drains**

310. Only nine samples are used to represent 720 million tons of tailing material. To get a good statistical representation, more testing than this should be performed for a facility of this magnitude. The Forest Service should request additional representative analyses of tailings.

311. The Forest Service should require analysis of the Dry Stack technology to determine whether or not carbon disulfide will be present in the tailings. Evaluation of the tailing facility should not be limited to the ore that is processed. Rosemont should also evaluate environmental fate of milling process chemicals and their breakdown products. Of particular importance here are xanthates and carbon disulfide. Carbon disulfide is regulated under A.R.S. 49-243(I) so that the applicant must limit discharge to the maximum extent practicable regardless of cost.

312. There is not enough information about the construction of the flow-through drains (Central Drain) supposed to convey stormwater under the tailings impoundment. It is unclear how tailing material will be kept out of this engineered drainageway. It is also unclear how it will remain unclogged during operation and in the post-closure period. Examples of mining facilities that have used this technology should be cited in the EIS so that it is clear that the technology is demonstrated.

**Design of Waste Rock Facility**

313. The design for this mine should include a disposal facility for potentially acid generating waste rock. The Mine Plan description states that Rosemont will separate potentially acid generating (PAG) waste rock. However, a separate disposal facility for this segregated material is not included with the design. Instead, the facility will re-combine this material with other waste rock, making sure that the PAG material is not at the periphery of the waste rock facility. There is less
likelihood of acid and metal discharge if the separated PAG material is not re-incorporated with other non-acid generating (NAG) waste rock. Many Arizona mines, e.g. ASARCO's Ray Mine, place separated PAG waste rock in appropriately lined facilities.

The Forest Service should request that Rosemont include a plan to keep PAG waste rock segregated and that the facility include an area designed to dispose PAG material so that there will be no discharge.

314. Geochemical modeling of waste rock and tailings only examined metals and nitrogen compounds for which there are numeric Aquifer Water Quality Standards. State regulations regarding water quality standards for both surface water and groundwater include narrative as well as numeric standards. Narrative standard provisions should also be included in the Rosemont discussion and evaluation. With regard to narrative Aquifer Water Quality Standards, of particular importance are the following provisions:
   a. R18-11-405(A) A discharge shall not cause a pollutant to be present in an aquifer classified for drinking water protected use in a concentration which endangers human health.
   b. R18-11-405(B) A discharge shall not cause or contribute to a violation of a water quality standard established for a navigable water of the state.
   c. R18-11-405(C) A discharge shall not cause a pollutant to be present in an aquifer which impairs existing or reasonably foreseeable future uses of water in an aquifer.

315. No assessment was conducted for chemical species for which narrative standards might apply under R18-11-405(A), such as uranium, or under R18-11-405(C), such as sulfate or TDS. In other mining areas in Arizona, sulfate and TDS are major sources of water contamination, and these are not among the numeric AWQS.

316. The SEIS should disclose that the recently issued draft APP also shows that no limits are to be set for TDS, sulfate or uranium.

317. There are discrepancies between numeric AWQSs and EPA's primary drinking water standards because of Arizona's delay in adopting EPA's new standards into state water quality regulations. Arizona currently has no numeric standard for uranium while the EPA MCL is 30ug/l. Arizona's numeric AWQS for arsenic is still set at 0.05mg/l while the EPA MCL is 0.01mg/l.

318. Standards set in the APP will not protect groundwater quality for drinking water use for arsenic and uranium. The recently issued draft APP also shows that no limits are to be set for uranium and that the limit to be used for arsenic will be the state's less stringent standard. The DEIS should address uranium and arsenic or the Forest Service should request that ADEQ add more stringent levels for these constituents to the groundwater monitoring in the APP.

319. The statement that tailings and waste rock facilities are not anticipated to exceed surface water quality standards does not take into account the possibility for discharge to exceed the numeric standard for suspended sediment concentration.
found in A.A.C. R18-11-109(D) or the narrative standards found at A.A.C. R18-11-108, which stipulates the following:

A. A surface water shall not contain pollutants in amounts or combinations that:
   1. Settle to form bottom deposits that inhibit or prohibit the habitation, growth, or propagation of aquatic life;
   2. Cause objectionable odor in the area in which the surface water is located;
   3. Cause off-taste or odor in drinking water;
   4. Cause off-flavor in aquatic organisms;
   5. Are toxic to humans, animals, plants, or other organisms;
   6. Cause the growth of algae or aquatic plants that inhibit or prohibit the habitation, growth, or propagation of other aquatic life or that impair recreational uses;
   7. Cause or contribute to a violation of an aquifer water quality standard prescribed in R18-11-405 or R18-11-406; or
   8. Change the color of the surface water from natural background levels of color.

B. A surface water shall not contain oil, grease, or any other pollutant that floats as debris, foam, or scum; or that causes a film or iridescent appearance on the surface of the water; or that causes a deposit on a shoreline, bank, or aquatic vegetation. The discharge of lubricating oil or gasoline associated with the normal operation of a recreational watercraft is not a violation of this narrative standard.

C. A surface water shall not contain a discharge of suspended solids in quantities or concentrations that interfere with the treatment processes at the nearest downstream potable water treatment plant or substantially increase the cost of handling solids produced at the nearest downstream potable water treatment plant.

D. A surface water shall not contain solid waste such as refuse, rubbish, demolition or construction debris, trash, garbage, motor vehicles, appliances, or tires..

E. A wadeable, perennial stream shall support and maintain a community of organisms having a taxa richness, species composition, tolerance, and functional organization comparable to that of a stream with reference conditions in Arizona.

320. Ambient surface water quality data is lacking for intermittent streams and springs throughout the area of likely impact. In mineralized areas, it is critical to collect such baseline data so that impacts during operation and post-closure may be distinguished from pre-mining ambient conditions. The Forest Service should ensure that background surface water quality data is collected from springs and intermittent waters throughout the area of likely impact. The DEIS should address specifically discuss the relevant narrative surface water quality standards and indicate how they will be met.

321. Tables 94, 95, and 96 compare the expected seepage water quality from waste rock, heap leach, and tailings, respectively with numeric AWQSSs and conclude that groundwater quality will comply. However, the values for selenium and perhaps some of the other metals will be a problem if discharge to the aquifer connects with surface water via spring flow downgradient of the facility. If this is the case, the
narrative standard of R18-11-405(B) could apply, and the surface water quality standards, which are more stringent for some of these metals, could be applied at the point of compliance in the Aquifer Protection Permit. ADEQ has not taken this approach with their recently issued draft APP. But, there has been no analysis of fracture flow or karst development in the area. If fracture or karst are significant controls on subsurface flows, the groundwater modeling results are not a reliable prediction of the likely transport direction for seepage from the facility. The DEIS identifies that there is little understanding of the relationship of groundwater levels and spring flow in the area.

322. The Forest Service should make sure that appropriate study of spring flow and groundwater/surface water interaction through isotope studies, tracers, or geophysics, is conducted, so that the narrative standard can be applied where warranted.

323. The Forest Service should work with ADEQ to identify appropriate points of compliance that will protect springs and intermittent waters.

Groundwater Modeling Issues (for additional comments on Groundwater Modeling, see attached memo by Tom Myers, phD, January 5, 2012)

324. Groundwater models used as a key assumption the presence of a barrier to groundwater flow from an intrusive dike across Davidson Canyon. Geologic maps show this feature is discontinuous. It should not be assumed to a barrier to groundwater flow.

325. The applicant should bear the burden of proof to perform technical studies such as detailed structural mapping, geophysical analysis, or pump testing to prove the presence of such a barrier across Davidson Canyon.

326. It is unlikely that assumptions about homogeneity in the modeling are correct. The bedrock in the area consists of steeply dipping sedimentary units that have been subjected to multiple igneous intrusions and faulted during two major tectonic episodes. Groundwater models have failed to take fracture flow into account. Basin and range faults or other prevalent fracture sets within the bedrock represent a source of potential anisotropy in the system that is not accounted for in the models.

327. The DEIS does not identify any plan to monitor water levels in the area. There is a need to verify in real time whether the predicted impacts of the groundwater model are correct. The Forest Service should develop a groundwater level monitoring program to verify whether the predicted impacts of the model are correct.

328. The DEIS should identify contingency actions to invoke if the system varies significantly from the impacts identified.
CHAPTER 3 – SURFACE WATER QUANTITY

329. Intermittent streams identified by Pima County have not been included in the DEIS analysis, but the SEIS should identify as potential impacts. Shapefiles of these are available upon request to Julia Fonseca.

330. New National Forest Service policy states that one should always presume there are hydrologic connections between surface water and groundwater on Forest lands unless it can be clearly proven that there are none in the local setting. The FEIS and SEIS should comply with this policy.

331. SEIS and FEIS should identify what assumptions they make or understanding they have with regard to whether a dam safety permit is needed for any "retention structures" or other structures in the mine.

332. The project descriptions provided so far inadequately identify the potential direct disturbance to the floodplain area that may result from modifications to Highway 83 needed for traffic safety. These should be disclosed in an SEIS.

333. Water Resources: Seeps and Springs. Springs and seeps are one of the most important natural features in desert environments and this is certainly true on and near-to the site of the proposed Rosemont Mine. The proposed mining operation will significantly impact springs in the area, but the applicant fails to disclose the full extent of those impacts. According to SWCA (2011), the original springs assessment done by Westland Resources Inc (2007) was insufficient and therefore warranted the collection of more data. The 2011 report by SWCA did advance an important new framework for understand potential impacts of the proposed mine on a larger set of springs and seeps (as compared to the WestLand effort), but did not provide additional field data; instead they relied on a host of data sources with known problems of accuracy. Any regulatory determinations that rely on information known to be of questionable accuracy should be considered flawed. The validity of the results reported in the 2011 SWCA report must be verified with additional field data, especially investigation of the geological setting of each spring and at least a point-in-time inventory of spring flow and key water-quality parameters. Only then can such data be used with confidence.

334. When describing a negative impact the DEIS uses vague language. One example states that groundwater pumping by the mine operators "is beyond the expected range of significant drawdown." This quote indicates that while drawdown is expected the authors have determined it to be insignificant.

335. When an impact is positive, overly confident language is used in the DEIS. An example on page 296 describes liners that are to include leak detection. Then in the next sentence it is stated that the liners "will prevent discharge". If this were 100% true leak detection would not be required. The inconsistent use of language is evidence that the DEIS language used is not balanced or accurate.

336. In numerous locations including on page 311 the DEIS concludes that springs and seeps do not contribute to surface flows. While the volumes may be too low to easily quantify during the time of study, they certainly contribute to saturated
conditions which result in streambeds becoming inundated more quickly in any given size rainfall event. This conclusion may be erroneously leading to underestimating the contribution and extent of surface flows. Groundwater modeling developed by Montgomery clearly shows shallow groundwater near springs. Springs contribute to saturation and surface flows during rainfall.

337. Page 321 lists agencies to be included in development of riparian habitat mitigation efforts. Pima County should be added to this list. Our regulatory authority in this area has been previously disclosed. Exclusion of Pima County here indicates the authors have not incorporated cooperators input and speaks to a lack of responsiveness regarding County concerns and understanding of our requirements and expertise. The DEIS preparers have concluded that the applicants consultants are correct where the County maps are in error. This unbalanced approach is clearly contrary to the intent of the Cooperator’s Agreement.

Replacement Surface Water

338. Water as replacement water sources for livestock and wildlife is not accounted for in the Water Supply and Control description. The type of water, location of the source, and means for conveying/providing such water needs to be specified.

339. Replacement surface water (timing, volumes, locations) should be quantified as a mitigation measure before finalizing the EIS.

340. Rosemont should be required to work with the US Fish & Wildlife Service, Arizona Game & Fish Department and other resource conservation groups to replace and repair water guzzlers, stock tanks and other human created water supply structures lost to ensure their effectiveness is not compromised.

341. The overall conclusion that all alternatives impact surface water equally is not supported by the analysis. The impacts to water resources are summarized in Table 69. Only the no-action alternative is clearly different than the other alternatives, however there are significant differences in the mining alternatives as well. The table recognizes four categories, but the mining alternatives are similar in only one — number of stock ponds impacted. The difference in runoff volume reduction by the mining alternatives differs by a factor of two (45.8% to 22.8%), which is a tremendous difference. As such, the finding that all alternatives impact surface water equally is simply not supported by the analysis presented in the preceding chapter and detracts from the credibility of the DEIS as a whole.

342. The approach will limit flows of surface water that sustains Outstanding Waters of the State of Arizona. The DEIS describes how stormwater will be retained on site, which will have the effect of eliminating water to downstream users. The DEIS is based on series of Tetra Tech’s Technical Memos. According to the Tetra Tech’s Memo, stormwater control basins are designed to contain up to the 500-yr, 24-hr storms. This means that storm water generated by more frequent and small storms will not be discharged to the downstream.

343. Davidson Canyon contains reaches that are classified as Outstanding Waters of the State of Arizona. Over the period of development, the 8.2 square mile
watershed upstream of the compliance point, in the headwaters of Davidson Canyon, will be modified to retain most of the runoff. Since the entire Davidson Canyon Watershed is only 50.5 square miles, the modifications in the upper portions of the watershed are likely to have significant impact on the Outstanding Waters. Since we cannot find the study referred in the DEIS (Tetra Tech, July 11, 2011. Predicted Regulatory (100-Yr) Hydrology and Average-Annual Runoff Downstream of the Rosemont Copper Project. Tucson, Arizona: Tetra Tech.), it is impossible to evaluate if the assessment of runoff for the pre-and post-mining conditions are reasonable. However, we expect that there are substantial issues of the methodology to evaluate runoff for Davidson Canyon, considering issues found in other studies done by Tetra Tech (Tetra Tech, January 27, 2010, March 4, 2010, March 5, 2010a, 2010b, 2010c, 2010d, March 31, 2010, September 10, 2010). The studies done by Tetra Tech have common errors in the methodology (See specific comments below). Because of the inappropriate selection of the elevations used to estimate average annual runoff, it is unclear how much the proposed activities will affect the Davidson Canyon. However, the impacts are expected to be significant due to the extent of disturbance. In addition, the difference between pre- and post-mining runoff volumes is likely larger than the values estimated by Tetra Tech, because the runoff for pre-mining was underestimated due to the inappropriate rainfall with lower elevation (see specific comments below).

344. The impacts of the proposed mining activities on downstream should be quantitatively analyzed with appropriate methods and parameterization. As mentioned above, Davidson Canyon contains reaches that are classified as Outstanding Waters of the State of Arizona. Over the period of development, the 8.2 square mile watershed upstream of the compliance point, in the headwaters of Davidson Canyon, will be modified to retain most of the runoff, which most likely affect the riparian habitat in Davidson Canyon. Using a simple regression equation to assess the impacts to the Outstanding Waters of the State of Arizona is not sufficient. Additional quantitative analysis is required.

Comments for “Analysis Methodology, Assumptions, Uncertain and Unknown Information” and “Summary of Effects by Issue measures by Alternative” (DEIS p.297-300)

345. The hydrologic modeling methods are flawed and underestimate the potential impact of extreme events. The studies the DEIS used to evaluate the impact of the proposed mining plans were done by Tetra Tech in 2010. Storm water analysis was done by using methods not acceptable to Pima County. Analysis related to “Surface Water Management” was mostly done by Tetra Tech. Tetra Tech should use the methods described in the Technical Policies 010, 015 and 018. Tetra Tech (Tetra Tech, August 18, 2011) cited that they use the Corps of Engineers HEC-HMS model to characterize peak discharges. However, in comparing a HEC-HMS model at the compliance point with the methods used by Tetra-Tech and those recommended by RFCD models yield dramatically different values at the compliance point, especially for the peak discharge rate:
<table>
<thead>
<tr>
<th>Watershed Area (sq mi)</th>
<th>Critical Storm</th>
<th>Precipitation (in)</th>
<th>Volume (ac-ft)</th>
<th>Peak Discharge (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFCD</td>
<td>7.92</td>
<td>3-hr</td>
<td>3.52</td>
<td>960</td>
</tr>
<tr>
<td>Tetra-Tech</td>
<td>8.2</td>
<td>24-hr</td>
<td>4.75</td>
<td>1003</td>
</tr>
</tbody>
</table>

346. The Forest Service has characterized District's various concerns over floodplain issues with the blanket statement that this is "a case of professional disagreement." The methods used appear to have been selected to satisfy guidance from more agencies than just Pima County. The purpose of the modeling is not to obtain a Pima County permit or satisfy specific regulatory requirements; it is to analyze impacts for the purpose of the DEIS." Please specify the guidance that the Forest is using for surface water hydrology and floodplain management and design of facilities located in floodplains. The Forest Service's cooperative agreement with Pima County recognizes our expertise in this matter. For all of these reasons, the Forest's lack of responsiveness to our concerns over surface water hydrology, repeatedly expressed over the past several years, is most puzzling. The Pima County Regional Flood Control District has the expertise the Forest needs to address these floodplain issues.

347. If the facilities located in floodplain and erosion hazard zones would not be designed to comply local floodplain management standards, this should be disclosed in the SEIS and FEIS.

348. The District urges the Forest to follow FEMA guidance to use the 'critical storm' that results in the highest discharge at a point of interest. Since 3-hr storms are typically more intense than 24-hr storms, they tend to be more intense with a shorter duration and result in a higher peak. Also, the Forest has an obligation under Executive Order 11988 to "take action to reduce the risk of flood loss" and to minimize unavoidable impacts on floodplains.

349. Precipitation Tetra Tech uses the point rainfall at 31.862N 110.692W, an elevation of 4429 feet. However, Tetra Tech documents that the mean elevations in the watersheds are between 5000 feet (Lower Barrel Canyon) and 5470 feet (Wasp Canyon). In addition, the 404 application (p.12, L13) said that the lower end of the proposed mining site is 4,500 feet. The location Tetra Tech selected for the analysis appears downstream of the downstream end of the project site. Therefore, the rainfall at the selected point is not representative for the entire project site. The elevation is too low, and as a result, rainfall is too low. It is known that rainfall is generally higher at higher elevation (orographic effect). Since there is a considerable orographic effect in the NOAA 14 Atlas, this will make a significant impact on discharge rates. When the higher rainfall is used, estimates of runoff volume should be greater than those used to assess the impacts of the proposed and alternative mining activities in the 404 application.

350. For floodplain management purposes, Pima County directs the use NOAA 14 Upper 90% rainfall (Tech Policy 10). Tetra-Tech has simply discounted the use of this value.
351. The selected Area reduction Factor (0.9) is too low. Because the watershed area is only ~1.93 square feet, the ARF should be around 0.95 per Hydro-40. Tetra Tech should closely look at the Hydro-40, Figure 14. Since there is a considerable orographic effect in the NOAA 14 Atlas, this will make a significant impact on discharge rates.

352. Rainfall Distribution. The rainfall distribution used by Tetra Tech has the greatest intensity in the first hour (31.9 %), which has the net effect of reducing runoff peak by using the highest intensity portion of the rainfall to satisfy the initial rainfall losses. Arizona State Standard Guidelines on Hydrologic Modeling [ADWR SS 10-07, section 3.3.4] recommends a symmetrical distribution. Pima County requires the use of a USDA-SCS Type I (24-hr) or USDA-SCS Type II (3-hr) storm. Both of these have peak intensity, at or near the middle of the hyetograph, and do not have peak rainfall at the front of the hyetograph as Tetra Tech has used.

353. Runoff Curve Number: Our assessment (PC-Hydro and HEC-HMS parameterized by Tech 018) and others have noted that runoff estimates are most sensitive to the CN value. The USDA SSURGO soils map indicates that the fee land on the site is hydrologic soils group D. Pima County has used available data to calculate CN values in support of CN tables (Stewart and Canfield, 2009). This analysis showed that values used in PC-Hydro were found to be more accurate in Pima County than those listed in TR-55. Rosemont should use the PC-Hydro CN tables and vegetation map with the SSURGO soils map to estimate CN values. The PC Hydro vegetation map indicates cover of Mountain Brush, Desert Brush and Herbaceous. Assuming 40% cover (which is fairly high), the CN for existing conditions is between 86 and 89. Rosemont used a CN of 85. Therefore, the CN of 85 is too low for existing conditions.

354. Time of Concentration/Lag Time. Tetra Tech did not use the method recommended by Pima County (Tech 018) to estimate Time of Concentration/Lag Time. Tetra Tech also uses methods that are not in the current parameterization of the 'NRCS Method' as practiced by NRCS (USDA-NRCS, 1986). The methods Tetra Tech is using to develop the Time of Concentration are un-documented or have been superseded. Since we do not know the origin of some of the equations, we cannot evaluate its appropriateness. Rosemont would be best-served by practicing the 'NRCS Method' as it is currently recommended by NRCS (USDA-NRCS, 1986) unless they provide documentation that another method is appropriate.

355. Rainfall Run-off Volume: The estimated Cw is too low. Please see the comment for “Runoff Curve Number”.

356. It is unclear how the duration and rainfall depth of the General PMP and Local PMP were determined. Please explain. Tetra Tech used the thunderstorm distribution with the peak in the middle, while the Local PMP has the peak within 30 min of the distribution. It is not clear why the highest intensity of the 6-hour Local PMP occurs within the first 30 min.

357. Peak Flows, Runoff Volume: Results of peak discharge and volume should be recalculated by using the method recommended by Pima County (Tech 018) and appropriate methods to determine parameters.
358. Tetra Tech (March 4, 2010) developed a regression equation to estimate average annual runoff using watershed area, average precipitation and mean watershed elevation. According to those the first Technical Memo, estimated annual runoff volume is 1407 ac-ft. It appears that Tetra Tech used elevation of ~4625 ft to estimate this volume for a "Baseline" condition. This elevation is too low, because the downstream end of the watershed (USGS Gauge Station # 09484580) is 4367 ft. The other issue is that it appears that Tetra Tech used the elevation of ~5000 ft for "MPO Post Mining" (Tetra Tech, March 5, 2010a). There are two issues about the analysis.

1. The elevation for the "Post Mining" should be lower.
2. Elevation for both the "Post Mining" and "Baseline" conditions should be higher than the selected values because the downstream end of the watershed (USGS Gauge Station # 09484580) is 4367 ft.

359. In addition to the elevation issue, there is an issue about the selection of rainfall depth. Tetra Tech used 4.82 inches of precipitation to estimate peak discharge. It appears that this value is a mean, 24-hr precipitation at the elevation of 4429 ft (NOAA Atlas 14). The elevation is too low since the watershed outlet elevation is 4364 ft. Because of those issues, the annual average runoff estimates used for this 404 application are not reliable.

360. Post-Mining Hydrology. The volume of the stormwater control basin should be determined using multi-day storms. Storms with the highest peak discharge do not necessary produce the largest volume. This is because multi-day volumes can substantially exceed single-day return-period rainfall values. Because of the higher elevation and orographic effect in the project site, multiple day storms are common in mountain areas of southern Arizona.

361. It appears that Tetra Tech used the elevation of ~5000 ft for "MPO, Post Mining" (Tetra Tech, March 5, 2010d). First, the elevation for "Post Mining" should be higher than the elevation for a "Baseline" condition. Secondly, the elevation for both the "Post Mining" and "Baseline" condition should be higher because the downstream end of the watershed (USGS Gauge Station # 09484580) is 4367 ft. Additionally, Tetra Tech used 4.82 inches of precipitation to estimate peak discharge for a "Post Mining" condition (Tetra Tech, March 5, 2010d). It appears that Tetra Tech used the mean, 24-hr precipitation at the elevation of 4429 ft (NOAA Atlas 14). The elevation is too low since the watershed outlet elevation is 4364 ft. Tetra Tech should provide the information of the location and elevation of the point and explain why this low elevation point was selected. Because of those issues, the annual average runoff and peak discharge estimates in the DEIS are not reliable.

362. Sub-basin Hydrograph Generation Method should be described: The method by which runoff depth is turned into a hydrograph (e.g. unit hydrograph method) is not specifically described and therefore cannot be evaluated.

363. Routing Methods should be described: The NRCS method only addresses runoff generation at the sub-basin scale. In order to prepare a hydraulic model to
describe runoff response of a complex watershed system, some method of channel routing must be selected, such as done with HEC HMS.

364. Input Parameter Values should be provided: While some methods are described, many of the parameter values are not specifically provided. For example, the Manning's 'n' values used in the HMS Time of Concentration were not provided.

365. The return-period analysis Tetra Tech uses to justify their values are from too small a dataset and the methods are flawed. Tetra Tech justifies their discharge calculation by comparison with the Regional Regression Equation 13 (Thomas et al, 1997), and performs a return-period analysis using the period of record on Barrel Canyon. However, peak record on Barrel Canyon is 1,900 cfs and the 100-yr prediction will be 5000 cfs or greater. It is questionable if using such limited observed data (especially observed discharge is much smaller than estimated 100-yr discharge). In addition, Tetra Tech used an outdated regional skew coefficient (-0.2 vs current recommendation of 0.0). The District has the expertise the Forest needs to address this issue.

366. The observed precipitation data used to estimate precipitation has an inadequate period of record and is collected during a period of drought, which will result in under-estimation of rainfall [Comments for Table 71 (p.303)].

Rainfall measurement from 2006 to 2008 (Tetra Tech, April 7, 2009) was done by Tetra Tech. The DEIS should provide the location of the rain gauge site (Lat, Long, and Elevation), although the DEIS referred the APP report as a reference. The DEIS uses an annual rainfall depth of 17.12 inches, which is lower than the value described in the APP application (18.1 inches), for estimating runoff volume. Rain gage data from the nearby Santa Rita experiment station has mean annual rainfall of 23.41 inches. For example, 2010 annual rainfall at the USGS Gauge station #09484580 (Barrel Canyon, elevation 4364 feet) is 22.54 in. Because the mine is higher than the Santa Rita gage, and annual rainfall increases with elevation, annual rainfall at Rosemont Mine is expected to be greater than 23.41 inches. As a result of higher rainfall, estimates of runoff volume should be greater than those used to assess the impacts of the proposed and alternative mining activities in the DEIS. Rainfall record is less than 2 years from early-2006 to mid-2008 (Tetra Tech, April 7, 2009). Rainfall at the Santa Rita Experimental Range from 2006 to 2008 (Gage #6, elevation 3986 ft) is summarized below. As shown in the table, both the average monthly and annual total precipitations at the Santa Rita were lower than the average from 1970 to 2000 (see Table 71). This suggests that the Rosemont site received less rainfall than a long-term average during the two years from 2006 to 2008. In other word, the period of the rainfall measurement at the Rosemont site was "drought". Therefore, the 2-yr record of rainfall at the Rosemont site should not be used as representative average rainfall.
Based on the issues described above, the assessment of impacts of mining activities on surface water is not credible. Rosemont needs to revise estimates of runoff volume, and associated impact on stormwater storage potential and leaching by using appropriate rainfall depths. There are ways to do this that are more credible.

367. **The estimated watershed yield values are likely too low [Comments for Watershed Yield (p. 308)]**. As mentioned above, the average rainfall used to estimate the average annual runoff is biased because of the relatively dry condition near the Rosemont site from 2006 to 2008. We expect the observed rainfall from 2006 to 2008 is less than “average”. Therefore, the estimated annual average runoff of 1407 acre-feet (Tetra Tech, March 5, 2010a) is most likely underestimated. The analysis should be revised using “average” rainfall (e.g. NOAA rainfall at the centroid of the watershed).

368. The estimated runoff the Technical Memo (Tetra Tech, March 5, 2010a) is not reliable.

   Tetra Tech compared their runoff calculation with average runoff for the Tucson Active Management Area (AMA). However, Tetra Tech ignores orographic effect. Project site is located at higher elevation than average elevation of the Tucson AMA. Most likely average annual runoff is larger than average runoff for the Tucson AMA. Since the calculated annual average runoff at the project site is close to the average runoff for the Tucson AMA, it is questionable if the calculation is reasonable.

369. Tetra Tech March 5, 2010a used 18 inches of annual average rainfall based on their data collection. It appears that this value is too low. For example, 2010 annual rainfall at the USGS Gauge station #09484580 (Barrel Canyon, elevation 4364 feet) is 22.54 in. Tetra Tech justified using 18 inches of rainfall by comparing average annual runoff for the Tucson AMA (Water Atlas). As mentioned above, the project site is located at higher elevation than average elevation of the Tucson AMA. Most likely average annual runoff is larger than average runoff for the Tucson AMA. Tetra Tech ignores an orographic effect. Therefore, Tetra Tech’s justification of using 18 inches of annual average rainfall is not valid.
370. The selection of annual average rainfall is critical for runoff calculation. Tetra Tech stated in the March 5, 2010a Memo "baseline average-annual runoff has been shown to be correlated to watershed area, average-annual precipitation, and mean watershed elevation". Tetra Tech should consider an orographic effect.

371. Tetra Tech developed a regression equation to estimate average annual runoff using watershed area, average precipitation and mean watershed elevation. It appears the elevations listed in Table 2 are too low. Especially Tetra Tech stated that the elevation above Compliance Point is 5190 ft. For example, Barrel Canyon is upstream of the Compliance Point. Because Tetra Tech used those elevations for the calculation, calculated runoffs are too low. Tetra Tech should reevaluate runoff volumes using appropriate elevations.

372. As mentioned above, the project site is located at higher elevation than average elevation of the Tucson AMA. Most likely average annual runoff is larger than average runoff for the Tucson AMA. Tetra Tech ignores an orographic effect. Therefore, Tetra Tech's justification of their annual average runoff calculation is not valid.

373. The modeled 100-yr peak runoff discharge at the USGS gauging stations (p.308) are low because the methods are flawed. The estimated 100-year regulatory flood peak of 8072 cfs (Tetra Tech, March 5, 2010a) was not obtained by appropriate methods.

374. The estimated changes in runoff volume (table 80, p. 314) are not reliable, because the hydrologic methods are flawed. The values used for "Change in Runoff Volume" are based on Tetra Tech's series of Technical Memos (Tetra Tech, March 4, 2010, March 5, 2010a, 2010b, 2010c, 2010d, March 31, 2010, September 10, 2010). Because there are substantial issues in the methodologies of the Tetra Tech's analyses, the estimated changes summarized in Table 80 are not reliable. Specific issues related to the Technical Memos are summarized above. Tetra Tech should reevaluate the runoff volume using the methods described in Pima County Tech Policies 010, 015, and 018.

375. The DEIS inaccurately describes the riparian mitigation methods described in Title 16 Pima County Floodplain and Erosion hazard Management Ordinance (p.302)

The statement "...proposed developments are subject to review for impacts to mapped regulated riparian habitat if more than 1/3 acre of the habitat is disturbed" is not correct. It should be "...proposed developments are subject to review for impacts to mapped regulated riparian habitat if more than 1/3 acre of property's regulated riparian habitat is disturbed". In addition, if the regulated riparian habitat is classified as hydoriparian, mesoriparian and/or important riparian areas, the following additional requirement is applied (Title 16, Floodplain and Erosion Hazard Management Ordinance 2010 FC5, effective 6/3/2010).

"Mitigation plans shall be approved by the Board for disturbance of hydoriparian, mesoriparian and/or Important Riparian Areas whenever more than 5% of a property's regulated riparian habitat is disturbed, except for those disturbances that are less than 1/3 acre"
376. **The DEIS does not quantify the water resources impact of stock tank losses (p. 314).**

The DEIS stated the loss of stock tanks are considered to be significant. However, it is unclear how these stock tanks will be mitigated. Table 69 (p.299) simply stated the number of the loss of stock tanks but failed to explain that those losses are significant and the mitigation method. The DEIS should add explanation.

377. **The hydrologic methods do not adequately evaluate the impact to water resources of stock tanks. (p. 315)** The estimated flow volumes from each action alternative should be revised because Tetra Tech used inappropriate parameters to calculate flood peak and volume (Tetra Tech, January 27, 2010, March 4, 2010, March 5, 2010a, 2010b, 2010c, 2010d, March 31, 2010, September 10, 2010). See the comments for p. 308 Streamflow.

378. **The DEIS does not provide any details on a mitigation plan for stock tanks (p.321).**

The DEIS simply stated that a Mitigation Plan will be developed and provide a replacement water source in the area impacted. This is not enough explanation about the Mitigation. The DEIS should clearly explain the detail of the Mitigation Plan. There is no information on the Mitigation Plan available in the DEIS. Therefore, the statement of "No net loss of stock tanks due to the mitigation" is not credible. The DEIS should show the analysis to support the citation.

379. **The notes and comments on Table 69 (p. 299-300) are not adequately supported as follows:**

*There is no supporting data for the conclusion for negligible effects of different alternatives.* 3D: Quantitative assessment of water released and available for beneficial uses. For "Proposed Action" and other "alternatives", the DEIS stated that after mitigation, negligible effect on beneficial uses". It is not clear how the conclusion was obtained. There is no detail explanation or quantitative analysis of how "mitigation" works. The DEIS should provide the detail study used to determine the "negligible effect".

*The conclusion that there will be no net loss to stock ponds because of mitigation is unsupported, because there is stock pond mitigation proposed.* 3D: Stock watering tanks that will be unavailable (number). For any "Actions" except "No Actions", the DEIS stated that there will be no net loss of stock tanks because of mitigation. It is not clear how the conclusion was obtained. There is no detail explanation or quantitative analysis of how "mitigation" works. The DEIS should provide the detail study used to determine the "no net loss".

*The estimated impacts to the volume, frequency and magnitude of runoff are flawed, because the methods used to develop those numbers are flawed.* 3D: Change in volume, frequency, and magnitude of runoff from the mine. The values of reduction in flow peak or volume are based on Tetra Tech's series of Technical Memorandums. As mentioned above, the methods used for the Tetra Tech's analyses include substantial issues. Therefore, the estimated reductions in flow or volume summarized in Table 69 are not valid.
380. The indirect impacts to beneficial uses (p. 315) are significant—especially to Davidson Canyon, an Outstanding Water of the State of Arizona. Davidson Canyon contains reaches that are classified as Outstanding Waters of the State of Arizona. Over the period of development, the 8.2 square mile watershed upstream of the compliance point, in the headwaters of Davidson Canyon, will be modified to retain most of the runoff. Since the entire Davidson Canyon Watershed is only 50.5 square miles, the modifications in the upper portions of the watershed are likely to have significant impact on the Outstanding Waters. Since we cannot find the study referred in the DEIS (Tetra Tech, 2011. Predicted Regulatory (100-Yr) Hydrology and Average-Annual Runoff Downstream of the Rosemont Copper Project. Tucson, Arizona: Tetra Tech. July 11.), it is impossible to evaluate if the assessment of runoff for the pre-and post-mining conditions are reasonable. However, we expect that there are substantial issues of methodology to assess runoff for Davidson Canyon, based on the other studies done by Tetra Tech. The studies done by Tetra Tech have common errors in the methodology, as described in p.297: Analysis Methodology, Assumptions, Uncertain and Unknown Information and p. 299 Summary of Effects by Issue Measures by Alternative.

Most likely runoff estimates for the pre- and post-mining conditions are not reliable due to the inappropriate parameterizations of the equation.

381. Re: Table 71, the DEIS should acknowledge that the rainfall was measured in a drought period. Rain gage data from the nearby Santa Rita experiment station has mean annual rainfall of 23.41 inches, while the average annual rainfall at the Rosemont site is 17.12 inches. Because the mine is higher than the Santa Rita gage, and annual rainfall increases with elevation, annual rainfall at Rosemont Mine is expected to be greater than 23.41 inches. As a result of higher rainfall, estimates of runoff volume should be greater than those used to assess the impacts of the proposed and alternative mining activities in the DEIS. As mentioned above, the Rosemont site received less rainfall than a long-term average rainfall during the observation period from 2006 to 2008. The 2-yr record of rainfall at the Rosemont site should not be used as representative average rainfall.

382. If the analysis done for the DEIS used the rainfall values derived from 2006-2008, the estimated average annual runoff volume for post-mine conditions and the estimated changes in runoff volume from pre-mining to post-mining conditions are not reliable. Rosemont needs to revise estimates of runoff volume, and associated impact on stormwater storage potential and leaching by using appropriate rainfall depths.

383. The hydrologic methods used to produce the values on Tables 81, 82, 83, 84, 85 and 86 (p. 316) are inaccurate. The estimated flow volumes from each action alternative should be revised because Tetra Tech used inappropriate parameters to calculate flood peak and volume (Tetra Tech, January 27, 2010, March 4, 2010, March 5, 2010a, 2010b, 2010c, 2010d, March 31, 2010, September 10, 2010).

384. The alternatives evaluation is unreliable for Proposed Action, Phased Tailing Alternative, Barrel Alternative, Barrel Trail Alternative, Scholefield-McCleary Alternative (p. 316-320)
The analyses of the impacts of each alternative are based on a series of Tetra Tech's Technical Memos (Tetra Tech, January 27, 2010, March 4, 2010, March 5, 2010a, 2010b, 2010c, 2010d, March 31, 2010, September 10, 2010). Since Tetra Tech did not use parameterization methods approved by Pima County and there are serious issues of methods used to estimate annual average runoff volume, the conclusions described in the Technical Memos and the DEIS are not reliable. Tetra Tech should revise the Memos by using appropriate methods and parameters. Specific comments are summarized above, Comments for “Analysis Methodology, Assumptions, Uncertain and Unknown Information” and “Summary of Effects by Issue measures by Alternative” (p.297-300)

385. Stormwater Control Feature Problems
Tetra Tech used 500-yr, 24-hr storm to size stormwater control features. It is not clear how Tetra Tech concluded that “the minimum event used to calculate peak flows will generally be the 500-year, 24-hour storm” for permanent conveyance structures, and “the 100-year, 24-hour event” for permanent and semi-permanent containment structures. 100-yr, 24-hr storms are not appropriate for the maximum volume calculation. The volume of the stormwater control basin should be determined using multi-day storms. This is because multi-day volumes can substantially exceed single-day return-period rainfall values. Because of the higher elevation and orographic effect in the project site, multiple day storms are common in mountain areas of southern Arizona. Storms with the highest peak discharge do not necessary produce the largest volume. Multi-day volumes can substantially exceed single-day return-period rainfall values. It is known that a long-duration with relatively low intensity storms produce larger runoff volume in southern Arizona. For example, rainfall depth with a recurrence interval of about five years caused the floods on July 31, 2006 that exceeded the 100-year estimates, largely as a result of saturated soil conditions after five days of rainfall (Griffiths et al., 2009; Magirl, et al., 2007). Similarly, a major flooding occurred on the largest river in southern Arizona, the Santa Cruz River, on Oct 1, 1983, after several days of rainfall. Tetra Tech should design those facilities to handle larger volume events. Pit diversion channel, permanent diversion channel and ponds should be sized to handle volumes generated by multi-day storms, and estimated by using appropriate parameters. The mine will be closed and many of the drainage features will remain. We need to assume that they will be stable in perpetuity.

- Hydrologic and Hydraulic Analysis Results
It is not clear how Tetra Tech concluded that “the minimum event used to calculate peak flows will generally be the 500-year, 24-hour storm” for permanent conveyance structures, and “the 100-year, 24-hour event” for permanent and semi-permanent containment structures. 100-yr, 24-hr storms are not appropriate for the maximum volume calculation. This is because multi-day volumes can substantially exceed single-day return-period rainfall values. Because of the higher elevation and orographic effect in the project site, multiple day storms are common in mountain areas of southern Arizona. Pit diversion channel, permanent diversion channel and ponds should be sized to handle volumes generated by multi-day storms, and estimated by using appropriate parameters. The mine will be closed and many of the drainage features will remain. We
need to assume that they will be stable in perpetuity, which means that at least the 500-yr discharge should be used to design structures.

- **Pre-Mining/Baseline Hydrology:**
  Since Tetra Tech did not use parameterization methods approved by Pima County (Tetra Tech, January 27, 2010, March 4, 2010, March 5, 2010a, 2010b, 2010c, 2010d, March 31, 2010, September 10, 2010), the estimated pre-mining peak discharge is not reliable. Tetra Tech should follow Tech 010, 015, and 018. Tetra Tech used 18 inches of annual average rainfall based on their data collection in order to calculate Average Annual Runoff. As mentioned before, this value should not use as "representative rainfall" at the Rosemont site.

- **Post-Mining Watershed Conditions**
  Tetra Tech stated that the PMP (500-year, 24-hour storm event) was used to size Waste Rock Storage Area. This is inconsistent with the previous Memo prepared by Tetra Tech (Tetra Tech, January 27, 2010). In the previous memo, 72-hr storm or 6-hr storm was selected as PMP, but Tetra Tech did not clearly explain how those storms were selected. The volume of the stormwater control basin should be determined using multi-day storms. Storms with the highest peak discharge do not necessary produce the largest volume. This is because multi-day volumes can substantially exceed single-day return-period rainfall values. Because of the higher elevation and an orographic effect in the project site, multiple day storms are common in mountain areas of southern Arizona, as described above.

- **Post-Mining Hydrology**
  Since Tetra Tech did not use parameterization methods approved by Pima County, the estimated pre-mining peak discharge and assessment are not supported. The volume of the stormwater control basin should be determined using multi-day storms. Storms with the highest peak discharge do not necessary produce the largest volume. This is because multi-day volumes can substantially exceed single-day return-period rainfall values. Because of the higher elevation and an orographic effect in the project site, multiple day storms are common in mountain areas of southern Arizona.

As mentioned before, it appears that the elevations for any "Alternatives" that Tetra Tech used are lower than "Baseline". First, the elevation for "Post Mining" should be higher than the elevation for a "Baseline" condition. Secondly, the elevation for both the "Post Mining" and "Baseline" conditions should be higher than the elevations that Tetra Tech used because the downstream end of the watershed (USGS Gauge Station # 09484580) is 4367 ft. Additionally, Tetra Tech used 4.82 inches of precipitation to estimate peak discharge for a "Post Mining" condition. It appears that Tetra Tech used the mean, 24-hr precipitation at the elevation of 4429 ft (NOAA Altas 14). The elevation is too low since the watershed outlet elevation is 4364 ft. Tetra Tech should provide the information of the location and elevation of the point and explain why this low elevation point was selected. Because of those issues, the annual average runoff and peak discharge estimates in those Memos are
not reliable. Tetra Tech should reassess hydrology for pre-mining, post-mining, proposed plan and alternative plans.

Additional Studies Needed

386. Because of the need to reassess the hydrologic information provided in the DEIS, a Supplemented Environmental Impact Statement (SEIS) should be provided that includes the following studies:

1.) **Evaluation of the impact of mine on habitat in Davidson Canyon – An Outstanding Water of the State of Arizona.** Because the DEIS describes an approach that captures rainfall on the mine site, and limits downstream discharge, the impact of this approach on downstream resources should be evaluated, especially in light of the fact that Davidson Canyon is an Outstanding Water of the State of Arizona.

2.) **Hydrologic evaluation that uses ‘critical’ storms and approved hydrologic methods to design structures for peak flow rates.** Design should adopt the FEMA Criteria for flood peak determination rather than use 24-hr storms. In Pima County, these are peak from Intensity-Duration curves, such as used in PC Hydro, and shorter duration high intensity rainfall events, such as 3-hr storms.

3.) **Hydrologic values that consider longer-term storm durations (1-week) for volume design.** Because recent events have shown that rainfall over several days can cause flooding and overwhelm ponds, a more critical (and conservative) evaluation of the hydrology used to design volume control is required.
CHAPTER 3 – SURFACE WATER QUALITY

387. Chp3, Surface Water, p341, 346 and Tables 94 and 96. **Analysis and Discussion of how to deal with elevated TDS, sulfate and other constituents from seepage moving to the shallow groundwater is needed.** Currently, the discussion is centered on surface water contamination. However, the contaminated seepage from tailings and waste rock will eventually recharge the shallow alluvial aquifer and potentially make contact with underlying fractures, faults and fissures. No discussion of monitoring wells is presented and this should not be left to an APP. The DEIS is responsible to evaluate the effects of tailings and seepage on the underlying shallow aquifer.

388. Page 324 lists factors for comparison of alternatives. While riparian habitat is listed it is unclear what source is used for habitat inventory. Pima County Important Riparian Area is listed as ancillary information but no mention is made of the actual Regulated Riparian Habitat Maps. IRA is only one component of these maps and does not indicate the range or prevalence of species present in particular location.

389. On page 324 the description of the water quality methods states that the projects impacts are assessed “relative to the overall watershed area”. By definition therefore any project in a large watershed would have a relatively small impact. The method is geographically flawed and another measure such as baseline comparison should be identified.

390. Page 324 lists mitigation measures for linear project features including the TEP Utility easement, water lines, and roads. The list includes hydroseeding with a grass seed mix. The County can provide guidance as to locally appropriate seed mixes which include plants other than grasses. The mixes preferred by Pima County and required where permits apply may be less susceptible to fire than a simple grass mix and may be more successful.

391. On page 326, Table 87 is unclear as to what source was used for the riparian habitat loss acreages.

392. Page 329 states that the Pima County Erosion Hazard and Floodplain Management Ordinance is discussed in the Surface Water Quantity section. On this page which is in the Surface Water Quality Section wherein riparian habitat is addressed the Regulated Riparian Habitat Maps and Mitigation standards should be discussed.

393. The subsection entitled “Riparian Areas”, has two paragraphs which confuse the meaning of terminology used throughout the report. The first paragraph erroneously describes the Pima County Erosion Hazard and Floodplain Management Ordinance Regulated Riparian Habitat provisions. The DEIS states: “Important riparian areas, as defined by Pima County, are regulated riparian habitat.”(pg 330) This is incorrect and very confusing. As defined by Pima County Important Riparian Areas (note capitalization) are those Regulated Riparian Habitats having the highest value. This overlaying classification is not solely based on vegetative density and species composition as claimed by Augusta’s
consultants Westland Resources, but also includes soils, water availability, and connectivity factors. Regulated Riparian Habitat maps adopted by the Pima County Board of Supervisors as an ordnanced provision of the Sonoran Desert Conservation Plan includes one class of Hydro/mesoriparian Habitat and 4 xeroriparian classes. While spatial inaccuracies associated with ground truthed satellite image processes used to create the maps are known they are not to the extent Augusta Resource claims (Westland 2010). They are simply different methods which have not been accurately compared in the DEIS. If the DEIS included a better balance between cooperator input and proponents consultants the reader and Coronado could make their own conclusions. This is the purpose of the DEIS to identify impacts such that they can be mitigated or avoided, not simply to make conclusions without presentation of all available information. The PCRRH maps represent a more thorough classification system than that applied by the Coronado. PC requests that acres of PCRRH directly impacted should be included in the Biological Assessment and those impacted by surface water drawdown should be included in the Water Quantity Section. As drafted the DEIS appears to do the reverse until a reader looks deeper at the multiple definitions of riparian habitat in different chapters and even within chapters on different pages and tables. In fact the Surface Water Quantity Section uses Westland habitat maps, County IRA, and Corps wetland delineations although this is still unclear. The Biological Resources section uses the Coronado's large scale system which erroneously includes no riparian habitat on-site. Just what they refer to as riparian woodland which is a water supported healthy association of upland vegetation. While unclear, it appears the DEIS settles on a system in which xeric habitats are not considered riparian. This is not regionally appropriate. The County has previously offered to make more accurate riparian habitat data available. While the Coronado has chosen to not follow this request from a cooperator to use County designations as a comparison factor the County formally request that this information at least be included in the report via addition of tables showing acreage of PCRRH impacted by drawdown and direct facility impacts. As identified by Montgomery & Associates on the attached Groundwater Level Contours and Depth to Water 2010 map there is a high coincidence of groundwater depths below 10 feet and PCRRH. Even minor drawdown will have significant impacts which have not been adequately quantified or included in proposed mitigation.

394. The Biologic, Surface and Groundwater sections of the DEIS appear to use differing definitions of habitat. Rectification and comparison is needed and should be developed in consultation with cooperators. One example on page 327 table 88 states that Pima County regulates riparian habitat but then on page 87 the acreage of habitat is not PCRRH. This confusion should be clarified by use of consistent terminology and comparison tables.

395. The Davidson Canyon water quality sample taken by Errol Montgomery and Associates (ELM 2008) is not characteristic of the flows of Davidson Canyon upstream of Interstate Highway 10 that would be impacted by the mine. Based on the high concentrations of sulfate (> 300 mg/l) and TDS (> 800 mg/l) reported in 2008 by ELM and the proximity of the site to the confluence with Cienega Creek (see Map), it would appear that the waters in the ELM "Davidson" site and Cienega Creek are similar, perhaps suggesting a mixing of subsurface flows along both creeks.
Samples collected for Pima County Flood Control District along Lower Davidson Canyon between June 2002 and January 2003 showed vastly different results, with sulfate levels less than 100 mg/l and TDS not exceeding 520 mg/l (PAG, 2003a). The results from 2003 indicate more of a similarity in the waters at both sites in Davidson Canyon as opposed to an influence by Cienega Creek subsurface flows.

Change in subsurface geology could be reflected in the water quality recently recorded at the two Davidson Canyon sites. The Pantano formation occurs all along lower Cienega Creek and in lower Davidson Canyon up to Interstate 10, whereas bedrock within Davidson Canyon south of the Interstate mostly consists of granitic rocks (PAG, 2003b). The Cienega Basin Source Water Study (PAG, 2000) compared waters from Cienega Creek with those of another tributary, Posta Quemada Spring, which has bedrock consisting of granitic rocks similar to the Middle Davidson Canyon site. Samples from the study showed levels of sulfate, sodium, magnesium, calcium and total dissolved solids in Posta Quemada that are similar to recent samples collected by PAG at DAV3, which are significantly lower than recent samples collected along Cienega Creek and in Lower Davidson Canyon.

MAP
Davidson Canyon is represented by an orange line
Arrows represent each water quality site.
### Table 1. Comparison of Water Quality in Davidson Canyon to EPA Standards

<table>
<thead>
<tr>
<th>Analyte</th>
<th>MCL</th>
<th>Unit</th>
<th>Lower Davidson Cyn (ELM, October 2008)</th>
<th>Middle Davidson Cyn DAV 3 (PAG, September 2008)</th>
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<tr>
<td><strong>Metals</strong></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Aluminum</td>
<td>0.5 – 2.0</td>
<td>mg/l</td>
<td>&lt; 0.03</td>
<td>&lt; 0.20</td>
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<td>mg/l</td>
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<td>&lt; 0.003</td>
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<td>mg/l</td>
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<td>0.0026</td>
</tr>
<tr>
<td>Barium</td>
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<td>mg/l</td>
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<td>0.23</td>
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<tr>
<td>Beryllium</td>
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<td>&lt; 0.001</td>
</tr>
<tr>
<td>Cadmium</td>
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<td>mg/l</td>
<td>&lt; 0.0001</td>
<td>&lt; 0.001</td>
</tr>
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<td>&lt; 0.001</td>
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<td>mg/l</td>
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*Secondary Maximum Contaminant Level*
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<td>No Sample</td>
<td>No Sample</td>
</tr>
</tbody>
</table>

<sup>a</sup> Secondary Maximum Contaminant Level
**Location and Operation of Compliance Point Dam**

396. As noted in DEIS Chapter 2, p34 within *Compliance Point Dam*: “The dam would be approximately 6 feet tall and approximately 100 to 200 feet wide, with a storage capacity of approximately 2 acre-feet.

The following definition is provided on page 7 of the ACOE 404 Application: “The Compliance Point Dam is a six-ft high, porous, rock-fill structure where additional sediment controls will be applied as necessary to manage stormwater quality and where stormwater samples will be taken.”

Within the *Forest Service DEIS* (p 340), it is noted the compliance point dam forms a “final sediment pond located at the outlet of Barrel Canyon” For all alternatives, the rock-fill structure would be constructed of large inert waste rock.

- However, on Figure 14 – *Barrel Alternative Footprint* (DEIS, Chapter 2, p. 58) the Compliance Point Dam is located below the confluence of Barrel and Trail Canyons, with the full stormwater contribution from McCleary Canyon.

- The entire portion of the mining project site contributing surface water flow to Barrel Canyon, and flows emanating from adjacent McCleary and Trail Canyons, will collect within the basin formed by the Compliance Point Dam.

- From a review of Figure 7 of the *Rosemont Copper Project, Reclamation Concept Update* (March 2010), the placement of a Compliance Point Dam at this location will clearly not be 100 to 200 feet wide nor have a (extra a) storage capacity of approximately 2 acre-feet. In the absence of the construction of a significant armored levee on the north portion of the Barrel drainage system, the Compliance Point Dam will actually approach 1000 feet in length with a much larger storage capacity.

**Request:**

397. Within a Supplemental EIS (SEIS), provide the following documents in order to present the Preferred Alternative in a more thorough and complete manner:

- For the Compliance Point Dam as shown for the *Barrel Alternative* (Preferred Alternative), provide DESIGN PLANS which clearly identify the location and overall design of the dam

- Provide the following information for the Compliance Point Dam: delineation of all contributing watershed areas, and hydrologic calculations which demonstrate under what size stormwater flow event would the dam be expected to overtop during different stages of the mining operation.

- Demonstrate how the Compliance Point Dam will adequately provide for the systematic assessment, monitoring, and sediment control of surface waters emanating from Barrel, McCleary and Trail Canyons.
Questionable Long-Term Integrity of Flow-Through and Finger Drains and Resultant Impacts to the Public and the Environment

398. The proper and permanent operation of the proposed mine flow-through drain system is one of the most critical components of the planned industrial waste disposal area. On page 7 of the ACOE 404 Application, it states “The flow-through drains are designed to allow conveyance of the 100-year 24-hour storm volume from the contributing basin through the drain within 30 days.” The Forest Service DEIS does not indicate what happens during a larger volume storm, which is inevitable.

One significant problem with the proposed flow-through drain system will be the eventual clogging of the entrances on the western side of the Tailings Disposal Mound. Watershed surface flows, consisting of water from both the side slopes of the tailings mound and the upgradient watershed, will bring sediment-laden stormwater to the entrances of the South 1, South 2, and PWTS flow-through drain entrances.

Water storage in the ponds are predicted to last up to one month in duration following significant storm events, with water surface elevations rising to heights which significantly cover the entrances to the flow-through drain features (Reclamation and Closure Plan – Tetra Tech, July 2007, Fig. 16) and cause direct seepage into the stacked tailings materials.

Upgradient sediment collected during storm events will settle in the attenuation ponds and over time retard the transmission of water into the sub-drain. The accumulated sediments will eventually clog the entrances to the drains during the post-mining period and render the flow-through drain non-operational. This situation is reasonably expected at the entrance to all the flow-through drains, particularly in association with adjacent stormwater basins.

The USEPA also commented on this questionable stormwater design component (Agency Review of the Internal Working Draft of the Rosemont Copper Project DEIS, July 2011):

• “The DEIS should contain more information on the design of the Central Drain. For instance, how will the design ensure that stormwater does not contact tails or contaminant generating waste rock while passing through the Central Drain? How will the Drain be constructed such that fine grain material is not allowed to settle and eventually migrate into the Central Drain? What long term maintenance is necessary to ensure that the Central Drain remains clear and clog free into perpetuity? What would be the potential impacts, contingency plan and potential costs were the drain to plug? Where would the funding for long term maintenance come from?”

When the flow-through drain system fails due to various factors, including lack of operational maintenance and clogging of the drain entrances due to the buildup of fine sediments, surface water flow beneath the massive Tailings Disposal Mound will eventually trickle down and may cease. The use of a geotextile filter fabric at the drain inlet ponding areas / rock drain interface is not sufficient to allow for long-term operation of the flow-through system, and will not stop blockage at the
entrance due to sediment buildup. Similarly, the use of a graded rock filter may assist in passing water into the drain entrance, but will not stop the eventual clogging of the entrance due to sediment buildup. This can only be accomplished by mechanical removal of accumulated sediment which will block the entrances to the flow-through drains.

Simply put, implementation of the proposed Flow-Through Drain System at the proposed Rosemont Copper Mine is ultimately a Fatal Flaw. The design function of this earthen-material system will cease in the future – it is only a question of when, not if. The SEIS/FEIS should acknowledge that this will adversely impact streams and the ecosystem downstream of the mine site, in Barrel Canyon, Davidson Canyon and likely Cienega Creek.

399. On Figure 9 of the ACOE Application, label the South Main and South 1 flow-through drains, and identify/label the flow-through drain located between the South Main and South 1 drains (South 2?).

400. On Figure 9 of the ACOE Application, properly label the North Finger Drain, which is now labeled the South Finger Drain.

401. On Figure 10 of the ACOE Application, show tailings material completely covering all flow-through drain sections. The notes provided are unclear, in part due to a lack of a longitudinal section(s) showing construction sequencing. Provide longitudinal sections to better exhibit the nature and construction of the flow-through drains.

402. Provide plans and sections showing the entrance design and setting for the three primary flow-through drain systems (South 1, South 2?, and the PWTS flow-through drains) which are proposed to transfer surface water completely through the Tailings Disposal Mound.

403. Provide a map showing mining post-closure watersheds for the three primary flow-through drains (South 1, South 2?, and the PWTS flow-through drains). Provide watershed calculations for these three drains, and show wet area due to the 100-yr storm event. Provide calculations showing storage and drainage times for these three drains, including the cumulative effects of a 100-yr storm event followed by a 25-yr storm event.

404. Discuss what occurs if the flow exceeds the capacity of these three flow-through drains, or if the volume detained at their respective entrances exceeds the available storage capacity.

405. Provide a Monitoring, Maintenance, and Contingency Plan for the Flow-Through Drain System so that both Rosemont Copper, the Forest Service, and the public are fully aware of the measures to be taken, and by whom, regarding the operation of this sub-drain system below the massive, permanent Tailings and Waste Rock Disposal Mounds. Include a long-term monitoring and maintenance plan to ensure the proper function of the flow-through drains in perpetuity.

406. Provide specific examples where flow-through drain systems, in the size range and with a tributary configuration similar to the proposed system beneath the
Tailings and Waste Rock Disposal Mound, have been successfully implemented at mining sites for periods of 10-20 years, 20-40 years, and 40+ years.

407. **The proposed action results in the greater impact to the Potential Waters of the United States than any of the alternatives, which is contrary to the guidance in the Federal Register** (p. 336, Surface Disturbance of Potential Waters of the United States and Table 91). According to the Federal Regulations (33 CFR Part 320.4), alternatives lessen any significant adverse impact to the floodplain should be selected. The proposed Action described in the DEIS is the one with the most significant impact on "Potential Waters of the United States" (see Table 91). It is necessary to explain the reason to choose the plan with most significant impacts on water resources.

Part of the 33 CFR Part 30.4 is shown below.

(I) **Floodplain management**

(3) In accordance with Executive Order 11988, the district engineer should avoid authorizing floodplain developments whenever practicable alternatives exist outside the floodplain. If there are no such practicable alternatives, the district engineer shall consider, as a means of mitigation, alternatives within the floodplain which will lessen any significant adverse impact to the floodplain.

408. **There is no quantitative analysis to support important elements of the mitigation plan** (p. 347-349, Mitigation Effectiveness). It appears that the Forest Service simply assumes mitigation practices sufficiently work without any supporting studies or documents. For example:

- p. 347 "a stormwater management and drainage system designed to prevent contamination outside containment areas would be developed". The DEIS did not mention how the volume of the containment will be determined.
- p. 348 "Rosemont Copper would develop a revegetation plan that includes planting native grasses, shrubs....". In general, revegetation on steep slopes is very difficult. The DEIS did not provide any plans for revegetation other than a simple explanation about the "greenhouse testing". Revegetation on steep slopes under natural conditions is much more difficult than "ideal" greenhouse conditions. The DEIS should provide how proposed mitigation practices could reduce potential impacts of the proposed mining activities. Qualitative assessment and clear explanation are required.

409. **The number of springs listed in the table is inconsistent indicating that the impact of the alternatives is not adequately determined** (p. 330, Table 89)

One of the "Identified features" is 7 Springs. Table 8 in Chapter 2 (p.98) said that number of springs and seeps lost or impaired is 64. The number of springs seems inconsistent. DEIS should explain why these numbers are different.

410. **The water quality impacts to downstream, including Davidson Canyon (an Outstanding Water of the State of Arizona), have not been evaluated and must be evaluated in order to understand the impact of the alternatives on downstream waters.** Davidson Canyon contains reaches that are classified as
Outstanding Waters of the State of Arizona. Over the period of development, the 8.2 square mile watershed upstream of the compliance point, in the headwaters of Davidson Canyon, will be modified to retain most of the runoff. Since the entire Davidson Canyon Watershed is only 50.5 square miles, the modifications in the upper portions of the watershed are likely to have significant impact on the Outstanding Waters, especially the frequency of runoff (most likely small storms will be retained and not discharged to downstream). Since we cannot find the study referred in the DEIS (Zeller, 2011. Predicted Regulatory (100-Yr) Hydrology and Average-Annual Runoff Downstream of the Rosemont Copper Project. Tucson, Arizona: Tetra Tech. July, 2011.), it is impossible to evaluate if the assessment of runoff for the pre-and post-mining conditions are reasonable. However, we expect that there are substantial issues of the methodology to evaluate runoff for Davidson Canyon, based on the issues found in other studies done by Tetra Tech. The studies done by Tetra Tech have common errors in the methodology, as described above (Surface Water Management). Because of the inappropriate selection of the elevations used to estimate average annual runoff, it is unclear how much the proposed activities will affect the Davidson Canyon. However, the impacts are expected to be significant due to the extent of disturbance. The difference between pre- and post-mining runoff volumes is likely larger than the values estimated by Tetra Tech, because the runoff for pre-mining was underestimated due to the inappropriate rainfall with lower elevation (see the comments for “Surface Water Management”). This suggests that the impacts of the proposed mining activities on the Davidson Canyon are larger than the estimated values. As outstanding resource waters, Tier 3 waters must be maintained and protected, with no degradation in water quality allowed. Additional qualitative analysis is necessary to evaluate potential impacts on “Outstanding Waters”. The study is required to quantitatively analyze the impacts of proposed mining activities on volume, frequency, and magnitude of runoff to Davidson Canyon.

One the possible impacts is damage to the channel that supports the Outstanding Water. As described on p.336-337, “When that delivery system is disrupted or altered, changes to stream aggradation and scour will occur until the system reaches equilibrium once again....a decrease in sediment production in headwaters will cause narrowing of channels as sediment-starved waters cut into channel deposits left by larger flows. This downcutting can ultimately increase the gradient of the channel and is likely to result in the formation of discontinuous gullies....”. Also, on p. 338, “...could cause changes in he geomorphology of the channel between the mine and the confluence with Davidson Canyon”. Proposed and alternative plans will change the stream delivery system and geomorphology of the channel. As a result, aggradation (deposition) and/or degradation (scour) will most likely occur along the streams. It is necessary to assess how the mining activities will affect stream sediment movement. DEIS should include the analysis.

The methods used to evaluate erosion and sediment transport are inappropriate and far below industry standard. Erosion and sedimentation embody the processes of entrainment, transport and deposition of solid particles (Julien, 1998). However, the DEIS employs a simple scoring method (PSIAC) as a basis for estimating all aspects of erosion and sediment transport. As described on p.337, “Sediment delivery was modeled to the US Geological Survey gaging station......”. This is incorrect. Tetra Tech’s analysis is the estimation of sediment yield from the project site using PSIAC (Tetra Tech, April 9, 2010). The PSIAC
method is a scoring method that is not capable of analyzing sediment transport and does not consider the impact of disturbance, such as mining. Sediment transport analysis to estimate scour/deposition is necessary to assess the impact of the proposed mining activities, especially because "Changes in sediment delivery to portions of Barrel and Davidson Canyons downstream of the US Geological Survey gauging station have the potential to cause aggradation or scour, including riparian areas in the reaches designed Outstanding Arizona Waters" as cited in the DEIS (p. 338, L.1-3). Davidson Canyon contains reaches that are classified as Outstanding Waters of the State of Arizona. The designation as an Outstanding Water of the State of Arizona is relevant because under 33 CFR 320.4 (b) 5 'state regulatory laws or programs for classification and protection of wetlands will be considered.' According to the State of Arizona, Tier 3 waters (AZ classification for Davidson Canyon) must be maintained and protected, with no degradation in water quality allowed. Additional qualitative analysis is necessary to evaluate potential impacts on "Outstanding Waters". In addition to a sediment transport analysis, a study is necessary to quantitatively analyze the impacts of proposed mining activities on volume, frequency, and magnitude of runoff to Davidson Canyon.

413. The Best Management Practices (BMPs) to be used are not provided, so it is not possible to evaluate their effectiveness. (P.47 Mitigation Effectiveness) The DEIS cited that "Disturbances are expected to be relatively small and to be mitigated by best management practices for construction (p.325, L. 12-13). However, the DEIS did not clearly explain how the best management practice work. Because the proposed mining activities could possibly affect Davidson Canyon, the DEIS should provide quantitative analysis to show how the proposed best management practice would work.

414. Revegetation evaluation methods are inadequate to determine effectiveness of post-closure revegetation, and on-site revegetation testing is required. The DEIS described that "All disturbed areas would be hydroseeded with native grasses and completely stabilized following construction" (p.325, L. 24-25). This statement seems to be based on the results of the Greenhouse testing by the University if Arizona (p.148-150). As admitted in the DEIS, "the greenhouse studies represent potential results under ideal conditions, and they do not represent expected real-world conditions". It is not reasonable to expect "successful revegetation with native grasses" under a natural condition, especially on steep slopes, based on the greenhouse results. Most likely revegetation will be substantially less successful on steep slopes with limited resources for plants (water, stability, organic material etc). On-site regeneration test is required to estimate the effectiveness of proposed revegetation efforts.

415. While the DEIS recognizes that soil erosion, sediment transport and geomorphologic analysis are required (p336), the information presented in the DEIS does not adequately specifically address any of these three components. Because sediment transport is a function of both the sediment and the flow of water, both the sediment component of the analysis and the hydrology are relevant. Furthermore, because channel form can change as a function of sediment moving into and out of a channel reach, changes in sediment transport can impact channel form.
The method used to estimate erosion is not appropriate to evaluate the impact of mining alternatives and is far below industry standards. (p.324, Analysis Methodology, Assumptions, Uncertain and Unknown Information, p. 325, Table 87, p.330 Surface Water Quality, and p.335-349, Impacts Common to All Action Alternatives)

All aspects of erosion and sediment transport described in the DEIS is based on series of Tetra Tech’s Technical Memos. Tetra Tech used PSIAC (Pacific Inter Agency Committee - PSIA, 1968) method to estimate sediment yield from the Rosemont site. PSIAC is developed for planning purposes by Pacific Southwest Inter Agency Committee for watershed basins of larger than 10 square mile (PSIA, 1968). It is not appropriate because it is a scoring method that does not explicitly recognize site conditions and changes in site condition resulting from disturbance (like mining) in the analysis. Furthermore, it was not intended for use on sites smaller than 10 square miles, and both the existing conditions (8.2 square miles) and proposed alternative (1.9 square miles) are smaller than this 10 sq mile threshold.

Because it does not recognize the effect of site disturbance, it cannot be used to evaluate alternatives that specifically involve evaluating the impact of site disturbance. To use the PSIAC method, especially for the post-mining condition. As such, the impacts of the projects on sediment yield were estimated simply based on changes in the contributing watershed areas. It is questionable if sediment yield would proportionally decrease with decreasing the contributing watershed area.

Tetra Tech claimed that over the 30 years Tetra Tech has highly satisfactory results of sediment estimation by using PSIAC (Tetra Tech, August 18, 2011). However, Tetra Tech did not provide any supportive data or references. Are there any comparisons between estimated and measured sediment data? The Tetra Tech’s “successful results” statement is not reasonable unless they can provide results that can support their assessment. Tetra Tech should explain why PSIAC is appropriate to estimate sediment yield at the Rosemont site or revise sediment calculations. Tetra Tech also should explain why the post-mining sediment will be reduced as a function of a watershed size.

While Rosemont’s consultant, Tetra Tech, has reiterated their justification for this method (Tetra Tech, August 18, 2011, comment 2), their justification is flawed. While the District concedes that the PSIAC method has been proposed for use on watersheds smaller than the 10 sq. miles, the two studies cited by Tetra Tech (Rasely, 1991; Renard and Stone 1982 [Tetra-Tech neglected to mention the co-author Stone]), clearly state that the PSIAC method is inappropriate for site level assessment:

‘The method developed by the Water Management Committee of PSIAC (1968) was intended for broad planning rather than specific project formulation where more intensive investigations are required.’

"It should be emphasized that the PSIAC sediment yield procedure is quite different from the Universal Soil Loss Equation, USLE, (Wischmeier and Smith, 1978) because the USLE evaluates on-site soil disturbance in relationship to agricultural cropland, which is the gross soil erosion in an individual soil and farm field setting, while the PSIAC sediment yield procedure rates sediment delivery from rangeland and mountainland which is net soil loss in a watershed hydrologic unit setting.'


This quote from Rasely, 1991 clearly indicates that PSIAC is meant to be used on undisturbed rangelands andmountainlands, while other methods, such as USLE, are appropriate for assessing the impacts of disturbance. Furthermore, the District contacted Ken Renard (co-author of Renard and Stone, 1981), who re-iterated that the PSIAC method is inappropriate for estimating erosion from mine sites. Therefore, the two sources identified by Tetra Tech as justification for the use of PSIAC method for evaluating the impact of the Rosemont mine actually state that PSIAC is an inappropriate method for evaluating impacts of mining on erosion and soil loss.

As such, there can be no doubt that the PSIAC method is inappropriate for evaluating the impacts of the different mine alternatives. Therefore, the soil loss, sedimentation and sediment yield evaluations need to be re-done using a method that is appropriate for mine sites.

417. A sediment transport analysis is needed, but the methods presented as sediment transport do not in-fact evaluate sediment transport. Sediment transport is a function of how sediment detached from a hillslope or channel bed is entrained (or eroded), transported and deposited (Julien, 1998).

The methods used do not consider the physical process of sediment transport (sediment entrainment by flowing water, sediment transport by flowing water, and deposition by sediment settling) and therefore cannot be used to evaluate sediment transport. Generally, sediment entrainment is a function of how flowing water is able to pick up particles of a given size. However, if sediment is cohesive or in a cohesive matrix (such as clay) the entrainment is also limited by the shear stress necessary to entrain that particle. Once sediment is entrained, there is a limit to how much sediment can be transported. This evaluation can only occur when model that describes physical sedimentation processes (entrainment, transport, deposition) is linked to a flow model. There has been no attempt to model these processes, even though the DEIS specifically recognizes sediment transport study (p 336).

418. Sediment transport requires an evaluation of how flowing water interacts with sediment eroded from a site but the hydrologic assessment is
inappropriate. Comments on the hydrology in ‘Water Quantity’ document the problems in the methodology used.

419. The sediment concentration estimates (table 92), are particularly flawed, because they are calculated by dividing total sediment yield (determined by PSIAC method) by total runoff volume (determined by flawed estimate of runoff volume). The DEIS cited that “the change in sediment yield to Davidson Canyon is estimated to be approximately 5 percent and is unlikely to represent a significant change in geomorphology. (p.339)” The analysis to support this citation is not appropriate. Therefore, this citation is not reliable. See the comments about “Issues related to annual runoff calculation” and “Issues related to the sediment calculation methods”. Appropriate analyses for runoff and sediment are required.

The sediment transport and concentration values cited in the report in the following areas are particularly suspect because of the problems described above:

- p. 325, Table 87 Estimated “Sediment delivery to the USGS survey Gauging Station (%change)"
- p. 336-339, Sediment Yield and Table 92
- p. 330-332, Surface Water Quality

420. A geomorphic assessment is needed, but no geomorphic assessment is provided: As described on p.336-337, “When that delivery system is disrupted or altered, changes to stream aggradation and scour will occur until the system reaches equilibrium once again....a decrease in sediment production in headwaters will cause narrowing of channels as sediment-starved waters cut into channel deposits left by larger flows. This downcutting can ultimately increase the gradient of the channel and is likely to result in the formation of discontinuous gullies...”. Proposed and alternative plans will change the stream delivery system. As a result, aggradation (deposition) and/or degradation (scour) will most likely occur along the streams. It is necessary to assess how the mining activities will affect stream sediment movement. DEIS should include the analysis, especially because “Changes in sediment deliverly to portions of Barrel and Davidson Canyons downstream of the US Geological Survey gaging station have the potential to cause aggradation or scour, including riparian areas in the reaches designed Outstanding Arizona Waters” as cited in the DEIS (p. 338, L.1-3). Davidson Canyon contains reaches that are classified as Outstanding Waters of the State of Arizona. Additional qualitative analysis is necessary to evaluate potential impacts on “Outstanding Waters”. In addition to a sediment transport analysis, a study is necessary to quantitatively analyze the impacts of proposed mining activities on volume, frequency, and magnitude of runoff to the channel and floodplains of Davidson Canyon.

421. The DEIS provides no detail on how sediment control features were designed, so it is not possible to evaluate their potential effectiveness. DEIS cited that “The stormwater management facilities onsite have been designed to maintain total suspended sediment concentrations in stormwater runoff similar to baseline conditions. (p.337)” It is unclear how sediment concentrations will be controlled. There is no quantitative analysis to support this description. DEIS should explain how the sediment will be controlled.
422. **A soil erosion assessment that specifically recognizes the impact of mining is needed:** The DEIS recognizes the need to estimate the erosion from existing conditions and post-mining conditions (p 336), but then does not provide soil erosion assessment, and instead provides the results of a scoring method for sediment yield, which does not assess soil erosion. A soil erosion method that specifically recognizes the impact of mining, such as RUSLE (Toy and Foster, 1998) is needed. Rosemont’s consultant, Tetra Tech has recognized this need in some of its correspondence to Rosemont (Tetra Tech, March 11, 2010).

423. **Sediment Transport Analysis:** A sediment transport analysis which considers the physical processes of sediment entrainment, transport and deposition as a function of flowing water rate will provide an estimate of how sediment will move in response to different events and provide a better assessment of what areas are likely to scour and which might experience degradation. A model, such as HEC-6 or HEC-RAS would be more appropriate than the models used in the DEIS.

424. **Geomorphic Analysis of Impact of Flow Regime Change Impacts:** Given the importance of the Davidson Canyon as an Outstanding Waters of State of Arizona understanding the potential of the change in flow regime on to change the integrity of the Davidson Canyon corridor through degradation or aggradation of sediment.

425. **Evaluation of Revegetation Effects:** Since revegetation is such a critical part of mine reclamation, analysis using on-site conditions is required.
CHAPTER 3 – BIOLOGICAL RESOURCES

426. Page 351: Analysis of impacts
The statement that “reclamation may not restore natural conditions” (italics added for emphasis) is both absurd and representative of the overly optimistic impact that the proposed mining operation will have on natural resources. How could it be possible for a tailings pile—with evenly contoured slopes and homogeneity of material—to restore natural conditions that were formed over millions of years and that are characterized by heterogeneity in slope, aspect, and coarseness of material? Similar language is used to a host of resource impacts, such as habitat loss. The commonly used quote when referring to habitat loss is “may result in loss of habitat...” Specific examples of this will be highlighted in this critique, but in general, any process or document that seeks to maintain credibility would not make such a vague assessment when habitat will be lost, it is often not a matter of “may” but rather of how much.

The Forest Service's response to a similar comment in the ADEIS was: “Impacts are described to the level of specificity determined appropriate by the interdisciplinary team resource specialist for that particular resource area.” This is an insufficient response. The role of the Service is to provide a realistic assessment of impacts, yet what we see is a measured response that largely seeks to minimize impacts. Certainly there are uncertainties with regards to the scope and scale of the mine’s impacts, but if anything those uncertainties should warrant weighting the Service’s analysis to one of more caution for the myriad of environment resources rather caution for upsetting the applicant’s desire to move forward quickly with a project that will impact our natural environment for thousands of years.

Page 352- Issue 5E Special Status Species or Species of Concern
427. Under what specific conditions and for what specific species of Species of Special Concern would the Forest Service analysis indicate mine operations would not impact habitat for species of concern.

Page 352/353- Analysis Methodology, Assumptions, Uncertain and Unknown Information
428. The Forest Service needs to provide justification for not requiring the comprehensive field surveys required to fully address questions of potential impacts and actual species presence with current data sets.

429. In its analysis of impacts on wildlife, the direct impacts and cumulative impacts on the native wildlife species in project area were not addressed. Further analysis of potential impacts to those same species present in the adjacent project analysis area is needed.

General: Habitat Loss
430. The DEIS document gives some detail on the total number of acres that will be impacted by the Rosemont mine, but when it comes down to species-specific analysis, there is very vague language as to the impacts that the mine will have on both the number of individuals that will be directly killed, as well as the number of acres of habitat impacted.
To quantify direct, on-site destruction of habitat, the County ran a geographical information system analysis of the preferred alternatives for the mine and transmission lines and then quantified habitat loss for a host of species in the County's Sonoran Desert Conservation Plan process (RECON Environmental Inc. 2000). The results of this analysis are below:

<table>
<thead>
<tr>
<th>Species</th>
<th>Loss (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huachuca water umbel</td>
<td>1.01</td>
</tr>
<tr>
<td>Needle-spined pineapple cactus</td>
<td>2,379.6</td>
</tr>
<tr>
<td>Pima pineapple cactus</td>
<td>660.2</td>
</tr>
<tr>
<td>Chiricahua leopard frog</td>
<td>4,208.4</td>
</tr>
<tr>
<td>Lowland leopard frog</td>
<td>932.1</td>
</tr>
<tr>
<td>Abert's towhee</td>
<td>600.1</td>
</tr>
<tr>
<td>Bell's vireo</td>
<td>600.1</td>
</tr>
<tr>
<td>Cactus ferruginous pygmy owl</td>
<td>1,785.1</td>
</tr>
<tr>
<td>Rufous-winged sparrow</td>
<td>688.4</td>
</tr>
<tr>
<td>Southwestern willow flycatcher</td>
<td>36.7</td>
</tr>
<tr>
<td>Swainson's hawk</td>
<td>4,506.4</td>
</tr>
<tr>
<td>Western yellow-billed cuckoo</td>
<td>176.6</td>
</tr>
<tr>
<td>Gila chub</td>
<td>0.2</td>
</tr>
<tr>
<td>Gila topminnow</td>
<td>0.2</td>
</tr>
<tr>
<td>Longfin dace</td>
<td>0.2</td>
</tr>
<tr>
<td>Allen's big-eared bat</td>
<td>4,506.4</td>
</tr>
<tr>
<td>Arizona shrew</td>
<td>4,506.4</td>
</tr>
<tr>
<td>California leaf-nosed bat</td>
<td>3,902.1</td>
</tr>
<tr>
<td>Lesser long-nosed bat</td>
<td>4,506.4</td>
</tr>
<tr>
<td>Mexican long-tongued bat</td>
<td>4,506.4</td>
</tr>
<tr>
<td>Pale Townsend's big-eared bat</td>
<td>4,506.4</td>
</tr>
<tr>
<td>Western red bat</td>
<td>4,506.4</td>
</tr>
<tr>
<td>Western yellow bat</td>
<td>3,808.8</td>
</tr>
<tr>
<td>Desert box turtle</td>
<td>447.9</td>
</tr>
<tr>
<td>Desert tortoise</td>
<td>1,311.6</td>
</tr>
<tr>
<td>Giant spotted whiptail</td>
<td>10.9</td>
</tr>
</tbody>
</table>

This example shows only one type of analysis that can be performed and we urge the Forest Service to undertake an analysis of the mine's impact on habitat by using a similar approach, but for all of the special status species outlined in the DEIS. This would allow for a more realistic accounting of direct habitat loss and therefore rely less on qualitative statements.

Of course, direct habitat loss is but one aspect of impacts to habitat and even more can be done to quantify impacts. In most cases, determining a link between changes in a species of interest and a habitat element is both well understood and definable, such as the predictable impact to birds when vegetation characteristics change (e.g., Carothers et. al. 1974, Mills et. al. 1991, Destefano and Mccloskey 1997, Holmes and Sherry 2001), or when aquatic species come in contact with compromised water-quality characteristics (e.g., Dixit et. al. 1999, Rouse et. al. 1999, Barber et. al. 2006). Other times, changes in a non-habitat feature of the environment can have cascading impacts to habitat, then to species. An excellent example—and one that is applicable to the Rosemont situation—is the impact that reduced subsurface water flows will have on species. Specifically, the impact of short-term loss of water into the headwaters of Davidson Canyon (due to diversion
and use in the mining operation) and after-mining drawdown of the regional aquifer (to form the pit lake) will impact species down gradient of the mine, particularly a host of riparian species in Davidson Canyon and Cienega Creek. These impacts will occur because of the well-understood connection between the depth of the shallow aquifer and aquifer-dependant plants in desert systems; plants that will die or become stressed if the aquifer level drops below a threshold. This well-documented threshold for the dominant species such as cottonwood and willow (Salix spp.) is about 3m to water (Lite and Stromberg 2005). Depths to a shallow aquifer that exceed 3m will, in turn, have a predictable and negative impact on riparian and aquatic bird species (Brand et. al. 2010) such as those that are found in Cienega Creek (e.g., yellow-billed cuckoo, summer tanager, southwestern willow flycatcher).

For this reason, the analysis in the table above underestimates the number of acres of habitat that will be impacted by the mining operations, because for many species of interest to the County (especially riparian and aquatic species), the downstream impacts to habitat are likely to exceed the impacts at the mine site. This analysis should be part of any honest assessment of the mine's impact on species and therefore should be included in the EIS.

General: Climate Change

431. The DEIS acknowledges that climate change will occur (page 205) and that at least a 5.4°F increase in global temperatures is expected in the next 100 years. What is missing is frank assessment of the impacts of climate change on the species analyzed in the DEIS. Such an analysis is needed because climate change will lead to increases in temperature and lower precipitation will lead to a further reduction in habitat, particularly for species that rely on ephemeral and perennial creeks, springs, and seeps (Fonseca and Connolly 2002) because of reduced runoff and recharge (Powell 2010). These resources are especially critical for aquatic invertebrates as well as fish, amphibians (e.g., lowland and Chiricahua leopard frogs), bats, and other wildlife that requires water sources and thermal cover for their life-history functions (Pounds et. al. 1999, Kirkpatrick et. al. 2007).

The proposed Rosemont Mine presents two challenges to species with regards to climate change. First, the mine will produce an enormous quantity of climate-changing fossil fuels during all stages of its development and operation. Second, any analysis of the effect of the Rosemont operation on aquatic and riparian species must take into consideration that climate change will intensify the impacts of the proposed mining operation on water resources. For example, the dewatering of the regional aquifer as a result of the pit lake will be more extensive because evaporation rates from the lake will increase as temperatures increase. This was not given sufficient attention in the mine's impact on water resources and the species that rely on these valuable water resources.

Climate change impacts will be particularly pronounced for riparian and/or aquatic species, which are also anticipated to be impacted by the proposed Rosemont mining operation. In the table below are the impacts that climate change will have in addition to—and not inclusive of— short-term and long-term impacts resulting from the Rosemont mine. More general impacts may include increased incidence of pests, diseases (e.g., West Nile virus), pathogens, and heat/moisture stress. The Forest Service should undertake a more specific analysis of the combined
impact of climate and the Rosemont mine on these and other upland species that will be impacted by these two forces.

<table>
<thead>
<tr>
<th>Species</th>
<th>Potential Direct and Indirect Impacts from climate change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huachuca water umbel</td>
<td>Habitat altered or lost by drought and scouring floods</td>
</tr>
<tr>
<td>Arizona giant sedge</td>
<td>Loss or degradation of springs and seeps.</td>
</tr>
<tr>
<td>Coleman's coral root</td>
<td>Loss of oaks (due to a retreat of oaks upslope) which are important to create cool, moist microclimate for this species, will lead to shift in the elevation range of this species. It is not clear if habitat is available for this species in the upper reaches of the watersheds that will not be directly impacted by mining</td>
</tr>
<tr>
<td>Western red bat</td>
<td>Loss or degradation of mesic riparian vegetation along Cienega Creek from drought; possible change in phenology of insect prey</td>
</tr>
<tr>
<td>Western yellow-billed cuckoo</td>
<td>Mesic riparian habitat along Cienega Creek may be lost due to flooding (i.e., scour) and prolonged drought; lack of synchrony with critical food sources during chick rearing</td>
</tr>
<tr>
<td>Southwestern willow flycatcher</td>
<td>Mesic riparian habitat along Cienega Creek may be lost due to flooding (i.e., scour) and prolonged drought; increased heat stress; lack of synchrony with food sources during chick rearing</td>
</tr>
<tr>
<td>Abert's towhee</td>
<td>Riparian habitat along Davidson and Cienega Creek may be lost due to prolonged drought; lack of synchrony with food sources during chick rearing</td>
</tr>
<tr>
<td>Bell's vireo</td>
<td>Riparian habitat may be lost in some areas due to prolonged drought and flooding, but increased in some areas due to increased in shrub density; lack of synchrony with food sources during chick rearing; effects on non-breeding habitat unknown</td>
</tr>
<tr>
<td>Longfin dace</td>
<td>Drought conditions will affect water availability and aquatic habitat features; higher temperatures will lead to stress and lower oxygen availability; prey base may change. Positive result of higher temperatures may mean fewer freezing events, thereby reducing mortality.</td>
</tr>
<tr>
<td>Gila chub</td>
<td>See longfin dace</td>
</tr>
<tr>
<td>Gila topminnow</td>
<td>See longfin dace</td>
</tr>
<tr>
<td>Chiricahua leopard frog</td>
<td>Drought conditions lead to loss of open-water habitat; intense fires in uplands leads to loss of habitat from silt and debris buildup; increased water temperatures. Potential positive effects may be a decrease in chytrid fungus because that disease prefers colder water</td>
</tr>
<tr>
<td>Lowland leopard frog</td>
<td>See Chiricahua leopard frog</td>
</tr>
<tr>
<td>Mexican garter snake</td>
<td>Drought conditions will affect this species through loss of aquatic habitat and effects on prey species</td>
</tr>
</tbody>
</table>
432. **Biology, general: Pima County’s Section 10 Permit**

The DEIS does not acknowledge the County’s forthcoming Section 10(a)(1)(B) permit from the U.S. Fish and Wildlife Service (Pima County 2010). This permit requires that the County clearly articulate the anticipated impacts and offsetting avoidance, minimization, and mitigation measures associated with the activities of the permit (primarily ground-disturbance activities). Pima County has considerable mitigation commitments at the Cienega Creek Natural Preserve and along Davidson Canyon at Bar-V Ranch. Because the proposed mine is within the watershed of these properties, the mine will negatively impact the County’s mitigation efforts for the Section 10(a)(1)(B) permit. The DEIS should both acknowledge this fact and propose a framework and details for how the mine operators will ensure that the ecological value of the County’s mitigation lands will be conserved in light of the anticipated impacts to the resources. Because of these impacts, the DEIS should explore compensatory mitigation options.

433. **Page 357: Pima County’s Priority Vulnerable Species**

Table 3.1 includes the County’s Priority Vulnerable Species (PVS), but the Sonoran desert tortoise is still not designated as a PVS. Ocelot, jaguar, and Mexican spotted owls are incorrectly listed as PVS. There is no “coverage” under the Sonoran Desert Conservation Plan, but rather the County’s Multiple Species Conservation Plan. This misconception is carried over to page 385.

434. **Page 414: Invasive Species**

Executive order 13112 requires that the Forest Service consider invasive species in its actions. It is stated that an invasive species plan will be developed with “specific measures”. This is an insufficient amount of detail given the area of disturbance and its high potential to be colonized by invasive species. Invasive species on the Rosemont site are of particular interest and concern to Pima County and other land owners downstream of the mine because seeds will wash through the system and be deposited in sensitive ecological sites such as Davidson Canyon in the County’s Bar-V Ranch and the Cienega Creek Natural Preserve. Therefore, specifics about targets, actions plans, and planning processes for the development and implementation of the invasive species plan must be included in the EIS. Simply leaving those decisions to post-acceptance of the MPO will likely result in a plan that is long on promises and vague on specifics. Consideration of adjacent and downstream lands that will be affected by the mine’s operations must be included in this plan. Finally, a plan and assured and sufficient funding for post-mining monitoring and treatment actions must be part of any invasive species plans.

435. **Page 390: Invasive Species**

There is some acknowledgement of the impacts that the Rosemont Mine will have on changes to vegetation communities as a result of invasive species, but missing from the DEIS is a detailed assessment of the impacts of groundwater decline and diversion will have on the riparian obligate plants in Davidson Canyon and Cienega Creek, particularly as it relates to Tamarix invasion. According to Stromberg et al. (2007): “Stream-flow regimes are strong determinants of riparian vegetation structure, and hydrological alterations can drive dominance shifts to introduced species that have an adaptive suite of traits.
Deep alluvial groundwater on intermittent rivers favors the deep-rooted, stress-adapted *Tamarix* over the shallower-rooted and more competitive *Populus* and *Salix.* Using the results of the Myers model, we request that the Forest Service undertake a modeling effort to determine the increased susceptibility of Cienega Creek to this invasive species.

436. **Page 379, 390: Animal Corridors**
This area of the Santa Rita Mountains is a critical wildlife movement corridor and may be one of the most important wildlife corridors in the region. The corridor in which Rosemont is sited is as the heart of three wildlife linkage areas that will be significantly impacted by the proposed action. The analysis in the DEIS does not provide any quantitative analysis of the impacts on wildlife movement and yet there is a growing body of literature that would facilitate this analysis (e.g., Rouget et. al. 2006) using GIS and the proposed footprint of the mine. Such an analysis will add a greater understanding of the important role that the site of the proposed mine provides for animal movement in the region.

437. **Page 353: Use of Dated Reference Materials**
Throughout the document (and the associated EA), the Forest Service relies on an inventory from 1977 (Davis and Callahan 1977). It is surprising that the Forest Service would rely on such a dated document to establish baseline conditions. Even for that time, the quality of the data varies widely among taxa, because of the variable field effort that was expended. Therefore, we recommended that new data be collected to establish a more credible and realistic baseline, most especially because the EA relies so heavily on this document for determination of impacts. Collecting up-to-date information is essential to substantiate the many claims of "no impact" that are found throughout the document.

In the ADEIS a similar comment was made and the Service's response was: "The U of A studies are used primarily to make assessments about certain species that would not be surveyed for this project, either for which surveys wouldn't reveal anything useful or for which suitable habitat is assumed to be present." This is an insufficient response. For example, the UA studies found both Cassin's and Botteri's sparrows on the site and both are grassland-obligate species that are receiving considerable interest in the conservation community. According the logic provided in the Service's response in the ADEIS, can we assume that Botteri and Cassin's sparrow habitat is still present and will therefore be destroyed by the mine? If so, these species should have been considered in the DEIS analysis.

**Page 9: Mine and Adits**
438. In the DEIS there is a very contradictory statement about mine adits and shafts: "All action alternatives would directly impact at least 11 mines and adits....construction an operation of the mine....may result in the loss of mine adits and shafts." This statement is contradictory because if the proposed action (and all action alternatives) will (not "may") result in the total destruction of bat habitat within the mine's footprint. As stated numerous times in these comments, it is unfortunate that the Service uses such cautious language; the destruction of the mine shafts and adits during mine development is simply a fact that will have important impacts on resources that rely on mines and adits.
439. **Caves, sinkhole, or underground drainage**

Given the geology of the area, it is very likely that the applicants will discover caves, sinkhole, or underground drainages during the course of the mine's development. These areas are likely to contain species and features that must be thoroughly investigated before they are destroyed as a result of the proposed mining activities. The DEIS states that work will suspend while a Forest Service representative is contacted and an investigation of the resources to be conducted. The EIS must contain additional details on how the applicant will be required to comply with this direction. Specifically, it will be too easy for mine and contract personnel to ignore this condition and proceed to destroy the resource before such an investigation is conducted; it is simply not in their interest to draw attention to such a situation. Therefore, a trained, independent biologist should be required to be present on site during most, if not all, stages of mine development to ensure that these resources are properly accounted for. The model of having a trained and outside expert on site is common in extractive industries and endeavors such as fisheries, power and pipeline installation, and development. Without an independent biologist to monitor the situation, requirements to stop work (even if stated in contractual terms) will be meaningless.

The EIS should include additional details on what will occur after a cave, sinkhole, or underground drainage is found. Sufficient time must be given to proper assessment and inventory of resources and particular attention must be paid to biological resources, especially invertebrates. The EIS should also state the process for creating and paying for an interdisciplinary team that will be in charge of investigations. Those teams should be formed prior to the start of construction.

440. **Page 391: Vegetation**

The DEIS acknowledges that some impact will occur as a result of airborne dust and toxins on plants and soils. However, there was no analysis of this impact, which can be significant. Instead, the Forest Service suggests that impacts would be mitigated through dust control measures. This is simply an avoidance measure and we recommend more study of the situation because dust and airborne toxins may can impact a host of resources, most of which were not even mentioned in the DEIS.

441. **Page 374: Huachuca water umbel**

This species has been found in the Cienega Creek Preserve, just upstream of the confluence with Davidson Canyon and may be present in other areas as well, though no surveys have been conducted since 2001 (Engineering and Environmental Consultants Inc. 2001). The presence of the species there is not acknowledged in the EIS. Also, based on recent data from Las Cienegas National Conservation Area, there has been a large increase in the population of this species during recent surveys (Jeff Simms, unpublished data). In the Cienega Creek Preserve, the species will be impacted by the Rosemont Mine because of the diversion of water from Davidson Canyon during mining operations and subsequent dewatering of the regional aquifer to form the pit lake. Also, there will be a greater probability of point-in-time scouring floods as a result of channel realignment in the headwaters of Davidson Canyon. These actions
and consequences will impact habitat for this species, but these threats have not been evaluated for this species. The DEIS states that impacts along Cienega Creek are not expected to occur until about 50 years after project closure but this is an insufficient time horizon for analysis period given that the groundwater impacts of this operation will last for thousands of years (Myers 2010). Rosemont did not conduct surveys for this species (and therefore relies on old location data for the species) nor has a mitigation plan been proposed to offset long-term impacts along Cienega Creek. Because this is a very spatially restricted species, specific and measurable mitigation methods must be established, along with periodic surveys to establish efficacy of those efforts.

442. Arizona giant sedge
This species was analyzed for impacts under a few of the action alternatives, but the analysis was lacking. The species is found in wet springs and streams and will be impacted by the proposed activities through direct mortality and long-term dewatering of the aquifer at spring and riparian sites. Spring sites where it may be present include: McCleary, MC-1, MC-2, Fig Tree, Sycamore, Helvetia, Peligro Adit, Ruelas, SW, Locust, Deering, Papago, Mulberry, Crucero, Lower Mulberry, Scholfield, SC-2, Barrel, Questa, Davidson, Reach 2, and Escondido. It is unclear from the DEIS where surveys for this species occurred, but it appears likely that only a subset of sites were visited. Not enough surveys have been conducted for this species nor have they developed any mitigation strategy for this wetland species. These must take place to more fully understand the impacts that the mine will have on this species.

443. Coleman's coral root
This xeroriparian species is found under the canopies of oak trees along washes. According to surveys for this species, many individuals were found in McCleary Canyon and a few individual were found in Wasp Canyon (WestLand Resources Inc 2010a). Surveys for this species were sufficient to document presence, but the population adjacent to the proposed mine represent the largest population of the species and is likely to be impacted by the proposed mining activity, activities that (as mentioned) will likely result in a downward trend in the species toward listing. Impacts to individuals outside of the mine footprint could include dust interference with photosynthesis of associative plants, light, and increase trampling given how close the McCleary population will be to the edge of the tailings. The DEIS has not suggested any mitigation for this species and it has not been acknowledged that mitigation through the use of transplanting may be difficult given its close association with a particular species of fungus. Clearly more analysis and investigations are needed for this species.

444. Page 400: Talus snails (Rosemont and Sonoran)
The DEIS provides a very cursory recognition that habitat will be destroyed from the proposed activities, but no attempt is made to put the 29-acres of projected habitat lost into a range-wide perspective for each of these species. Though the applicant did conduct some surveys on the Rosemont site (WestLand Resources Inc 2010b), additional surveys could be collected to get a better understanding of the larger distribution of these species. In the DEIS there was no recognition that approving the mine would lead to the decline of the species, something that would surely lead to listing the species under the Endangered Species Act. Even
in occupied sites outside of the direct impact from mining there will be impacts from blasting and lights, which could harm or kill individuals.

445. Page 398: Long-fined dace
This is one of three species of fish that occur in Cienega Creek and which will be impacted by the proposed activities. It is the only one of the three fish species that has been documented in Davidson Canyon (Ehert 2007). Given these observations, the data on the distribution of the species is incomplete and the conclusions are incomplete. Potential impacts for this species are reduced water quality and quantity and the greater probability of point-in-time scouring floods as a result of channel realignment in the headwaters of Davidson Canyon. These threats have not been evaluated for this species. Water quality impacts could come from the mine itself through discharge of toxic materials and sediment as well as impacts to parameters such as dissolved oxygen and water temperature, which are regulated, in part, by hydro-riparian emergent vegetation and trees. Habitat impact to these trees (through reduction in groundwater and potentially scouring floods) was not noted in the DEIS. In general, impacts noted in the DEIS are minimized by suggesting that impacts along Cienega Creek are not expected to occur until about 50 years after project closure. This is an insufficient time horizon for analysis period given that groundwater impacts of this operation will be indefinite. No mitigation has been proposed for this species.

446. Page 397: Gila topminnow
This is one of three species of fish that occur in Cienega Creek and which will be impacted by the proposed activity. This species tolerates a narrower range of conditions than the long-fined dace and uses runs and riffles to a lesser extent. Potential impacts for this species as a result of the proposed activities are primarily reduced water quality and quantity and the greater probability of point-in-time scouring floods as a result of channel realignment in the headwaters of Davidson Canyon. These threats have not been evaluated for this species. Water quality impacts could come from the mine itself through discharge of toxic materials and sediment as well as impacts to parameters such as dissolved oxygen and water temperature, which are regulated, in part, by hydro-riparian emergent vegetation and trees. Habitat impact to these trees (through reduction in groundwater and potentially scouring floods) was not noted in the DEIS. In general, when impacts are noted in the DEIS they are minimized by suggesting that impacts along Cienega Creek are not expected to occur until about 50 years after project closure. This is an insufficient time horizon for analysis period given that groundwater impacts of this operation will be indefinite. No mitigation has been proposed for this species.

447. Page 397: Gila chub
This is one of three species of fish that occur in Cienega Creek and which will be impacted by the proposed activity. This species is primarily found in the deepest pools along Cienega Creek. Potential impacts for this species as a result of the proposed activities are primarily reduced water quality and quantity and the greater probability of point-in-time scouring floods as a result of channel realignment in the headwaters of Davidson Canyon. These threats have not been evaluated for this species. Water quality impacts could come from the mine itself through discharge of toxic materials and sediment as well as impacts to parameters such as dissolved oxygen and water temperature, which are
regulated, in part, by hydro-riparian emergent vegetation and trees. Habitat impact to these trees (through reduction in groundwater and potentially scouring floods) was not noted in the DEIS. In the DEIS there is first a suggestion that no impacts will occur, then (later) a suggestion that some impact might occur as a result of groundwater drawdown. This fact is minimized by suggesting that impacts along Cienega Creek are not expected to occur until about 50 years after project closure. This is an insufficient time horizon for analysis period given that groundwater impacts of this operation will be indefinite. No mitigation has been proposed for this species.

448. **Page 396: Desert tortoise**
The desert tortoise (Sonoran population) occurs with the footprint of the Rosemont mine and associated infrastructure and therefore individuals will be impacted by the mine and its infrastructure. The population of the species may not be as abundant in the vicinity of the mine footprint as in other areas around Tucson, but nevertheless this may be an important population of individuals, which likely have a connection to individuals in the Vail area. Tortoises have been collected in the vicinity of Helvetia (specimen housed at the University of Kansas Biodiversity Research Center). We recommend that a complete survey be conducted within all areas of the project boundary, including along power lines and roads leading into and away from the mine site. The DEIS suggests that impacts to this species may occur, but "are unlikely to result in a downward trend", though no surveys of the area were conducted to make this assessment. Impacts to this species will occur through loss of habitat, disturbance to movement corridors, increased and long-term predation of this species (e.g., along the proposed transmission line) are certain. These impacts will become greater as climate change forces the species to seek upslope to match its climate tolerance and food sources. Also, the Rosemont area is on the edge of the species’ range and we know from countless examples in wildlife ecology that impacting habitat (on the scale of Rosemont) on the edge of a species' range will lead to range contraction. Given the downward trend that this species is experiencing throughout its range, it seems impossible that the Rosemont project will not lead to the decline of this species. Finally, no mitigation has been proposed for this species, but there are many operational models for avoiding death of individuals and reducing predation along power lines. Mitigation measures should be investigated.

449. **Page 396: Giant spotted whiptail**
This xeric-riparian species is thought to be common in the Rosemont area, but no surveys have been conducted to determine the species' range within the mine footprint. This should be done to better understand the population size and if the statement in the DEIS that asserts "the proposed project....is not likely to result in a downward trend" is correct. Given the lack of surveys of the area since the 1970's, and the importance of this area for the species in Pima County, the Forest Service should not make this claim without more evidence. Finally, mitigation should be put forward to avoid or killing individuals and for providing long-term, off-site habitat for this species.

450. **Northern Mexican garter snake**
This species was once common along perennial streams but is now very rare along Cienega Creek, though habitat features important for the species (close
proximity to standing water, emergent vegetation, hydro-riparian streamside vegetation, and course woody debris) as well as a robust prey base appear to be present there. There is a high likelihood that this species will be listed under the Endangered Species Act in the coming years. The species will be impacted by the proposed mine through death of individuals, loss and/or pollution of water coming into Cienega Creek and subsequent impacts to habitat features and prey base. The Rosemont Copper Company commissioned no surveys for this species within the project area nor developed a mitigation plan.

451. Page 395: Chiricahua leopard frog
The Chiricahua leopard frog is listed as Threatened under the Endangered Species Act and has been found at a number of sites on and around the proposed mining site in 2008 and 2009 (WestLand Resources Inc 2008, 2009), including Box Canyon, South Sycamore Canyon, the Lower Stock tank, as well as three areas just east of the proposed mine: East Dam, "Oak Tree Canyon" tank, and Highway Tank. (Surveys were also conducted in 2011, but no data have been reported from that effort.). Earlier surveys—conducted in 1975-76—by Lowe and Johnson (1980), also found what was most likely the Chiricahua leopard frog.

The presence of Chiricahua leopard frog in the entire mountain complex suggests that that area of the Santa Rita Mountains is an important metapopulations and currently the U.S. Fish and Wildlife Service is reviewing comments on the species’ proposed critical habitat designation. Based on the historical data from the area and from recent surveys by Rosemont's consultants, Pima County and others have requested that the Rosemont area be considered as critical habitat. Whether or not this request is considered, it still remains that the death of individuals or (more importantly) the loss and degradation of habitat from the proposed mining operations will likely compromise the long-term viability of this species in this part of southern Arizona. Loss of habitat will occur as a result of on-site disturbance of habitat (most of the areas that were mentioned earlier) as well as long-term dewatering of the aquifer to create the pit lake. Individuals dispersing from nearby source populations will die or be displaced if they enter the project site during active operations and over the subsequent thousands of years the pit lake may become a long-term “sink” for the population as individuals dispersing to the lake either die from the toxicity or are trapped in the lake.

The Rosemont Copper Company has commissioned surveys for this species in and around the proposed mine site, but no mitigation plan has been proposed. This must be completed and because of the site-specific nature of the species (i.e., restricted to small, isolated wetlands), any broader mitigation plan for the project must include specific, measureable objectives for mitigation.

452. Lowland leopard frog
In general, the lowland leopard frog occurs at lower elevations than its congener, the Chiricahua leopard frog. A population of lowland leopard frogs occurs along Cienega Creek and occasionally in Davidson Canyon, though complete regional surveys are lacking for this species. Potential impacts for this species as a result of the proposed activities are primarily reduced water quality and quantity and the greater probability of point-in-time scouring floods as a result of channel
realignment in the headwaters of Davidson Canyon. Water quality impacts could come from the mine itself through discharge of toxic materials (or accidental spills) as well as impacts to parameters such as dissolved oxygen and water temperature, which are regulated, in part, by hydro-riparian emergent vegetation and trees. Habitat impacts to these trees (through reduction in groundwater) was not noted in the DEIS. Impacts to this species are not evaluated in the DEIS and no mitigation is proposed.

453. **Page 400: Western yellow-billed cuckoo**
This meso-riparian obligate species requires large cottonwood and willow trees for nesting and feeding. It has been found nesting at Cienega Creek (Empire Ranch, Davidson Canyon confluence, and Upper Cienega Creek) and has been found on the project site. Impacts to water quantity (and potentially quality) will likely impact this species by way of negative impacts to the large riparian trees that it needs for nesting as well as its prey base. Impacts to these essential habitat elements are expected to result from groundwater decline and scouring floods. Insufficient surveys have been conducted on and in the vicinity of proposed mine to determine the status of the population there. Finally, no mitigation plan has been put forward by the Rosemont Copper Company.

454. **Page 400: Southwestern willow flycatcher**
This meso-riparian species is listed as endangered under the Endangered Species Act. It is known to nest along Cienega Creek and will be impacted by the proposed project as a result of reduced flows in Davidson Canyon and groundwater drawdown. Impacts to water quantity (and potentially quality) will likely effect this species because of impacts to the dense understory and midstory (by way of scouring floods and groundwater withdrawal), which it needs for nesting and its prey base. The DEIS states that impacts along Cienega Creek are not expected to occur until about 50 years after project closure but this is an insufficient time horizon for analysis period given that the groundwater impacts of this operation will be indefinite. No mitigation measures have proposed by the Rosemont Copper Company for this species.

455. **Abert's towhee**
This year-round resident is found along many of the major washes and rivers of eastern Pima County including along Davidson Canyon and Cienega Creek. Habitat features that are important for this species are primarily mesic-riparian and xeric-riparian small trees and shrubs and the vegetation structure in the understory and midstory, which will be impacted by the Rosemont mine due to a loss of water into Davidson Canyon and a reduction of aquifer levels from the pit lake. This species was not analyzed in the DEIS and no mitigation for loss of habitat has been proposed by the Rosemont Copper Company, but it is an important species for Pima County as part of the Section 10 permit.

456. **Bell's vireo**
This migratory bird is found along many of the major washes and rivers of eastern Pima County including along Davidson Canyon and Cienega Creek where its habitat is dense stands of xero-riparian and meso-riparian vegetation, particularly in the understory and midstory. Vegetation species of importance include hackberry, mesquite, and *Baccharis*. The vireo will likely be impacted by the Rosemont mine due to a loss of water into Davidson Canyon and a reduction
of aquifer levels from the pit lake and subsequent loss of riparian vegetation. This species was not analyzed in the DEIS and no mitigation for loss of habitat has been proposed by the Rosemont Copper Company, but it is an important species for Pima County as part of the Section 10 permit.

457. Other migratory birds
The DEIS gives scant attention to other migratory bird species that will be impacted by the proposed mining activity. Additional analysis should be conducted for a host of species that will be impacted and there should be mitigation measures in place to conform with the Migratory Bird Treaty Act.

458. Page 398: Jaguar
Though it is true that the jaguar is rare in southern Arizona, the recently confirmed sighting of an individual in the Whetstone Mountains and an unconfirmed sighting in June 2011 in the Santa Rita Mountains should compel the Forest Service reexamine its conclusion that the species would not be impacted by the Rosemont Mine. From what we know about this species in the US and northern Mexico, it prefers habitat within the oak woodland and associated canyons, which would make the Rosemont area habitat for this species.

459. Page 398: Lesser long-nosed bat
The Rosemont mine represents prime feeding and roosting grounds for this endangered bat. As the DEIS states, approximately 250,000 palmer agaves are likely to be impacted by the mine operations and a significant roost site is located very close to the mine footprint. Therefore, it is must be a typo in the DEIS when it states “no indirect impacts to lesser long-nosed bat maternity roosts are anticipated.” Perhaps the nearby Helena Mine and more minor roosts on the Rosemont Mine footprint are not maternity sites, but they are still important for the bat and the loss of significant foraging resources will have marked impact on the regional population of the species. A more thorough analysis of the impact the mine will have on the larger population should be conducted. This analysis should include bat use of the Rosemont and adjacent areas. Finally, there is no proposed mitigation for impacts to this species. Mitigation should include offsite protection of lesser long-nosed bat caves, adits, or other mine features.

460. Western red bat
This species is primarily associated with broadleaf riparian deciduous forests and woodlands. A population likely occurs along Cienega Creek and Davidson Canyon, though complete regional surveys are lacking for this species. Reducing surface flows into Davidson Canyon and reducing groundwater levels will likely impact the species’ roosting habitat (tall mesoriparian trees) and food supplies (insects), but the species is not given serious consideration in the DEIS. Impacts to habitat may also result from scouring floods due to upstream diversions. No mitigation plan has been put forth by the applicant, but mitigation can include protection of existing populations.

461. Other bats
The Rosemont site will have numerous impacts on bats, but the analysis only gave cursory attention to species other than the lesser long-nosed bat. The 2009 bat survey of the Rosemont site found a number of bat species roosting include
the Mexican long-tongued bat, Townsend’s big-eared bat, big brown bat, fringed myotis, and the cave myotis. Additional impacts on these bats may come from the pit lake and those impacts were not accounted for except in passing. A more thorough analysis of the various threats posed by the mine and those impacts on the species must be included in the EIS.

462. **Species summary**
The proposed Rosemont mine and its associated activities, actions, and infrastructure will have a large and permanent impact on species within and in the vicinity of the mine. These impacts are neither fully accounted for in the DEIS nor is there any proposed mitigation. These deficiencies must be more fully addressed.

463. **Environmental Assessment: p. 34: Arizona manihot**
For the Arizona manihot, the EA states: “Forest Service (2009r) reports that only 11 specimens of Arizona manihot have been collected in the United States”. Surveys specifically looking for this species have not been conducted on this species, yet the Forest Service provides the following statement: “For all action alternatives, the proposed project may impact individuals but is not likely to result in a downward trend toward federal listing as threatened or endangered or a loss of population viability.” If not enough is known about the species, how can this conclusion be reached?

464. **Environmental Assessment: p. 58: Peregrine falcon**
The suggestion that peregrine falcons “have been observed breeding in less optimal habitats (small, broken cliffs in ponderosa pine forest or large, sheer cliffs in very xeric areas)” is not correct. There is no data to support this claim and the Rosemont site is almost certainly a foraging area for this species. As with many species in this analysis, conjecture is no substitute data.

465. **Mitigation**
The FS relies on the guidance of the Council of Environmental Quality (2011) for understanding the commitments that Rosemont is agreeing to with regards to mitigation. However, the section on biological mitigation has no set commitment to doing even the most minimal of mitigation measures. Firm commitments of money and resources must be in place prior to the Forest Service agreeing to any mitigation commitments, no matter how enticing they may seem on paper. This suggestion is supported by the Council of Environmental Quality’s mitigation document, which states: “Agencies should not commit to mitigation measures considered in an EIS or EA absent the expectation of resources to ensure that the mitigation is performed” Though there is discussion of financial assurances, specific figures for mitigation costs must be presented for public review.

466. **Page 385- Other Plants and Animals**
This analysis does not adequately recognize the legal protections, regulations and policies afforded non- Special Status Species of wildlife and plants. The quantitative consequences of the loss of habitat and loss of individual animals and plants in both the analysis area and proposed action areas is missing.

467. **Page 390- Vegetative Communities**
The analysis states "All of the action alternatives would result in long-term, permanent impacts to at least approximately 6,278 acres of vegetation...". This statement is in direct conflict with how Issue 5A is stated.

468. **Page 391- Animal Movement Corridors**
Justify the statement that there would only be a “temporary 20 year” impact on wildlife corridors as accurate based on other identified analysis impacts to habitats, potential reclamation failure, vegetation and dewatering impacts of more than the impact area. The overall analysis of the impacts of wildlife corridor loss in the analysis area is inadequate.

469. **Page 398- Jaguar**
This analysis needs to be updated based on more current information available.

470. **Page 401- Migratory Birds**
The analysis states that 4,937 acres of habitat would result in “…direct, permanent impacts...” yet under Special Status Species of Wildlife the same alternatives would impact 6,278 acres of habitat. Clarify the difference in acreage.

**Vegetation Communities**

471. Pima County contends that USFS needs to consider a method of measuring riparian habitat value that will capture all impacts to regulated riparian habitat. USFS needs to coordinate their choice of riparian habitat evaluation methods with all cooperators. Evaluation of habitat based on methods that utilize only vegetative volume may not capture all potential impacts to habitat as a result of this project.

472. The riparian areas are present along McCleary, Wasp, Barrel Canyon and Trail Canyon Washes. All the riparian areas are classified as Important Riparian Areas by Pima County. The proposed mining activities will significantly affect the riparian habitat along those washes. The DEIS did not show the amount (area) of the disturbance of the riparian habitat.

473. The description of the “Pima County riparian mapping” on page 369 is incorrect and incomplete. Pima County’s regulatory Riparian Classification Maps are habitat maps, not vegetation maps. IRA classification is an overlaying designation that corresponds to the Conservation Lands System boundary under Pima County’s Comprehensive Landuse Plan and included in the Sonoran Desert Conservation Plan. IRA designation is based on a number of factors that support habitat including, biological corridors, hydrologic continuity, floodplain functions, special resource features such as springs and shallow groundwater areas, and landscape linkages. The habitat types underlying IRA include hydro/mesoriparian and four classes of xeroriparian habitat, which were based on vegetative volume interpreted from satellite imagery as well as other floodplain functions supporting habitat.

474. On page 369 it is reported that according to the proponent’s consultants Pima County IRA is primarily based on vegetative volume and typically overestimates the area by 37%. In our experience riparian areas are also often underestimated. IRA is not based on vegetative volume. The county also considers connectivity of biologic corridors, soils, geomorphology, amongst other factors (see comment #53
The conclusion that Pima County habitat maps are in error is not substantiated. The study (Westland Resources, “Onsite Riparian Habitat Assessment and Impact Analysis – Rosemont Project, April 2010”) criticizing the County habitat classification method and maps was used as the basis for dismissing the map accuracy. The Westland Resources 2010 study was not peer reviewed or reviewed by Pima County. There are several flaws with the Westland Study cited. The first major flaw with Westland’s effort is recognized therein. On page 19 the study states that “atmospheric conditions...preclude direct comparison of the vegetation classes.” If the vegetative indices used were not normalized for rainfall they are not comparable as the study recognizes.

Second the Westland study only examined IRA. IRA is not solely based on plant density. The comparison should have been to the underlying classification maps themselves. The transects examined in this study did not include the full width of the IRA. Instead the riparian boundaries were estimated by Westland field staff and transects ran the width of the boundaries. Transects lengths should be greater than the IRA being evaluated, with sampling therein to determine errors of inclusion and exclusion. The methodology is not repeatable and the results do not support the conclusion without consideration of annual rainfall. In reporting the proponent’s conclusion that the County maps are inaccurate it should also be noted that Pima County has a formal procedure to re-examine map boundaries when development is proposed and the applicant has not pursued this route.

The list of canyons that include “interior riparian deciduous woodland vegetation” mapped by the Coronado in the analysis area excludes Barrel Canyon and other notable areas of gallery riparian forest which is to be impacted by the mine footprint. A map should be provided along with the text so that such errors are more readily identified and comparison to other regulatory maps (Corps and County) is possible. These areas are included in the County Regulated Riparian Habitat Maps and are classified as IRA and hydro/mesoriparian. If the Service had chosen to use these as requested during the cooperator process rather than maps developed specifically for the project it may not have been overlooked. Due to limitations of the current Coronado habitat maps the DEIS states that the Service is currently developing new riparian habitat maps for much of the Coronado and the County would expect this error to be corrected through this process. Unfortunately the DEIS states this may not be completed for the FEIS. On page 369 the DEIS has listed some of the riparian habitats locations on site as Ephemeral Fluvial Systems Supporting Upland Vegetation. Aspect on this site has much to do with the vigor of upland species, whereas the habitats within the canyons including barrel and others on-site should be classified as riparian deciduous woodland containing water dependent species including Canyon Hackberry, Willow and Cottonwood. This error is demonstrated by the fact that the Western yellow-billed cuckoo has been observed “within Barrel canyon in the Rosemont area” (pg. 383). This is a significant error in the DEIS characterization of the site and therefore the impacts.

Page 369 states that the County RRH Maps are more extensive than either Westland’s (Augusta Resources Consultant) or the Service’s preliminary efforts. It then goes on to cite a frequently heard argument from Westland that these maps overestimate the width of riparian areas. The Pima County method was vetted by peer, public and stakeholder reviews. While registration errors do occur, the
method used by the proponent's consultant is not geographically sound. The claim that the County RRH Maps are in error by the applicant's consultant is unsupported and should not be treated as though it was peer reviewed in the DEIS. Should any entity wish to re-examine the accuracy of these maps the County has a formal process to do so. The project proponents have not pursued this procedure and their characterization of errors is unfounded.

478. The DEIS states that "one benefit" of the County maps is their geographic extent. Taken in context of Westland's claim that the maps overestimate width by 37% and the subsequent statement that Westland's maps were developed using field verification there is a clear pattern of misinformation. The county maps were also developed using field verification on this site. The incomplete description along with relying on references to source material leaves the reader unable to draw conclusions. The DEIS is consistently flawed in this regard. While noting the claim of error perhaps it should also be noted that the consultant making the claim works for the proponent not the public. A full citation style would help rectify this type of misinformation.

479. The pattern of drawing conclusions not supported by the evidence presented continues in the discussion of individual species. There is a good example of this flaw on page 376 within the description of habitat suitable for the Chiricahua leopard frog. The first sentence for which two citations are provided states that the frog occurs in springs, tanks and upper watershed streams. The concluding sentence however which contains no citation includes only stock ponds as suitable habitat. This conclusion appears intended to support the proposal to limit mitigation to man made water sources within grazing allotments.

480. On page 386 the statement is made that direct impacts to riparian areas range from 83 to 220 acres of habitat as defined under Section 404 of the Clean Water Act. Section 404 is concerned with "wetlands", a broader definition of riparian is appropriate in the study area. A comparison to Pima County's RRH maps would be useful for reference and more accurately reflect local habitat characteristics.

481. On page 389 the DEIS fails to acknowledge the presence of hydro/meso riparian areas within the mine site stating only that xeroriparian areas will be impacted.

482. Page 397 states that impacts to designated critical habitat for the Gila Chub within the upper Cienega creek are not readily foreseeable because they are not expected to occur until 50 years after mine closure. Defining an event as not reasonably foreseeable just because it does not occur for a long time is inherently a flawed argument. The groundwater drawdown is expected to occur and may in fact be made worse by other events. It is not only reasonably foreseeable but imminent.

483. **Cumulative Effects**

Pima County reviewed and compiled the 10-year plans of various utility companies. Utility companies have identified in their utility plans over 200 miles of proposed and potential future transmission lines, principally affecting eastern Pima County. These are depicted in Figure X in the Visual Resource comments. The DEIS should consider the biological impacts of the Rosemont transmission
line in the context of these future lines, as many of these will not only have direct impacts but also indirect impacts from future maintenance.

Mitigation Effectiveness

484. The direct and irretrievable impact to a minimum of 12 springs is inconsistent with Pima County's 2001 Comprehensive Plan Update – Water Resources Element. This policy is to protect groundwater-dependent ecosystems within Pima County including springs, perennial and intermittent streams and other shallow groundwater areas. While there is commitment to replace improved water sources which assists in keeping a no-net-loss of these human-created water sources, there is no commitment to mitigate for the loss of natural springs. Taken collectively, only mitigating for such human-made features still accounts for a net-loss of total surface water features (human-made and naturally-occurring). In a desert environment where such surface water features are rare, at best, it is unthinkable to incur the outright loss of these valuable resources without proposing some mitigation measure (e.g., artificial creation, perpetual protection of or enhancements to at-risk springs).

485. ADEIS-3/ Biol. Resources/p.61, lines2-3
An additional important mitigation is needed: to provide discharge of dewatered pit water after water quality monitoring to downstream ponds and Davidson Creek to mitigate the effects of regional lowering of the water table and loss of numerous springs and seeps.

DEIS-Biological Resources, p.413-1-414:
None of the mitigations address downstream depletion of water resources. ADEIS Comment not addressed. Mitigation of down-gradient and down-canyon depletion from loss of streamflow of up to 40% in Davidson Canyon and drawdown of the aquifer due to pit construction is not addressed. Loss of springs and seeps, as a water source for animals is not addressed. This must be addressed. To say that most springs and seeps would be irretrievably lost is an unacceptable answer. The Mine should be rejected on that basis. A supplemental EIS is needed to address this issue.

486. ADEIS-3/ Biol. Resources/p.61, lines2-3
Due to the thousands of acres lost as mentioned on P.62, an additional element of design is the commitment of Rosemont Copper to purchase and deed to the USFS an equivalent amount and biological quality of private land dedicated to mitigate the irretrievable and irreversible commitment of biological resources of public land. This land should be as close to Davidson Creek and Cienega Creek watersheds to mitigate the irreversible loss of the riparian habitat and Madrean character of Barrel Canyon, Wasp Canyon and McCleary Canyon. The deeded land shall not allow mining on the property.

DEIS-Biological Resources, p 413-414 Mitigation Effectiveness.
ADEIS comment not addressed. P.415 indicates that 955 acres of Madrean Evergreen will be lost for good. Yet, this is not addressed in the Mitigation Effectiveness comments. Such an oversight is not acceptable for public lands. In addition, many more acres of riparian land need to be quantified and will be lost due to a lowering of water table from loss of streamflow for recharge and a large pit that will act as a large well dewatering many tens of feet of aquifer for
thousands of years. The commitment of Rosemont Copper to purchase and deed to the USFS an equivalent amount and biological quality of private land dedicated to mitigate the irretrievable and irreversible commitment of biological resources of public land needs inclusion. For the USFS to not require Rosemont to do this is unacceptable to the public and is not consistent with stewardship of the public resource.

487. On page 414 the DEIS proposes to create fence out schedules to protect remaining riparian areas from livestock during critical breeding times. As the cattle are being run by the proponent it would make far more sense to simply abandon cattle grazing on public lands surrounding the mine so that displaced riparian favoring species would have somewhere to go all year round.

488. Page 415- Irretrievable and Irreversible Commitment of Biological Resources
Based on actual performance of reclamation plans for mines in SW, what percentage of the reclamation efforts actually resulted in successful restoration of native habitats and for what percentage of the area delineated in reclamation plan? Please explain how that data is consistent with only showing irretrievable loss of only the 955 acre pit and the consequential impacts on plant and animal life and habitats.
CHAPTER 3 – LIVESTOCK

489. In discussing grazing mitigation effectiveness on page 441 the DEIS reports the productivity of comparable soils in greenhouse tests. Reporting the effectiveness of reseeding around areas disturbed on site during exploration and testing, and the on-site experimental plots would be more comparable to results expected in the field. The exclusion of these results is notable.

490. The grazing section fails to address the loss of grazing potential off site due to groundwater and riparian habitat loss.

CHAPTER 3 – DARK SKIES

491. The correct reference to the Outdoor Lighting Code is Ordinance No. 2006-91, Exhibit H. The reference on page 447 is incorrect.

492. Outdoor lighting is regulated by Pima County under A.R.S. §11-861 and §11-251(35), the latter of which provides counties authority to adopt and enforce standards for shielding and filtration of commercial outdoor portable or permanent light fixtures in proximity to astronomical observatories. The 2006 Pima County Outdoor Lighting Code has been adopted under these Statutes and comprises standards for shielding and filtration accomplished through regulating fixture geometry, lumen output and spectra. Mines are not exempt from standards for shielding and filtration adopted under A.R.S. §11-251(35).

493. Contrary to the claim in the Rosemont Mine Outdoor Lighting Pima County Outdoor Lighting Code Technical Memo (M3-PN08036), the 2006 Pima County Outdoor Lighting Code applies to the Rosemont site including all developed areas and roadways. More specifically, Rosemont is required to comply with this code and/or subsequently adopted editions for all fixed and portable outdoor lighting. Furthermore, and in line with the intent of the regulation, maximum lumen and lamp type output shall be limited to the net acreage of developed areas and not to the entire Rosemont site as proposed in the technical memo. Developed area calculation for lumen cap purposes shall be limited to roads, parking lots, mine process area and a set allowance for the portions of pit, waste rock, tailings and leach pads actively in use at any given time.

494. The DEIS declares that the mine will have adverse effects on astronomical research and adverse impacts on dark sky conditions at both the Whipple and Jarnac Observatories. There is no further exploration of what the consequences of those significant and adverse impacts will be on the economic and scientific viability of the observatories. This deficiency needs to be addressed.
CHAPTER 3 – VISUAL RESOURCES

General Comments

495. The SMS relies upon rating levels of public concern for scenery. These definitions are not common sense and seem backward. Concern level one states that those on highways are the most likely to be concerned about scenery while, concern level 2 is said to be those areas including back-country and secondary roads “where the likely interest in scenic quality is moderate”, and concern level three are areas rarely visited where concern is least likely. Per this method the public is assumed to be the least concerned about the scenic quality of wilderness and the most concerned along the highway. The method appears to confuse level of concern with frequency of exposure. Substantiation of this method needs to be presented. The method is simply not common sense, visitors and residents of rural areas are very concerned about scenic quality that is why they are there. While the SMS may be newer than the VMS it appears it is not appropriately applied in this assessment.

496. The only viewpoints assessed over 10 miles away are in relatively low lying areas. Analysis viewpoints from higher areas within the Coronado are absent. The Mt Lemmon Highway, Mt. Wrightson Wilderness area and Canelo Hills should be included as well as the rural residential areas east of the site and Cienega Creek and San Pedro National Conservation Area, Sonoita and Elgin. Furthermore the proposal for closure of one of the southwest’s most popular forest service routes (Gunsight Pass) has been included in all alternatives and excluded from the viewpoints. Along scenic highway 83, within the Coronado the mine will be fully visible from the road and scenic pullovers near mileposts 10-12 and 28 far south of Sonoita. This impact has been overlooked by the analysis.

497. The visual contrast analysis states an assumption the slope failures will be "revegetated quickly". Elsewhere in the report it states that revegetation will take 50-100 years. The basis for this assumption as it is related directly to contrast analysis should be provided as it is far faster than revegetation efforts elsewhere onsite.

498. Pima County reviewed and compiled the 10-year plans of various utility companies. Utility companies have identified in their utility plans over 200 miles of proposed and potential future transmission lines, principally affecting eastern Pima County. These are depicted on the attached figure. The DEIS should consider the visual impacts of the Rosemont transmission line in the context of these future lines.
Visual Simulations

499. Visual simulations were noted as being based on "digital photographs" as the basis for evaluating the impact of the mine at nine viewpoints. The Forest Service must assure reviewers that the digital images were created using a camera/lens combination that is equal to the perspective of the human eye. This is no small matter because lens choice can have a huge impact on the relationship between foreground and background (in this case the mine) elements. It appears that the images were created using a wider angle lens than is "normal" to the human eye. This creates a phenomenon known as perspective distortion and it could make the mine site recede into the background, thereby minimizing the visual impact of the mine.

Use of a 50mm lens on a 35mm-equivalent camera is considered "normal" angle of view, thereby giving the most realistic perspective on which to evaluate the simulations. (It should be noted that all but the most high-end digital cameras have a sensor that is much smaller than a 35-mm equivalent and this changes the field of view considerably). Therefore, the Forest Service should provide more technical details about the camera make, model, and lens angle of view to assure the public that the simulations are actually replicating the impacts as they would be experienced by the viewer.
Page 452, Introduction
On page 452 in the introduction to Visual resources the DEIS acknowledges the value of visual resources to visitors but not the analysis area as a whole.

Page 453, Analysis Methods
Page 453 of the Visual Resources section of the DEIS states that; "reclamation vegetation would approach maturity in 50 to 100 years, and the stormwater drainage systems would need to be monitored and maintained indefinitely". Bonding and monitoring must be in place for assurance.

Page 455 Coronado Scenic Resource Management
Page 455 reports that the Coronado has been directed to use a "newer" system of visual analysis and although a citation is provided, there is no rationale. The DEIS should present all rationales leading to decisions.

Furthermore the style of citation utilizing only the name and date provides no lineage to the reader.

The selection of the Scenery Management System (SMS) over the Visual Management System (VMS) would appear to benefit the proponent and lead to a failure to identify the flaws in the narrow scope of alternatives included by the Coronado. The SMS is far less prescriptive and well defined. For instance the highest rated landscapes within the VMS are referred to as "preservation" and, "Allows for ecologic changes only" and states that, management activities are prohibited except for very low visual impact recreation facilities. The highest rated category in the SMS on the other hand is confusing at best containing contradictory statements that the area is "unaltered" and "natural-appearing". Furthermore, compare SMS High, the sites designation to VMS Retention. The SMS High allows landscapes to "appear unaltered", whereas VMS Retention states that "management activities ...are not visually evident". This statement would appear to limit activities to those that are management related and NOT visible. The selected method is far more permissive and the Service’s rational for dismissing the system the Forest Service has used previously should be explained not simply cited. As stated on page 509 the SMS tools are an assessment of character not a management tool, and perhaps a management tool (VMS) is needed.

On page 455 the DEIS states that the “Coronado has...been directed” to use VMS. Yet on page 467 it states that the directive was from the Coronado Supervisor. The former statement leads the reader to believe an external perhaps federal office of the NFS or court directed the local branch, the Coronado to use the SMS, however in truth it was decision made locally.

Page 456, Visual Impact Methodology
There are no viewpoints in the visual analysis along Whitehouse Canyon Road, Madera Canyon Road, Santa Rita Road, and Houghton Roads, all of which will be impacted by the project and should be included in the analysis. In particular, Whitehouse Canyon and Madera Canyon roads are highly used for recreational purposes and thus are particularly important to evaluate for visual impacts. Santa Rita Road is used to access residences near Helvetia and to visit the Helvetia cemetery.
506. **Page 457, Scenic Integrity map, Figure 66**
Confirm if the map is correct in that it does not show any “moderate – very low” Scenic Integrity Objectives category lands. Is the northernmost portion of the Coronado National Forest shown supposed to be “very high” category?

507. **Page 460, Missing Scenic Roadways**
Sahuarita Road is missing from the list of roadways designated as “high sensitivity” and Santa Rita Road is designated “level 2”, however both are designed Scenic Routes per Pima County Code and should be classified as “level 1” highly sensitive roadways.

508. **Page 465, Visual Impacts Summary Table 119**
Table 119 fails to indicate that the power lines will also be visible from Santa Rita Road, a Pima County designated Scenic Route (see below), which generally requires all new utility lines along scenic routes to be underground to preserve and enhance the visual resources of the natural environment.

509. **Page 467, Other Scenery Guidance**
Pima County’s “Scenic Route” guidance is missing from this section. Pima County designates certain roadways as Scenic Routes per the Pima County Code Section 18.77.040 which dictates specific zoning and setback requirements to preserve scenic views. This applies to Whitehouse Canyon Road, Madera Canyon Road, Box Canyon Road, Santa Rita Road and Houghton Road which are all located within 10 miles from the project. This Scenic Route designation should be referenced and described in this section of the report.

510. **Page 472, Viewpoint 1**
The description of viewpoint one severely understates the visibility of the site. It is described as obscured by foreground hills. This view could also be described as a framed view. Artists, landscape architects and view shed experts recognize the increased focus a framed view provides over an expansive view. While the mine site is a distraction in an expansive view it is the focus in a framed view. The vegetation test plot sticks out noticeably currently in this view and the mine will as well. The description is not accurate.

511. **Page 473, Viewpoint 5**
The description of Viewpoint 5 neglects to include the fact that the Gunsight Pass area and much of the pit site is visible from this location. This error is continued in Viewpoint 7.

512. **Page 473, Viewpoint 4 – Mount Wrightson Wilderness**
Arguably, one of the most sensitive, important, and impacted views of the mine site is from Mt. Wrightson and the wilderness area surrounding the peak. This information should be obtained and presented. Page 473 notes that the Mount Wrightson Viewpoint was excluded due to “smog and haze” during the photo documentation process. Southern Arizona has some of the sunniest weather in the world. Costs should not be exorbitant and scheduling too difficult for such an important component of analysis. Air quality data is available from the County and SMOGMAP as well as other sources should the scheduling issue persist.

513. **Page 474, Viewpoint 8 – Box Canyon Road**
Viewpoint 8 is a location that affords an "extremely limited" view toward the proposed mine site and therefore, may not be the best representative viewpoint along this roadway to assess views. If other locations along Box Canyon Road afford better views of the mine site, a new viewpoint should be chosen and assessed.

514. Page 475, Viewpoint 9 – Sahuarita Road
Viewpoint 9 along Sahuarita Road is said to be representative of views from the Tucson area. Viewpoint 9 is a location along Sahuarita Road that affords a distant view toward the proposed mine site. It is miles closer and on an opposite aspect (angle of repose) and lower elevation than much of the Tucson residential population. There may likely be other locations along Sahuarita Road that afford better views of the mine site, and should be assessed.

515. Page 475, Sensitive Viewpoints – Table 120
The communities of Green Valley and Sahuarita both have much closer and better views of the Santa Rita Mountains and the proposed site than Viewpoint 9 along Sahuarita Road. Viewpoint 9 should not be used as the analysis viewpoint for these locations and instead additional viewpoints should be selected.

Page 481, Impacts
516. Page 481 notes that “background views of the mountain range would be partially obscured”. There are also numerous locations where the view would be almost entirely obscured. These should also be mentioned so that impacts are fully disclosed.

517. Even with the limitations of the visual assessment the DEIS concludes that the utility lines are not compatible with the current Forest Service Plan.

518. The document suffers from a lack of consistency and fairness. Page 481 states that visitors displaced from the areas adversely affected by the visual impacts of mine related facilities would “cause crowding on other areas, visitor conflicts, and increased resource damage.” Yet elsewhere the assessment states these impacts would be negligible as they are absorbed in other areas of the Coronado. Impacts should be compared to baselines not hidden under economies of scale.

519. Page 483, Power Line Impacts to Scenic Routes
It should be stated that Box Canyon Road and Santa Rita Road are both designated Scenic Routes by the Pima County Zoning Code which may restrict the type and location of power line infrastructure allowed. The use of non-reflective wire and monopoles may or may not be sufficient to comply with the Pima County Zoning Code requirements for development along scenic routes.

520. Page 484, Primary and Secondary Access
On page 484 the description of the visibility of the construction phase of the Lopez Pass secondary access road fails to mention that it will be visible west of the ridge. This may include Sahuarita, Green Valley, the San Xavier District of the Tohono O’odham Nation, and Tucson, as well as the foothills and National Forest areas of the Tucson and Catalina Mountains.
521. **Page 487, Visual Impacts to State Route 83**
The report inaccurately states that motorists would have a "brief" view of the mine features from viewpoint 1 along State Route 83. This statement grossly mischaracterizes the impact to viewers along SR 83. In fact, the view from motorists and passengers traveling along State Route 83 would be "constant" along entire visible portion of the road, stated on page 502 to be 3.4 or 5 miles in length. At 45 mph, this would be over 13 minutes of impacted views for each traveler. Multiplied by 2,500 vehicles per day and 1.5 travelers per car would yield over 812 hours per day or 296,562 hours per year, or nearly 12,357 days per hear of impact viewing for existing travelers using State Route 83.

522. **Page 495, Visual Impacts from Mt. Wrightson**
The report inaccurately states that visual impacts of the mine from Mt. Wrightson would be "moderately adverse". Notably, this conclusion is not supported by any photos or analysis from this location. The summit of Mt. Wrightson views are 360 degrees in all directions and not screened by vegetation above certain elevations. Views of the mine project from the summit of Mt. Wrightson would, in fact, dominate the view the north. For this reason, the visual impacts would instead by "significantly adverse" to recreational hikers on this mountain. The DEIS statement that "wind-blown dust, atmospheric haze, heat shimmer" reduce visibility in this location is also false, especially given that the astronomical facility on Mt. Hopkins is located close by. Visual analysis from Mt. Wrightson should be provided and these statements should be revised.

523. **Page 500, Visual Impacts from Sahuarita Road**
Mitigation measures should be proposed to mitigate adverse views from this location, the town of Sahuarita, City of Tucson, Coronado de Tucson, Interstates 10 and 19 and unincorporated Pima County. Other locations along Sahuarita Road and/or nearby locations should be modeled to identify alternative locations where impacts are more adverse than Viewpoint 9, which does not accurately characterize all the affected communities located west and north of the proposed mine site.

524. **Page 502, Visual Impacts to State Route 83**
The statement that "the overall effect of the mine surface disturbances and structures on the road's scenic quality is expected to be minimal" is not supported by the data presented, and seriously understates the visual impacts of the project. This reviewer would argue that the impacts would be "significant" and "adverse" as described under discussions of Viewpoint 1 and Viewpoint 2.

525. **Page 502-503, Visual Impacts of the Schoelefield-McCleary Alternative**
The statement that there would be no view of this alternative south of Green Valley fails to describe the visual impacts from locations east, west and north of Green Valley, which are arguably significant and adverse under this alternative. Those view shed impacts should be analyzed and presented in the DEIS.
CHAPTER 3 – RECREATION AND WILDERNESS

Recreation and Socioeconomics

526. Augusta Resource has repeatedly touted the number of jobs that will be created as a reason for approval of the mine, but the company consistently ignores the long-term consequences that the mine will have on the recreation and tourism-related jobs and revenue. Should this mine be approved, recreational and tourism opportunities, which are cornerstones of the local economy and quality of life, will be affected by the direct loss of almost 8,000 acres of vegetation and wildlife habitat, adverse impacts to dark sky conditions, impacts to viewsheds and other factors that draw recreation and tourism to the area.

527. Key to understand the short-term and isolated argument for approximately 450 new jobs at the Rosemont Mine is highlighted when one looks at the relative contributions of employment from mining with that of tourism. Pima County has a robust, diverse economy, but the mining industry accounted for only 0.4% of employment in the county in 2006. By contrast, tourism in Pima County in 2006 accounted for more than 5% of total county employment in that year; more than 10 times the employment impact of mining. With an estimated $2.26 billion in revenue and over 25,870 jobs in Pima County in 2006, the long term maintenance of tourism should be given far more priority.

528. Recreation opportunities in the northern Santa Rita will be severely impacted as a result of the mine. Hunting and fishing are big revenue generators and in 2001, direct spending generated by hunting and fishing along activities totaling $84.5 million with state tax revenues from spending on equipment totaling more that $5 million in Pima County. Revenues from activities associated with wildlife viewing in scenic places like the Santa Rita Mountains was even greater. In 2001 these revenues amounted to $173.5 million and generated almost $10 million in state tax revenue in Pima County.

529. Given the overwhelming importance of tourism and recreation in Pima County—as compared to the contribution of the proposed mine—the arguments put forth by the proponents for more jobs is a false argument and must be rejected.

530. Road touring on bicycles has been erroneously excluded from the list of common local recreational activities presented on page 511.

531. Gunslight and Lopez Pass roads have been excluded from Figure 73. Both are popular routes across the site and a regional tourist attraction and need to be included in the existing conditions analysis.

532. In the discussion of OHV use on page 526 no mention is made of the popularity of the Gunslight Pass, Lopez Pass, Syac amore Canyon, Fagan or Barrel Canyon Routes which are to be irretrievably damaged either directly or visually. Gunslight pass has been left off the discussion in the second paragraph on page 532 and throughout the DEIS wherever connectivity between 83 and the west slopes of the ridge has been discussed. Gunslight Pass is an alternative to Lopez Pass and much more commonly known and used. Still this paragraph acknowledges the complete loss of this area to OHV users and that it is one of the most popular such
areas within the Coronado.

533. On page 482 under the discussion of Arizona Trail "Impacts Common to all Action Alternatives" the statement is made for all but the preferred and McCleary alternatives that: "It may not be possible to construct the necessary switchbacks within the small widths between the highway fence and project area perimeter fence in some sections...". On page 532 the DEIS concludes that "The conceptual realignment of the Arizona....Trail is likely to be feasibly designed and constructed to meet Forest service trail standards". Yet page 515 provides the following caveat: "It should be known that no on-the-ground trail feasibility determination has been completed and no verification that the realignments would meet Forest Service Trail standards...has been completed." If there has been no such assessment it should not be considered "likely to be feasible" to meet standards.

Page 512- Impacts on recreation
534. The lack of definitive, quantitative and current data inhibits the accurate analysis of the impacts to current recreational activities in the analysis area.

535. Please identify and quantify the impacts to existing watchable wildlife recreational activities in the analysis area and the proposed alternatives.

536. The loss of hunter days in table 123 does not adequately reflect the actual loss of hunting related recreational activities and does not reflect the loss of recreation by associated nonhunters who accompany hunters.

537. Page 548- Cumulative Effects
Acknowledgement of the previous analysis of the cumulative negative effects on wildlife in the DEIS and how these would impact wildlife related recreation should be addressed in this recreation section. No mitigation measures are offered.

Page 744- Recreation and Tourism
538. The Cordell et al reference does not have a citation in literature review.

539. Please identify the reasoning to use only the Cordell et al valuation figure for the loss of recreational land areas.

540. Page 744- Recreation and Tourism
Identify the reasoning that analysis of the loss of recreational expenditures was restricted to only the 6,175 acre figure. Other recreational uses would be restricted/lost for an area much larger based on analysis found elsewhere in DEIS.
CHAPTER 3 – HAZARDOUS MATERIALS

541. Page 578 points out that catastrophic hazardous material releases won’t migrate off-site due to the pit acting as a hydraulic sink. The year the sink is expected to develop is not mentioned and should be. A description of how catastrophic releases will be handled prior to development of the sink should be added. This same section suggests that “long-term undetected release quantities are small”. A dripping sink still drains the tank, this is another unsubstantiated conclusion. In many industrial facilities fugitive emissions are known to often exceed point sources.

CHAPTER 3 – FUELS AND FIRE MANAGEMENT

542. General Comment: The fire discussion clearly indicates that Rosemont recognizes the potential for greater fire ignition associated with the mining activities. Furthermore, in Figure 86 they recognize that the area at risk is far beyond the mine site. However, they make no commitment to limit the potential impact of fire in two important ways that must be considered, fuels management as well as fire management and suppression should a fire start.

Specific Comments:

543. A Fuel Management Strategy Needs to be Presented: This could include, thinning or prescribed burning.

544. A Specific Fire Plan Needs to Be Presented: Given the fact that fire may impact habitat and people living at the urban-wildland interface, the simple assurance that a fire plan will be developed (p. 590) is inadequate.

Details about the level of commitment to fire management are required to assure the public that the additional potential for fire ignition (which Rosemont admits is likely) will be mitigated. Currently they are not being provided.

Additional Studies Needed:

545. Because of the inadequacy of the data on provided in the DEIS, a Supplemented Environmental Impact Statement (SEIS) should be provided that includes the following studies:

1. A Fuel Management Strategy: This could include, thinning or prescribed burning.

2. A Specific Fire Plan: Given the fact that fire may impact habitat and people living at the urban-wildland interface, a fire plan will need to be developed.

Additional Mitigation Measures:

546. The Sonoita-Elgin Fire Department, a volunteer agency, currently has primary jurisdiction to respond to fire/rescue calls in the proposed Rosemont Mine area. If the mine became operational it would be required by law to have on-site, dedicated fire response capabilities. The SEFD would therefore supplement whatever fire/rescue capabilities they had. Impact on SEFD day to day operations are
expected to be minimal with few mine-related, emergency responses anticipated. Local fire/rescue support to the mine and surrounding area would have to be formalized in a mutual aid agreement at some point should the mine open.

Even though the Sonoita-Elgin Fire Department does not anticipate a significant impact on their operations, any increase of people and traffic in the area will inevitably result in the occurrence of emergency situations which should be anticipated and planned for. SEFD has sufficient resources and capabilities to support current demands; however, higher traffic volume will increase the probability of motor vehicle collisions, injuries requiring medical care and transport, and fires, all of which may tax the SEFDs response resources. The area is very rural in nature which usually equates to increased response time for support from other emergency agencies. It is, therefore, important that SEFD maintain the greatest degree of operational readiness and capabilities to respond to and stabilize an emergency situation until additional resources arrive, if necessary.

Considering that the SEFD is primarily a volunteer fire agency, functioning with a restrictive operating budget and limited capability to acquire new equipment and vehicles, it is likely that they will need some assistance in order to develop an elevated level of basic emergency response capabilities to adapt to the mine’s opening. The mine would benefit from the improvement of capabilities of the SEFD in several ways:

- Increased emergency, life/safety resources for mine employees
- Increased emergency, life/safety resources for local residents, tourists/visitors and travelers
- Positive public image

The mine might consider ways to provide assistance to the SEFD by augmenting their overall capabilities. The SEFD may, for instance, determine the need for wildland fire attack trucks or other vehicles, extrication tools (Jaws of Life) for use at traffic accidents, and other safety equipment (turnout gear, self-contained breathing apparatus [SCBAs], etc.) or tools. When not being used to actually support a mine incident, that equipment could be used by SEFD on a daily basis responding to roadside/brush fires, traffic accidents and routine calls for service, all of which yield benefits in increased public safety and reduced strain on the small rural fire department and their operating budget. Some of this equipment is quite costly and, therefore, far out of reach for a small fire department to acquire.
CHAPTER 3 – TRANSPORTATION / ACCESS

547. **Page 591, Issues, Cause and Effect Relationships of Concern**
In the first paragraph describing “Issues, Cause and Effect Relationships of Concern” on page 591 although safety concerns were raised, the conclusion is that “no significant issues were identified”. An increase in fatalities associated with the drastic increase in large truck traffic on a substandard scenic by way is a significant issue. A failure to identify “issues” is a failure of the preparers not the input received; Pima County and local emergency responders have raised this issue throughout the Cooperator process including review of the ADEIS. Furthermore the Coronado has chosen to include issues not identified by the public and cooperators. Traffic Safety should be added as an issue and assessed in the FEIS. Corresponding safety mitigation by way of support to local first responders and road improvements are appropriate. Addressing Level of service (commute times) and roads maintenance are inadequate mitigation of the impacts. Page 613 provides a statement continued on 614 that Augusta Resource will negotiate with ADOT for unspecified improvements. This statement should be specifically extended to include traffic safety, in addition to maintenance issues. Furthermore the negotiation should include local first responders.

548. **Page 591, Introduction**
The document describes Santa Rita Road, a Pima County maintained unpaved road from Sahuarita to Helvetia, as the secondary access to the project site. Please disclose quantified and qualified direct and indirect impacts to this road.

549. **Page 592, Analysis Methodology, Assumptions, Uncertain and Unknown Information**
A 2-mile radius is insufficient to effectively capture the routes that will be impacted by traffic generated by the mine construction and operations. Roadway travel by its nature is widespread and diffuse, within the constraints of available routes. The proposed primary access to the mine connects to State Route 83 – Sonoita Highway approximately one-half mile south of Hidden Springs Road, a named easement (see Figure 88). All traffic to or from the mine oriented to the north must travel 8.5 miles to the first tributary route opportunity, Sahuarita Road, a county-maintained arterial roadway that extends west to the Town of Sahuarita and I-19. The next significant connection is at I-10, 11.8 miles north of the proposed access road. All traffic on S.R. 83 at the two mile buffer limit continues for at least another 6.5 miles. A similar analysis can be performed for traffic to and from the south. The use of a 2-mile buffer in the context of traffic effects and impacts appears contrary to NEPA policy (42 USC § 4331) on its face.

550. **Page 596, Existing Conditions**
Sahuarita Road, a Pima County-maintained paved roadway, is classified as a Rural Principal Arterial under USDOT / FHWA criteria. While it is mentioned by name in the DEIS, there is no quantitative discussion of potential usage or impacts from traffic generated by the proposed project.

551. **Page 598, Traffic Counts**
The traffic count information, beginning on page 598 does not match nor correspond with the traffic count information presented in the Public Health and
Safety section of the report, beginning on page 650. For example, the statement “traffic... is projected to increase by 204-356 percent” would mean that the reported 2008 AADT of 2,767 (Table 137) will be in excess of 8,000 vehicles per day during project year 20. Also, an increase of 356% in daily traffic volume would likely result in failing level of service, yet the report says level of service will not degrade to failing levels. The traffic count information should be consistent throughout both sections of the report and should be provided in all level of service analysis.

Page 600, Traffic Counts
552. The summary of traffic data contained in Table 136 includes road segments well outside the 2-mile buffer zone, but it does not include the other roadways that will carry project traffic, such as Sahuarita Road and Santa Rita Road to be consistent and comprehensive, these other roadways should be included in the traffic data.

553. The traffic counts and data summary in Table 136 lists only the traffic on S.R. 83 but no data for the intersecting roadways which would be typical for any standard intersection analysis. Therefore the statement that intersections were analyzed is misleading if not false, because no east-west traffic counts were analyzed.

554. The subject section of the document is a discussion and presentation of annual average daily traffic (AADT) for the period 2006 – 2008 as collected and presented by ADOT. The case is well made that this data is comprehensive and statistically sound. The data are shown as applicable to two roadway segments, defined by ADOT milepost references. However, none of the Figures in this section of the document show these locations, nor are they described. Given the statistical strength of these data, no attempt is made to use this to characterize the representativeness of the short term counts described on page 598 and in Table 136 on page 600.

555. The heavy-duty truck component of the ADOT data Is stated as 4 percent of the daily volume, but the manual traffic count data presented on page 598 states that the heavy-duty component of the traffic is 6 to 12 per cent. This is a difference of 50 to 200 per cent – which is correct? An accurate presentation of the heavy truck component is critical to subsequent discussions of the comparative increase in heavy trucks generated by the proposed project both during construction and operations. Heavy trucks are a key component of level of service, highway safety and traffic noise analysis.

556. Page 601, Level of Service
The Highway Capacity Manual states “...all grades of 3 percent or more with a length of 0.6 mi or more must be analyzed as specific upgrades or downgrades” (page 20-1, Highway Capacity Manual 2000). State Route 83 in the vicinity of Greaterville road meets the conditions of this restriction but there is no indication that such an analysis was made. There is no discussion of how the variations in conditions along the segments were averaged into a single value applicable to miles of roadway.

557. Page 603, Bicycle and Pedestrian Usage
The document fails to include any discussion of bicyclists and pedestrians which are both common and legal modes on S.R. 83 and all other public roadways
except the controlled access portions of I-10. Bicyclists present special issues for level of service (overtaking and passing) and safety.

558. **Page 603, School Bus Service**
The document states that school buses must stop within the travel lanes of State Route 83 – Sonoita Highway during student loading and unloading (also common on all of the other local public roads which will experience increased traffic). The document does not address how this operation will affect level of service under increased mine traffic or how these interruptions in traffic flow may impact safety with the increased number of heavy trucks traveling to and from the mine site.

559. **Page 604, Traffic Impacts**
Impacts on level of service (including tables 141-146) are only presented for State Route 83. There is no discussion of impacts on roadways under the jurisdiction of Pima County (Sahuarita Road, Santa Rita Road, Kolb and Valencia Roads adjacent to the Port of Tucson, for specific examples) which will have increased traffic, especially heavy trucks, due to Rosemont mine construction and operations.

560. **Page 604-609, Traffic Impacts**
This section is the heart of the quantified analysis and presentation of traffic volume impacts created by the Rosemont mine, yet it does not provide any projected neither traffic counts nor a comparison of traffic conditions with and without the project, which is the standardized method of all traffic impact analysis. The discussion of each table states "compared with the existing traffic conditions" but it never presents background traffic without the project at each time interval. It is impossible, therefore, to determine the traffic impact resulting from the project at each time interval. The values that are presented are nonsensical in this context. Projected traffic counts must be provided to substantiate all level of service conclusions.

561. **Page 604-605, Traffic Impacts - Year 1**
According to the level of service analysis presented in tables 141 and 142, the P.M. peak hour delay is lower during the peak season compared to the non-peak season in a couple of instances. Given the assumed growth of background traffic and projected constant project traffic, how and why can this be so? If the table represents a true result, what analysis and assumptions support this finding? Projected traffic counts must be provided to substantiate the delay information.

562. **Page 604-608, Traffic Impacts - Year 1, 5, 20**
Comparing the data, in some instances the delay is shorter in later years – for example the year 20 non-peak pm peak hour delay is only 12.1 seconds compared to 13.8 seconds at the same location in year 5. Given the assumed growth of background traffic and projected constant project traffic, how and why can this be so? Projected traffic counts must be provided to substantiate the delay information.

563. **Page 609, Transportation Route Impacts**
If the secondary access road connects to Santa Rita Road, the connection will require a Right-of Way Permit from Pima County. A similar permit or permits
would be required for any utility facilities that are located within the Santa Rita Road right-of-way.

Page 611, Mine Related Traffic Impacts

564. The document says that during construction of the mine as many as 900 workers will be bussed to the site (26 busses) from staging areas along I-10 or in Sonoita. Where will these "staging areas" (parking lots) be located, will they involve permitting (ADOT, local jurisdictions), and will they disturb new ground not accounted for in the DEIS? Construction is stated to occur in one shift; what will be the impacts on State Route 83 traffic and level of service from the platoons of busses headed to the mine at about the same time? If the busses leave the project site after delivering workers there will be up to 104 additional bus trips per day on S.R. 83. at the height of the construction activity. This is not addressed in the DEIS.

565. The document estimates that the construction of the mine will entail 1,000 truck shipments of equipment and materials to the site during the course of the 18 month construction period (plus the 1,000 empty trucks leaving the site). This activity will follow the same pattern as the level of construction employment at the site. What is the actual estimated peak daily truck trip generation and how will it impact traffic safety and level of service on State Route 83 (in addition to as many as 104 busses)? This is not addressed in the DEIS.

566. The document provides an estimate of heavy truck traffic generation during the 20 year mine production life. 88 roundtrips (176 one-way daily trips) will have a greater impact on level of service on State Route 83 and other affected roadways than the simple number would indicate. How are the effects of heavy vehicles in the traffic stream taken into account in the estimation of level of service impacts?

567. This section fails to mention the impacts of project-related heavy truck traffic on roadway pavement conditions and the likely need to overlay affected roadways. The high amount of heavy truck traffic will accelerate pavement distress on the primary access routes. A structural overlay will be required at or shortly after the commencement of the project. Pima County estimates the cost of the structural overlay to be $14.6 million. However, the Arizona Department of Transportation has recently proposed to spend $76 million on State Route 83 improvements, ostensibly to safely accommodate mine-related traffic and truck traffic. The DEIS fails to disclose any cost estimates for roadway improvements.

568. This section fails to mention that project-related heavy truck traffic will likely meet the AASHTO threshold criterion for supplemental lanes on State Route 83 between mileposts 47.5 and 53.3. Pima County estimates the cost of the truck lanes at $13 million. However, the Arizona Department of Transportation has recently proposed to spend $76 million on State Route 83 improvements, ostensibly to safely accommodate mine-related traffic and truck traffic. The DEIS fails to disclose any cost estimates for roadway improvements.

569. Page 612, Bicycle and Pedestrian Impacts
This section fails to discuss impacts to bicyclists and pedestrians, both common on S.R. 83, especially in relation to safety, overtaking and passing and the increase in truck traffic.

570. **Page 612, Truck Traffic Mitigation**
The proposed mitigation measure requiring truck traffic to avoid times of high commuter or school bus traffic does not seem possible, given the statement on page 611 that "the largest volume of mine traffic...would occur...between 6-8 a.m. ..." This timeframe coincides with school bus traffic and morning peak hour traffic. How would this measure be accomplished?

571. **Page 613, Bus Pullout Mitigation**
The claim that constructing bus pullouts would "improve traffic flow by allowing through traffic to proceed without being impeded" may not, in fact, be accurate because school children may still need to cross the street to board or depart the bus. Given the additional truck traffic, school children may require the bus to stop traffic so that they can safely cross the street.

572. **Page 614, Public Access Mitigation**
Public access to Rosemont Copper’s private land holdings is suggested, by why aren’t mitigation measures to provide or improve public access to the public lands that this project would impact also suggested?

573. **Page 614, Irreversible and Irretrievable Commitment of Resources**
The route through Barrel Canyon and over Gunsight Pass to Santa Rita Road is one of the most popular routes within the Coronado. Similar in popularity to the Mt. Lemmon Control Road, it is enjoyed by OHV users, birders, hikers, and drivers. It has been featured in movies and books. Club rides over this pass are an almost weekly event. The descriptions of lost forest service routes and recreational opportunity fails to assess the value of this route to recreationists and anyone wishing to access both sides of the range. This route should be called out in the irretrievable losses on page 614.
CHAPTER 3 - PUBLIC HEALTH AND SAFETY

General Comments

574. The EIS should disclose how asbestiform minerals in the work environment will be monitored and abated, if found.

575. The Rosemont Mine should have a mosquito control plan to address mosquito species of interest in southern Arizona, such as Anopheles (Malaria), Aedes (Dengue, Yellow Fever and nuisance mosquitoes), and Culex (West Nile Virus, Western Equine and St. Louis Encephalitis). The mosquito control plan should have a surveillance component, including a threshold to commence treatment with pesticides: larvicide and adulticide.

576. An appropriate design of the holding ponds or tanks should preclude mosquito breeding. If breeding occurs, it is typically be near the shallow edges or where overgrowth of vegetation has occurred and could be mitigated with larvicide.

577. Increased movement of heavy equipment may create depressions in the land that are capable of holding standing water, particularly for Aedes type mosquitoes that lay their eggs in soil and await water accumulation for hatching and development. These areas where depressions are routinely created should be monitored after rainfall. These areas, depending on the soil and configuration, may be treated with larvicide to prevent mosquito development. Previous research of cattle tracks by UA Entomology department confirmed mosquito breeding in these depressions.

578. Workers should be properly educated on preventing mosquito bites by using repellent or physical barriers, such as clothing.

Page 643, Issues, Cause and Effect

579. The Public Health and Safety Section notes that just one issue was identified during scoping: the impact of increased traffic on road maintenance and construction costs. The County has previously raised concerns regarding accident rates. Assessment of increased accident and fatality rates are briefly mentioned on page 652 but are not presented in the executive summary or concluding paragraphs on impacts. The statement that only one issue was identified is misleading; the fact is the Coronado only selected one issue for inclusion despite cooperator input. Safety mitigation is critical. The first mitigation measure listed for Public Safety addresses “the impacts to emergency service providers”. While we agree that first responders will need increased capacity and that this should be included in the mitigation the impact of increased accident (approx. 300%) and fatality rates is to road users and this should be acknowledged throughout the FEIS.

Page 646, Traffic Deaths

580. Table 163 fails to mention increased traffic-related deaths and injuries that are predicted to occur on area public roadways as a direct result of project-related traffic. Fatal traffic deaths are expected to increase from once every three years to between three to six deaths every three years with the project (see page 652).
Based on US Department of Transportation guidance regarding the economic value of a life, $5.8 million per statistical human life, an incremental increase of 2 to 5 fatal traffic deaths every three years would equate to a value of $116 million to $232 million over the 20 year mine project.

Page 646, Roadway Pavement Impacts
581. Table 163 fails to mention the impacts of project-related heavy truck traffic on roadway pavement conditions and the potential for damaged roadway conditions that could affect traffic safety. The high amount of heavy truck traffic will accelerate pavement distress on the primary access routes. A structural overlay will be required at or shortly after the commencement of the project to mitigate this safety impact.

Page 646, Hazardous Spill Roadway Impacts
582. The statement in Table 163 that hazardous material spills during transport would only affect a radius of up to 0.5 mile and 1.0 mile for explosives is false – the affected radius could be as much as 25 miles and involve a detour of more than 50 miles. Any hazardous material spill as described on a highway would close the road or highway. The effect will propagate back to the available detour routes. The magnitude of a diversion will depend on the duration and the location of event on the highway. For example, in the case of an event on Sonoita Highway north of the proposed mine entrance; the detour routes are south on S.R. 83 to S.R. 82 (Sonoita), to S.R. 90, to I-10 (Benson), or south on S.R. 83 to S.R. 82, to I-19 (Nogales), to I-10 (Tucson). Either route entails a distance in excess of 50 miles. An event or crash at the S.R. 83 / I-10 interchange could potentially propagate over several states.

Page 654, Hazardous Spill Roadway Impacts
583. The report fails to mention that the nearest fire station to the mine site is over 10 miles away (near the junction of I-10 and SR 83). Any hazardous spill response on or adjacent to State Route 83 will be compromised by this distance.

Page 654, Hazardous Spill Roadway Impacts
584. Remarkably, the discussion of hazardous material spills during transport fails to include any mention of roadway closures and traffic impacts that could result from a roadway spill. With an estimated 24 trips per day of hazardous materials (page 565), the possibility of a spill appears to be significant. The referenced emergency response guidelines are insufficient and inadequate to address roadway and transportation impacts resulting from a spill. This section should address all comments listed in comment 3 above.

Page 658, Traffic Safety Mitigation
585. There is no mention of truck passing lanes for safety mitigation. Given the expected increase in traffic deaths and "substandard tight, horizontal curves" on State Route 83, what additional mitigation measures are proposed to address the anticipated increase in traffic deaths and accidents and in particular the need for truck passing lanes between mileposts 44 and 46?
CHAPTER 3 – HERITAGE RESOURCES

586. The Pima County Office of Sustainability and Conservation, Cultural Resources & Historic Preservation Division, has worked extensively with the legal protections for cultural resources that include archaeological sites, historic sites and buildings, and traditional cultural places. We work with the State Historic Preservation Office (SHPO) and the Arizona State Museum (ASM) on an ongoing basis, and we have worked cooperatively with various state and federal land management agencies affected by the Rosemont Mine undertaking. These include the US Forest Service (USFS), the Bureau of Land Management (BLM), the Arizona State Land Department (ASLD), and various American Indian Tribes that may have an interest in the project area. We have an interest in cooperating with the Coronado National Forest (CNF) to ensure protections for cultural resources are fully considered in the Environmental Impact Statement as required by the National Environmental Policy Act (NEPA).

The issuance of the permit by the U.S. Army Corps of Engineers (COE) under Section 404 of the Clean Water Act of 1972 for the Rosemont Mine is a federal action subject to the requirements of the Clean Water Act, and concerning cultural resources, Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations, 36 CFR 800 Part 60. The Rosemont application to the USFS for permitting the mine actions is subject to the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality regulations, 40 CFR 1500.

NEPA recognizes the importance of cultural and historic preservation in its policy statement under Title I. Section 101(b) of the Act states it is:

"...the continuing responsibility of the Federal Government to use all practical means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may ... preserve important historic, cultural, and natural aspects of our national heritage..."

The permit to develop and operate the Rosemont Mine is a "major federal action significantly affecting the quality of the human environment" (40 CFR 1502.3).

The term "Significantly," as used in NEPA, requires consideration of both context and intensity (40 CFR 1500.27). Context relates to the multiple contexts in which both short and long term effects must be analyzed (society as a whole, the region, affected interests, and the locality). Intensity refers to the severity of the impacts on the quality of the human environment. The regulations establish a number of subjects that should be considered in evaluating intensity including:

"(3) Unique characteristics of the geographic area such as the proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical area."

"(8) The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources" (1508.27)
The term "effects" includes "ecological, aesthetic, historic, cultural, economic, social or health, whether direct, indirect or cumulative" (40 CFR 1500.8).

The term "human environment" is broadly interpreted to include

"...the natural and physical environment and the relationship of people with that environment.... When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment." (40 CFR 1508.14)

Thus, in considering the impacts of the proposed permit for the Rosemont Mine on the human environment, the USFS is directed to assess the physical effects to cultural and historical resources and those places that are listed in or eligible for listing in the National Register of Historic Places in accordance with the National Historic Preservation Act (NHPA). The agency, however, must also consider the social effects of its actions on cultural and historical resources as a part of the relationship between people and their environment. This is particularly important in situations where federal actions may affect the relationships between Indian tribes and their cultural landscapes, the consideration of which is consistent with the requirements of Executive Order 12898 on Environmental Justice, Executive Order 13007 on American Indian Sites, and the American Indian Religious Freedom Act.

As proposed, Rosemont Mine will have both physical and social consequences to cultural and historic resources. Because the Tohono O'odham, Hopi, Apache, Pascua Yaqui and other tribes have interests in the area and claims to the region as their ancestral lands, the Rosemont Mine has the potential to affect the tribes' access to, and traditional use of, the land as well.

Pima County has an interest in cooperating with the USFS to ensure the full extent of impacts to cultural resources and the human environment from the Rosemont Mine is understood. These impacts, whether immediate or future, direct, indirect, on-site, off-site, and cumulative, must be identified, assessed, and made known to the public and all interested parties, and appropriately and comprehensively considered under NEPA.

The assessment of alternatives, including the no-action alternative, must be considered as well as appropriate mitigation measures in the event the project should proceed. The opinions and comments of all citizens, including affected tribes and other traditional communities, must be heard and included in the decision-making process.

Social and environmental justice must be considered in the NEPA process to ensure that individuals and groups receive fair treatment and to ensure that Rosemont Mine does not impact certain segments of the Pima County community disproportionately.

**Historic Preservation Laws and Ordinances**

587. In addition to NEPA, the following State and Federal historic preservation laws apply to the Rosemont Mine and its direct, indirect, and cumulative impacts.
A1. Federal Laws and Executive Orders

The most comprehensive and important of these federal laws and executive orders are:

The National Historic Preservation Act (NHPA) applies to any project on any land that has Federal funding, is federally assisted, or requires a Federal permit or license. These projects must comply with Section 106 of the National Historic Preservation Act, regardless of land status. Any Federal undertaking on Federal lands must comply with this Act. All cultural resources, including archaeological sites and traditional cultural properties, must be considered under Section 106 and 36 CFR 800.

The Archaeological Resources Protection Act provides protections for archaeological sites and penalties for failure to follow these protections on Federal and Indian lands.

The American Indian Religious Freedom Act states it shall be the policy of the United States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites.

The Native American Graves Protection and Repatriation Act provides for the protection of Native American human remains and funerary objects on federal and Indian lands, and for the repatriation of cultural items, including human remains and grave goods from museums and other institutions to Indian Tribes.

Executive Order 12898 on Environmental Justice ensures the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.

Executive Order 13007 on Indian Sacred Sites specifies that in managing federal lands the federal agency will, as permitted by law, accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of these sacred sites.

State Lands

State lands are considered because the connected action to bring electric power and water to Rosemont Mine and will cross State Trust Lands. The utility alignment(s) will be accessed from Santa Rita Road, a Pima County right of way, which will be subject to County permitting. Lands owned or administered by the State of Arizona, or any of its political subdivisions such as Pima County, are subject to State law. The most important laws that protect cultural resources on these lands are found in Title 41 of the Arizona State Statutes. The Arizona Antiquities Act ARS 41-441 et seq. requires the inventory and treatment of cultural
resources on State lands, and human burials and their grave goods on State lands are protected under ARS 41-844 and on private lands under ARS 41-865. The Arizona State Historic Preservation Act ARS 41-861 et. seq. requires consultation with the State Historic Preservation Office.

Project Purpose and Need

589. The stated purpose and need for the undertaking published in the Federal Register by the National Forest is "to grant permission to the Company to use National Forest land for certain activities relating to the operation of the Rosemont Mine." This is a clear statement that the USFS has already made the decision to issue the permit. This statement essentially precludes any real consideration of alternatives or the no-action alternative. If indeed the decision to grant a permit is already made, it is also clear that public comment will not be considered in a meaningful way, nor will any impact assessment lead to any modifications or meaningful efforts to minimize these impacts to the human and physical environment.

Project description

590. The Rosemont Mine Draft Environmental Impact Statement (DEIS) and its Appendix B. U.S. Army Corps of Engineers' Section 404(b)(1) Alternatives Analysis describe the Preferred Alternative as affecting less than 4,000 acres of Forest Service land. This is too restrictive. Instead, the entirety of the mine impacts, currently planned and future, including all the mine features and ancillary facilities, roads, pipelines, utilities, smelter, railroad line, well fields, etc. that would not exist but for the mine operation must be considered. These must be included as part of the project description in order to assess the direct, indirect and cumulative impacts of the issuance of the permit to operate the mine.

Existing conditions

591. Actions and studies conducted prior to the issuance of the Draft EIS include:

1. **Initiate consultation under NHPA Section 106** — Because it is preferable to integrate NHPA Section 106 compliance with the NEPA process, it is strongly recommended that the USFS initiate consultation with SHPO and the ACHP to ensure that the process to integrate the compliance with the two statutes is correctly established and that efforts to consider cultural resources are appropriate and adequate. Given the scope and complexity of the undertaking, it is not advisable to defer or disconnect Section 106 and NEPA review.

2. **Initiate consultation with affected American Indian tribes and other traditional communities** - In order to fully document and assess the potential direct, indirect and cumulative effects on the human environment and cultural resources, it is imperative that consultation with Indian tribes and other traditional communities be initiated as soon as possible.

3. **Conduct ethnographic and ethnohistoric research** - This was initiated in consultation with several affected Indian tribes and
traditional communities, but has not been sufficiently comprehensive, nor was it done well enough in advance so that all the effects to traditional cultural places, the living cultural traditions and practices of these communities, and the human environment can be assessed.

4. Conduct cultural resources surveys of the entirety of the Mine Operations area and ancillary facilities - Class III cultural resources surveys were conducted by SWCA, Inc., of the Area of Potential Effect of the Mine Plan of Operations, or the Preferred Alternative, and later, of the additional lands affected by the Action Alternatives of the DEIS. SWCA also prepared an ethnohistoric report based on archival research and informant reviews.

In the 1970s, the Arizona State Museum conducted a survey for the ANAMAX project area, including Forest Service, fee, and ANAMAX patented lands within the Coronado National Forest covering nearly 30 square miles. We understand that this survey was prepared for NEPA compliance for an earlier Rosemont EIS.

However, whether this survey would be considered adequate by today's standards will need to be determined by the Forest Service in consultation with the State Historic Preservation Office. Nonetheless, some 621 prehistoric and historic sites and one paleontological site were identified, the majority of which reflect Native American use and occupation over thousands of years. Only 30 sites date to the historic period or the last 300 years. Notable historic sites include a number of mines, camps, mills and the mining towns of Helvetia, Old Rosemont, and the VR Ranch established by Edward Vail of the Empire Ranch in 1883, and today the headquarters of Rosemont Ranch. Only a sample of these sites was investigated, and virtually all of these sites remain undisturbed, reflecting an intact, multi-dimensional cultural landscape.

In 2008 a Class III survey was conducted of the Area of Potential Effect (APE) as defined by the Mine Plan of Operations. The results included identification of 93 sites and 315 isolated occurrences of artifacts or features, including 52 prehistoric sites, one protohistoric site, 36 historic sites, and 4 multi-component sites. Several previously recorded sites were combined into single sites, and several others were not relocated. Of the 93 recorded sites, 37 sites were newly recorded. Overall results included 70 sites recommended eligible to the National Register of Historic Places, 5 sites recommended ineligible, but the eligibility of 18 sites could not be determined from survey results. Each site was evaluated for potential adverse effects from the proposed action and recommendations were made for additional archival or archaeological work if ground-disturbing activities cannot be avoided.

In 2010, survey was conducted in the expanded areas affected by the Action Alternatives, recording 66 sites and 258 isolated occurrences of artifacts or features. One site was recommended ineligible for listing in the National Register of Historic Places, and the rest were recommended eligible.

Finally, in 2010 survey of the electric power and water utility corridors, considered Connected Actions, resulted in the identification of 19 National Register-eligible sites and 6 ineligible sites.
In summary, the combined survey results revealed a high overall density of both prehistoric and historic sites, with a high proportion of recorded sites considered significant and eligible to the National Register. There is a great potential for enormous loss of scientific knowledge and more importantly, an unthinkable loss of human burial remains. The survey results included counts of known sites with human burial remains projected to estimate total numbers of recorded but unexcavated prehistoric and historic sites with potential for human burial remains. The estimates range from 30 to 21 sites, with 29 sites within the Proposed Action, and 3 sites in the utility corridors.

In general, the survey reports are well written, comprehensive in scope, with up-to-date research designs. The reports documenting survey of the Mine APE and areas of Alternative Actions blend a Cultural Landscape model approach with traditional Section 106 cultural resources definitions and evaluations. The concepts are integrated with research issues and themes and translate well into survey and data collection methods. The discussion of scale and units of analysis also is useful. The ethnohistoric report is also well written, but lacks well defined rationales for defining the cultural landscape and would benefit from more extensive and in depth informant interviews with a greater number of Tribal Elders and other Tribal members with traditional knowledge to ensure an adequate grounding in traditional beliefs, lifeways, and especially, uses of the landscape in the Santa Rita Mountains, or Ce:iw Duag.

592. At minimum, the site documentation, significance evaluations, and site condition data should be used to develop a mitigation treatment plan to address all impacts to resources within the Mining Operations area. All cultural resources documentation should be subject to SHPO review and approval through the formal Section 106 consultation process.

Impacts of the project

593. Before discussing impacts of the project, it should be noted that in nearly all cases, the impacts will result in the total physical loss of affected Heritage Resources, representing enormous losses of traditional and scientific knowledge, and importantly, unacceptable losses of human burial remains. These losses are presented throughout the DEIS as unavoidable and necessary regardless of what Action Alternative is selected. Proposals to mitigate such losses are uniformly inadequate.

594. The claim of inevitable loss is based on the false premise that the No Action Alternative cannot be considered as a viable alternative, as intended by NEPA. Instead, it is presented to provide a baseline reference. This a priori position is neither questioned nor challenged. The USFS cites mining laws as justification for the assertion that the No Action Alternative cannot be selected.

595. Pima County challenges this assertion and calls on the USFS to objectively and fully evaluate the No Action Alternative as a viable alternative. If it were selected, all direct and indirect impacts would disappear and the cumulative impact would be that the Santa Rita Mountains and the Ce:iw Duag Traditional Cultural Place (see discussion below) would remain undisturbed and open to continued recreational
use and enjoyment by visitors to the CNF, and especially, would remain open and available to the traditional beliefs, lifeways, and uses of the Tohono O'odham and all concerned Indian Tribes. Failing to fully consider the No Action Alternative does a great injustice to this important natural and cultural landscape; CNF is failing to meet the expectations and guidance of NEPA and most importantly, failing the American people.

596. Pima County asserts that the impacts of the Rosemont Mine project have not been fully defined. The USFS has defined the Area of Potential Effect (APE) for the physical environment based on the nature and extent of the Proposed Action and the Action Alternatives. The APE will define the Heritage Resources affected by the proposed undertaking, but also should include effects on the resources from all the off-site facilities and related construction, not just the USFS land, including connected actions, such as the electric power and water lines proposed to service the mine. The APE for the impacts to the human environment may be different and can only be defined after consultation with interested parties and ethnographic and other studies are completed.

597. Existing cultural resources documents prepared for the Rosemont Mine provide information about the distribution, nature, and potential significance of the known archaeological and historic sites within the mining project area and its ancillary facilities, including the No Action Alternative, the Proposed Action, and all proposed Action Alternatives, as listed in the DEIS currently under public review. The cultural resources documentation provided in the DEIS provides summary documentation of known, recorded archaeological and historic resources to allow assessment of impacts from proposed actions. The following comments will summarize the impacts and also provide comments on specific impacts and related issues. In addition, an important issue will be addressed regarding the importance of the Santa Rita Mountains to the Tohono O'odham Nation, Hopi, Apache, Pascua Yaqui and other concerned Indian Tribes.

Comments on Direct, Indirect, and Cumulative Impacts

598. In general, the DEIS provides adequate information to evaluate Heritage Resources affected by proposed Action Alternatives and provides adequate discussions of related issues. The section, Analysis Methodology, Assumptions, Uncertain and Unknown Information, provides adequate information concerning research and methodological issues surrounding the archaeological problems of identifying and evaluating Heritage Resources, determining effect, and identifying archaeological treatments to mitigate impacts, per Section 106 of the NHPA.

599. There is a fair treatment of the loss of scientific knowledge from the destruction of Heritage Resources, but, as discussed above, Pima County challenges the premise that this destruction is inevitable.

600. Similarly, the discussion of loss of human remains and sacred places suffers from the same weakness of false premise, as does the discussion of Irretrievable and Irreversible Commitment of Resources, which seems to employ soft language to portray such dramatic and permanent loss of resources.
601. The discussion in the DEIS of the destruction of identified prehistoric cultural resources emphasizes numbers of sites, and the Hohokam ballcourt site and other villages, but does not synthesize the combined results of survey data to reflect new knowledge of regional settlement history and patterns of settlement distribution revealed in the Santa Rita Mountains. This approach is possible from survey data, and could be expanded, based on excavation data that becomes available, and could open new perspectives on the identified Hohokam upland complex and allow for more detailed inter-regional comparisons with other contemporaneous settlement groups in geographically or physiographically constrained settings. Valuable synthetic interpretive analyses with significant potential to contribute to new scientific knowledge cannot be adequately made if any Action Alternatives are implemented. This is a serious scientific loss that should be considered.

602. The discussion in the DEIS of the destruction of historic Heritage Resources and loss of their potential to contribute to future scientific knowledge is mixed in with prehistoric and Protohistoric resources, but the same comment as posted above applies regarding lack of synthetic discussion of the complex of historic sites in the Santa Rita Mountains, considered within a regional context, and with a similar potential for significant loss of scientific knowledge. Synthetic discussions are available in the cultural resources survey reports, but they do not adequately exploit this potential. The discussion of cumulative effects continues the regional comparisons, particularly with regard to Zone 1, upland environments, in which prehistoric and historic resources are discussed. These sections expand on the discussion mentioned in the previous comments, but the discussion remains primarily descriptive and would benefit from expansion to incorporate a synthetic interpretive comparison. The potential for loss of human burial remains and associated burial objects should be discussed, in spite of mitigation strategies designed to recover these categories of remains, there is great potential for irretrievable loss of burial remains.

603. The section on Traditional Cultural Properties is weak, lacking detail and supporting documentation, but a better discussion follows in the DEIS Consultation section. Pima County recommends that the CNF incorporate and follow guidance of the document recently released by the Advisory Council on Historic Preservation (ACHP), entitled Native American Traditional Cultural Landscapes Action Plan. This plan advises a more proactive role in engaging Indian Tribes concerning Traditional Cultural Landscapes and details an agenda for this engagement and the evaluation and determination of Traditional Cultural Landscapes as historic properties, under Section 106, and NEPA. ACHP envisions an expanded role for itself and the National Park Service in this process and supports the Traditional Cultural Landscapes approach.

**Ce:wi Duag Traditional Cultural Property**

604. The Tohono O'odham Nation issued a Tribal Resolution to consider the natural and cultural landscapes of the Santa Rita Mountains as a Traditional Cultural Place/Property. The CNF conducted an evaluation of the eligibility of the proposed TCP, under NRHP criteria of significance, and has submitted a request to SHPO for an official Determination of Eligibility. The discussion in the DEIS does not say whether SHPO consultation will occur in a meaningful time frame relevant to the DEIS review period nor does it list what possible actions might result from a SHPO
determination of eligibility (says only that the evaluation has been sent to SHPO for review and comment). The discussion is too brief and needs to be significantly expanded to address the issues discussed below.

605. Pima County fully supports the Tohono O'odham position, as voiced by the Chairman, Legislative Council, and Tribal Historic Preservation Officer, regarding the view of the Santa Rita Mountains as a traditional cultural landscape. The Tohono O'odham consider the area to be a Traditional Cultural Property (TCP), under the criteria of significance of the National Register of Historic Places, and believe the effects of the proposed Rosemont Mine on its cultural and heritage resources should be evaluated holistically. The Santa Rita Mountains are important for the plants, animals, springs, ancestral homes, ancestral burials, and ancestral religious places that are embedded within this natural landscape, all of which have tremendous present day cultural and religious importance to them.

606. The proposed Rosemont Mine is at such an enormous vertical and horizontal scale that it will eviscerate Ce:iw Duag effectively destroying this unique traditional cultural place. The San Carlos Apaches, Mescalero Apaches, Chiricahua Apaches, Western Apaches, who know the Santa Rita Mountains as Dzil enzho ('Beautiful Mountain'), and the Hopis all have similar concerns with respect to their traditional cultural landscapes and important ancestral places within the Santa Rita Mountains. There simply is no adequate measure that can mitigate the destructive and permanent impact of the proposed Rosemont Mine to this important and unique traditional cultural landscape.

607. In 2009, the Tohono O'odham Nation formally requested that the CNF begin the process to assess and nominate the Santa Rita Mountains as the Ce:wi Duag TCP for its archaeological and cultural significance and critical importance to the living traditions of the Tohono O'odham, Western Apache, and other concerned Indian Tribes; however, the CNF response did not come until 2011. The CNF responded with an evaluation and recommendation that the proposed TCP is significant and eligible for listing on the National Register of Historic Places, under Criteria A and D. The CNF submitted a formal request to SHPO for a determination of eligibility of the Ce:wi Duag TCP, with supporting documentation described as meeting standards for registering properties in the National Register of Historic Places and meeting the procedural and professional requirements set forth in 36 CFR Part 60. SHPO has responded with initial comments favoring the eligibility of Ce:wi Duag, but has not yet issued a formal Determination of Eligibility.

608. Pima County is concerned that the timing of the CNF request, overlapping with the release and review period of the Rosemont Mine DEIS, will allow insufficient time for SHPO to properly evaluate the request for Determination of Eligibility and respond with its determination before the review period expires. This timing represents a deficiency in the DEIS because a SHPO Determination of Eligibility for the TCP significantly alters the way in which effects are evaluated, under 36 CFR Part 60, and is critical to the fair and comprehensive assessment of the effects of the proposed mine actions on the natural and cultural resources.

609. Pima County is also concerned that the CNF submittal should present a better rationale for the proposed boundary of the TCP and stronger arguments for the natural and cultural significance of the TCP to the Tohono O'odham. Insufficient
research was done, and too few informant interviews with tribal elders to provide supporting traditional knowledge about the significance of the landscape and resources of Ce:wi Duag to the Tohono O'odham. The lack of stronger supporting documentation is a deficiency that could be corrected if additional time were allowed for revision of the submittal. In fact, SHPO identified the same deficiencies and responded with similar comments regarding the CNF submittal and with requests for additional information to strengthen the supporting documentation for a Determination of Eligibility.

610. The effects of the Rosemont Mine on Ce:wi Duag can only be properly evaluated within the context of its status as a TCP. Furthermore, a SHPO Determination of Eligibility will lead to the next logical step to protect and preserve Ce:wi Duag, that of preparing and submitting a nomination to the Keeper of the National Register for listing on the National Register of Historic Places as a Traditional Cultural Place. If listed, the TCP will receive the comprehensive protections it deserves under Section 106 of the NHPA, as amended, and supporting regulations, 36 CFR 800 Part 60.

611. Permitting decisions should be postponed until the National Register status of Ce:wi Duag Traditional Cultural Place is determined and effects of the proposed undertaking can be assessed under the appropriate standard relative to the National Register eligibility status of the resource.

612. Discussions in the DEIS regarding the Action Alternatives and the Utility Lines also include consideration of the Tohono O'odham Tribal Resolution mentioned in the previous comment, which includes considering the Santa Rita Mountains as a Traditional Place/Property, but they are too limited and should be expanded, with more information presented on the current status of the CNF request to SHPO for a Determination of Eligibility for the TCP.

613. The DEIS discusses the Tohono O'odham Tribal Resolution to consider the Santa Rita Mountains as a Traditional Cultural Property. The discussion states that the CNF has conducted an evaluation of the eligibility of the proposed TCP, under NRHP criteria of significance, but does not give a timeframe for the evaluation and what possible actions might result from a SHPO determination of eligibility. The discussion is too brief and needs to be significantly expanded to address the issues listed above. Pima County supports the nomination of a TCP as proposed by the Tohono O'odham.

Impacts on Sonoran Desert Conservation Plan Priority Cultural Resources

614. Pima County is especially concerned about adverse effects on "Priority Cultural Resources" identified in the Sonoran Desert Conservation Plan and the Comprehensive Land Use Plan.

615. For example, the historic Helvetia Townsite, which is recorded as site AZ EE:1:80(ASM), is included in the western portion of the mining project area (Township 18 South, Range 15 East, Section 23; parcel #s. 305-58-0200 & 305-58-0210). This is an important historic mining townsite and a Priority Cultural Resource (as determined in the Sonoran Desert Conservation Plan and Pima County Comprehensive Land Use Plan). This preservation project was a 2004
bond project, CIP No. HP-04-405; Bond No. CR4.05, but the County was unsuccessful in acquiring the property before it was acquired by the Augusta Resource Corporation as part of the acquisition of lands for the mining project. Saving and preserving the Helvetia Townsite is an important historic preservation goal.

Helvetia Townsite from our Priority Cultural Resources Database:

**Helvetia Townsite**

- **Site No. AZ EE:1:80(ASM):** This was a mining community, and like so many in the region, suffered the ups and downs of the market for copper ore. Mines were probably in use after the civil war but it wasn't until the early 1880s that several large mining claims were developed including the Old Dick, Heavyweight, and Tallyhoo mines. In the 1890s the Helvetia Copper Company formed and it was in response to the mining under this company that the community of Helvetia developed. Copper mining continued until 1911 when low copper prices lead to a shut down, although sporadic mining continued through the years of the First World War. The post office opened in 1899 and was closed by 1921.

The historic Helvetia Cemetery is within the preferred alignment for the connected action to provide electric power to the mine, but the cultural resources survey conducted for the alignment did not record or mention the historic Helvetia Cemetery, situated on the north side of the Santa Rita Road in state land. As mentioned, Santa Rita Road is a County right of way, subject to County permitting, but a permit to use or enter Pima County lands or right of way for mine utilities or other purposes was not cited in the DEIS. Cultural resources inventory, evaluation, and treatment/mitigation are required for right of way use permit to be issued. All cultural resources survey, evaluation and treatment including mitigation or data recovery on County land or right-of-way must be done according to a plan approved by the County and State and will require issuance of an Arizona Antiquities Permit from the Arizona State Museum per State statute.

Depending on how a site boundary would be drawn, the Helvetia Cemetery is partially or entirely within the preferred utility corridor. The cultural resources survey report includes a brief discussion of the historic Helvetia Townsite, AZ EE:1:80(ASM) as part of the "Survey Expectations" section of the report (page 12), but does not mention the cemetery, which is directly related to the town site and located a short distance to the west of Helvetia. The cemetery is not identified or recorded as a historic site. The utility corridor Area of Potential Effects (APE) diverges from its parallel route along Santa Rita Road to the west of the Helvetia Townsite, but it does encompass the cemetery, which leaves the historic resources and human burials there extremely vulnerable to construction impacts. The cemetery receives infrequent visitation, from family and friends of some individuals buried there, but the cemetery is not actively used; does not have recent graves and does not receive new internments of recently deceased individuals. It has not been documented as an historic property and its significance under the National Register of Historic Places criteria has not been determined. Therefore, it is impossible to assess the potential of adverse effect from construction, under Section 106 of the National Historic Preservation Act. In spite of claims to avoid the cemetery during construction – a voluntary act – the cemetery remains unprotected.
by law, with the exception of Arizona State Burial protections (ARS 41-844), which account for discovery situations. This deficiency in the assessment of effect from the proposed electric alignment should be addressed before the action proceeds.

616. The **Upper Davidson Canyon Archaeological District** listed in the National Register of Historic Places is adjacent to the project area and may be both directly and indirectly impacted by the Rosemont Mine operations. This district is also County Priority Cultural Resource Complex and described as:

*Davidson Canyon Complex*

This complex includes sites that were recorded as part of the survey of the Cienega Creek area by Michelle Stevens in the mid 1990s, as well as during the Anamax land exchange on US Forest Service lands in the 1970s and 1980s. The complex contains multiple archaeological sites representing human use of the upland areas of the eastern Santa Rita Mountains from the Archaic Period through the historic era. Sites within the area include those listed on the National Register of Historic Places as part of the Upper Davidson Canyon Archaeological District created on the National Register of Historic Places in 1991. The District encompasses 1300 acres within which 29 sites are recorded dating to both the Archaic and later Ceramic Periods with the most intensive occupation associated with Hohokam land use between A.D. 700-1200. A single historic ranch house dating between 1870 and 1920 is also known with in the District. In all, this complex represents a complementary set of archaeological sites to those recorded along the Cienega Creek and which represent the upland component of human existence in the Cienega Valley.

617. Along with Tumamoc Hill, the **Santa Rita Experimental Range (SRER)** is an identified Scientific Research Area under the Sonoran Desert Conservation Plan due to its long history. Under the County's comprehensive land use plan, SRAs should continue to be managed for the purpose of scientific research on the environment and natural resources. The SRER as a scientific research area is entirely dependent on the future decisions of the State Legislature and ASLD; University of Arizona is only a lessee. The construction of a power line capable of serving a huge excess capacity for future growth is proposed in this DEIS. No evaluation of the impacts on the long-term viability of the SRER as a whole is provided in the DEIS.

Pima County urges the Forest to consider the entire 53,000 acre SRER is an historic district deserving of analysis and protection as a unit. Swartz (2002:17) notes that "given markers and other remains from studies [conducted] in the first half of the twentieth century may meet eligibility requirements for inclusion in the National Register of Historic Places." Madsen (2003:69) states "by virtue of being an experimental station with 100 years of continuous operation and contributing significantly to range research, SRER today may warrant national recognition as an historic landmark".

**Mitigation Measures**
618. We are encouraged that CNF will meet the requirements of the National Environmental Policy Act (NEPA) regarding Heritage Resources within the Rosemont Mine Project Area, under Section 106 of the National Historic Preservation Act (NHPA), as amended, and its implementing regulations (36 CFR Part 800), and other federal regulatory requirements (e.g., the Native American Graves Protection and Repatriation Act of 1990 [NAGPRA]). However, we are concerned that the mitigation treatment strategies developed to comply with NEPA requirements under Section 106 are appropriate and sufficient to address the scope and scale of loss to the resources. The development and implementation of a comprehensive Historic Properties Treatment Plan (HPTP) must be completed before the development of the Rosemont Mine can begin. The HPTP should be produced by the CNF and attached as an appendix to the Mine Plan of Operations and Mined Land Reclamation Plan to allow CNF to meet its statutory obligations and permit future implementation of preservation and/or mitigation strategies throughout the life of the mine, its closure, and the reclamation schedule. Strategies should be part of a comprehensive Preservation Plan dealing with prehistoric and historic resources within the Rosemont Mine Project Area.

619. Discussions in the DEIS regarding development of a HPTP to address the requirements of Section 106, NHPA, are too brief and do not provide details about the scope and scale of mitigation (even in general terms relative to the anticipated scale of impacts from the Action Alternatives). The discussions should provide a detailed synopsis of how this process would work and a timeline for development and implementation. The synopsis should review the full consultation process, development of an MOA (including requirements, standards, and guiding mitigation strategies it would contain), and the implementation of mitigation (phased? If so, how and in what sequence and time frame).

620. The irreparable harm to the natural and cultural resource base by the proposed Action Alternatives requires significant and substantial mitigation, none of which has been committed to by Rosemont. We have the following recommendations:

1. We ask for clarifications about the question of the Rosemont Mine closure and reclamation standards, procedures, and defining documents regarding both public and private lands within the Rosemont Mine project area.

2. We strongly recommend comprehensive and consistently applied mitigation strategies to ensure compliance with Section 106 and its implementing regulations (36 CFR Part 800) and other applicable federal standards (e.g., NAGPRA).

3. We urge the Augusta Resource Corporation to take into account direct, indirect, and cumulative impacts on important prehistoric and historic resources, such as the Helvetia Townsite and the Santa Rita Experimental Range, and develop specific strategies to address the preservation and protection of these resources. Strategies should be part of a comprehensive Preservation Plan dealing with prehistoric and historic resources within the Rosemont Mine Project Area.

4. We reiterate the requirement of completion of appropriate consultation with concerned and interested Indian Tribes: Tribes, MOU participants (including Pima County), and other project stakeholders.
5. We request that Augusta Resource Corporation prepare a task list and approximate schedule for development and implementation of all cultural resources compliance actions to be taken by CNF for distribution to Cooperating Agencies and other project stakeholders, which will include

- Any necessary Class I and Class III survey
- Complete all necessary identifications and eligibility evaluations of identified resources and confirm through consultation
- Treatment recommendations: avoidance, mitigation (including mitigation documentation of historic resources and archaeological data recovery conducted to Secretary of the Interior’s Standards and Guidelines)
- Historic Properties Treatment Plan (HPTP)
- HPTP implementation schedule that is keyed to the mine implementation schedule
- Management and Monitoring Plan (MMP)
- Preservation Plan (PP)
- Inadvertent Discovery Plan (IDP)

6. Finally, we recommend full and continued participation by Pima County as a Cooperating Agency in the Rosemont Mine MOU throughout the NEPA process and implementation of the Rosemont Mine Project during the life of the mine, and including its closure and implementation of all reclamation plans applying to public and private lands within the Rosemont Mine Project Area.

621. Mitigation assumes that we preclude the no-action alternative. However, it is recommended that the CNF consult with the SHPO and tribal entities to develop appropriate mitigation measures to address the potential adverse effects of this undertaking in the event that CNF approves the mine.

622. An alternative to be considered within the context of the HPTP is to avoid to the greatest extent possible archaeological and historic sites within CNF lands that will be impacted by Rosemont Mine actions. This includes avoiding significant prehistoric and historic Heritage Resources that will be impacted by mining waste stockpiling and other activities to insure that these resources are avoided. Avoidance is a preferred mitigation strategy because it preserves the individual resources, and more importantly, contributes to the preservation of the integrity of the cultural landscape formed by the resources, rather than losing the resources through mitigation of impacts by data recovery or other mitigation treatment, such as documentation.

623. The scope of all the alternatives may be too large to realistically consider avoidance of sensitive cultural resources as a viable preservation option. This leaves documentation and/or data recovery as a mitigation option of last resort. All
Alternatives have huge environmental impacts with long-term, irreversible consequences and high potential to destroy significant Heritage Resources, including prehistoric and historic sites with known human burials or high potential for human burials. If avoidance is not a viable option, then mitigation, recovery, and repatriation will be required. Alternatives with the smallest impact footprint will be preferred.

624. An alternative mitigation strategy that should be given serious consideration is to require Augusta Resource Corporation to purchase lands of equivalent acreage and natural and cultural value as mitigation land for preservation purposes and retire any mineral rights and other potential for disturbance. Precedence for this kind of mitigation is acquisition of lands for preservation purposes by the Bureau of Land Management as mitigation for the Central Arizona Project Canal and related projects.

625. The DEIS descriptions of means to avoid or reduce impacts on cultural resources are extremely limited and need to be expanded. Avoidance measures should be detailed according to strategies employed relevant to specific categories of impacts on different prehistoric and historic site types and/or Heritage Resource categories. The inventory surveys need to be described in more detail, including defining the review process and reviewers, and the standards to which they were executed (cf. SHPO standards for survey and appropriate federal and/or ASM site recording standards). The distinction should be made between surveys that have already been done (cf. surveys conducted by SWCA for the MPO and its proposed APE and the later supplemental survey for the Alternatives and the ethnohistoric study; as well as the surveys for the utility corridor alternatives). If this is so, the discussion should provide detailed descriptions of the work, survey results, and documentation. If the discussion refers to proposed surveys to be conducted after the Action Alternative is selected, then detailed descriptions should be provided of the proposed inventory survey research designs, what historic contexts would be cited, what relevant research questions would be addressed by the anticipated data collected, and the necessary data requirements to address the research questions. Describe the survey method, including variations in systematic or reconnaissance-level surveys that would be required by the variations in environments and physiographic differences in the defined APE. Also provide detailed discussions of recording and documentation methods, mapping and artifact collection policies employed. Survey documentation needs to be addressed, including project record keeping, site records, and the project reports to be generated. Include the proposed dissemination of project reports, to public agencies, responsible private sector entities, etc., and for what purposes. Include provision for production and circulation of redacted versions of project documentation for public release. Discuss any phasing of implementation of proposed mitigation, including Phase I testing and Phase II data recovery sequencing for the project and/or individual sites, site types, or Heritage Resource categories. Also provide justification and discussion of mitigation phasing that is tied to phases of mine construction, operation, decommissioning, and reclamation, including direct and indirect impacts from the implemented Action Alternative and connected actions, such as access roads and utility corridors. Mitigation strategies should be detailed that maximize potential recovery of human burial remains and associated grave goods and ceremonial objects.
626. Discussions in the DEIS describe the scope and scale of impacts from the Action Alternatives and Utility Corridors and the mitigation measures proposed by Rosemont Copper as well as the Coronado's intention to enter into a MOA with SHPO to formulate and implement mitigation strategies. However, this comment concerns the huge and inadequately justified scale of irretrievable loss of cultural and natural resources that will result from implementation of any Action Alternative, in spite of any proposed mitigation measures. Pima County supports and shares the concerns expressed by consulted Tribal representatives; the value of the proposed mine to the people of Pima County is extremely limited, but the short- and long-term costs and permanent losses are immense and simply cannot be justified. Any mitigation strategy should be implemented to the fullest extent possible and include meaningful mitigation of cultural and social impacts to the Tohono O'odham people and other traditional communities.

627. Cultural resources, including traditional cultural places, are nonrenewable resources for which there may be no adequate mitigation to offset their irretrievable and irreversible loss. Whether currently listed or determined eligible for listing in the National Register of Historic Places, such properties are often critical to the continuity of living cultures as expressed in their traditions, beliefs, practices, lifeways, arts, crafts and social institutions. The proposed mine will destroy archaeological sites ancestral to the Tohono O'odham, and it will adversely affect and diminish the integrity of Ce:wi Duag, a traditional cultural place where archaeological sites, natural resources, natural landforms and viewsheds comprise a cultural landscape imbued with cultural meaning and value that is vital to the identity of the Tohono O'odham. While the ADEIS acknowledges the "massive movement of rock and soil will irrevocably alter those landscapes...," the impacts to the Tohono O'odham people and culture that would result from the destruction of the integrity of Ce:wi Duag is not addressed. To not address these social and cultural impacts is disrespectful and dismissive of Tohono O'odham concerns and the vital significance of this traditional cultural place.

Summary of Impacts and Mitigation

628. Direct, indirect, and cumulative impacts to cultural resources and the physical and human environment will be both intense and far-reaching. In order to assess all the impacts from planned and future mine operations, and adequately inform the public and interested and affected parties, the full extent of mine facilities must be identified and the Areas of Potential Effect must be defined in support of the Section 404 permitting process.

629. The results of archaeological surveys conducted for the Rosemont Mine reveal that regardless of which Alternative is selected, the consequences for affected historic properties will be dramatically and consistently severe, with only small differences in the numbers and types of cultural resources damaged or destroyed by the different Alternatives. Nearly all the threatened resources have been evaluated as archaeologically or historically significant and eligible for listing in the National Register of Historic Places. The Proposed Action, for example, will adversely affect, damage or destroy nearly 90 historic properties representing many centuries of human occupation and land use in the Santa Rita Mountains. The threatened resources range from prehistoric villages, including an important Hohokam village with a ballcourt and many Native American sites with human
burial remains, to historic ranches, town sites, and mines. Impacts from the Alternatives will have similar results, damaging or destroying as many as 100 historic properties, or more. These important, but fragile and non-renewable cultural and historic resources represent our shared heritage of prehistoric and historic events, cultural traditions, and religious beliefs. It is important to holistically consider the effects of the Proposed Action and Alternatives within the larger context of the culturally significant landscape of the Santa Rita Mountains.

630. Another important issue concerns the irretrievable and irreversible loss of Cultural and Historic resources and scientific information. The Section 404 Analysis does not address specific cultural or historic resources issues, but relies on discussions in the DEIS, which describe the scope and scale of impacts from the Action Alternatives and Connected Actions (utility corridors) and the mitigation measures proposed by Rosemont Copper as well as the CNF's intention to enter into a MOA with Arizona SHPO to formulate and implement mitigation strategies. Pima County is concerned that the huge scale of irretrievable loss of cultural and natural resources that will result from implementation of any Action Alternative remains inadequately justified, in spite of any proposed mitigation measures. Pima County supports and shares the concerns expressed by consulted Tribal representatives; the value of the proposed mine to the people of Pima County is limited, but the short- and long-term costs and permanent losses are immense and simply cannot be justified.

631. In spite of mitigation strategies designed to recover these categories of remains, there is great potential for irretrievable loss of human burial remains. The potential for loss of human burial remains and associated burial objects should be discussed in more detail in the DEIS. Tabular summaries of known sites with human remains, based on previous investigations, are presented with estimates of as yet unexcavated sites with potential for human burial remains. Greater emphasis is needed in addressing this potential and incorporating appropriate strategies for recovery into any mitigation treatment plan. Monitoring should be an important component of any mitigation plan because of the high potential for human remains in the area.

632. The discussion in the DEIS of identified prehistoric cultural resources emphasizes numbers of sites, and the Hohokam ballcourt site and other villages, but does not synthesize the combined results of survey data to reflect new knowledge of regional settlement history and patterns of settlement distribution revealed in the Santa Rita Mountains. This approach would reveal new perspectives on the identified Hohokam upland complex and allow for more detailed inter-regional comparisons with other contemporaneous settlement groups in geographically or physiographically constrained settings. Valuable synthetic interpretive analyses, with significant potential to contribute to new scientific knowledge, can never be made if any Action Alternatives are implemented.

633. These comments apply equally to consideration of Historic cultural resources lost to the Rosemont Mine. The discussion of historic resources is mixed in with prehistoric and protohistoric resources and shares the same deficiencies, lacking synthetic discussions of the complex of historic sites in the Santa Rita Mountains, considered within a regional context, and with a similar potential for significant loss
of scientific knowledge. These are serious scientific losses that should be considered.

634. There is mention of perimeter fencing around the implemented Action Alternative in a few places in the DEIS, including Appendix B COE Alternatives, but there is no mention of cultural or Heritage Resources. This deficiency should be addressed with discussion recognizing the potential for impacts to cultural resources from perimeter fencing to be installed around the mine. Mitigation measures to address impacts from the fencing also need to be discussed. The analysis areas for indirect effects are determined by reference to the location of the perimeter fence for each alternative. This is inadequate to evaluate indirect effects, including vibration and audible impacts. The analysis areas should be expanded, with appropriate justifications provided.

Consultation

635. We reiterate the requirement of completion of appropriate consultation with concerned and interested Indian Tribes: Tribes, MOU participants (including Pima County), and other project stakeholders. Consultation defines the requirements for inventory, evaluation of significance, eligibility to the National Register, determination of effect, and resolution of adverse effects that are compliance requirements under Section 106. Finally, the DEIS addresses the issue of consultation with Indian Tribes, but lacks references or discussions of identifying and/or consulting with other, non-Native American descendant groups. Even though Native American tribes have special standing under NHPA and public scoping reached out to the community, more effort should be taken to fill this gap with strategies for identifying and engaging other descendant groups and outline how consultation would be implemented, in a similar way as is done for consultation with Tribes.

Project schedule

636. The proposed timeframe for the EIS review is insufficient to conduct required analyses or to allow determination of eligibility of Ce:wi Duag. We request that Augusta Resource Corporation prepare a task list and approximate schedule for development and implementation of all cultural resources compliance actions to be taken by CNF for distribution to Cooperating Agencies and other project stakeholders.
CHAPTER 3 – SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

General

637. The Forest should describe the indirect and cumulative impacts of the infrastructure investments that are proposed for the Rosemont mine on the future development of the Cienega Valley.

638. Rosemont Copper has applied for a 50-year lease (SLD Right-of-Way application 14-115294) in which the proposed powerline would be situated (see pdf attached). The application states that Rosemont will operate and maintain the line, a fact which should be disclosed in an SEIS.

639. Pending arrangements would result in Rosemont owning and operating a private transmission line and substation with 400 MW excess capacity to serve southern Arizona. In addition Rosemont would own a substation on the line. The broader socioeconomic ramifications of these connected actions should be weighed or disclosed in an SEIS.

640. The SEIS should examine the economic consequences of Rosemont ownership of the powerline. TEP’s Ed Beck said in the line siting hearings was that the federal treasury will not receive approximately $4 million in taxes if Rosemont owns the line. This should be disclosed, along with other taxes may be reduced by this strategy.

641. The Rosemont 138 kv line would have approximately 400 kv excess capacity. The excess capacity power line should be disclosed in the EIS and alternatives should be studied.

642. One of the greatest contributions that Pima County provides the nation is military airspace. While much of Pima County's airspace is used to maintain military readiness, a disproportionate amount of the low-level air training routes are conducted over the Tohono O’odham Nation (see map showing air_routes_all, Military Air Training Routes in Pima County). A military air training routes lies over the Rosemont area and Las Cienegas extending to Buenos Aires National Wildlife Refuge (air routes, Military Air Training Routes in Eastern Pima County). Please disclose what effects, if any, will the project have on airspace in a SEIS.
Notably, the route crosses the Santa Rita Mountains just north of the Rosemont ore deposit. The proposed mine by Augusta Resources represents a potential encroachment into the low-level training routes in our area. Two aspects of the mine can affect the training routes: the first are physical encroachments, such as the power poles and communications towers which would be constructed over the crest of the Santa Rita Mountains to bring electricity to the site. The SEIS should identify the location and height of any project-related (direct and indirect) communications towers and evaluate the effects on air traffic, military or otherwise.

Second, the Department of Defense is concerned with bandwidth encroachments. For that reason they established a Buffalo Soldier Electronic Test Range Boundary (see Figure below). The Rosemont project is located within this area. Radio transmissions or other electronic (aka SCADA) devices which might direct the flow of electricity, water or ore slurry might have the potential to encroach bandwidths currently used by the military, astronomers and TV stations in the area. Some of the Rosemont project features are in the line-of-sight to portions of Fort Huachuca (note red areas of the same figure). No mention of the effects or mitigation measures for the Buffalo Solider Electronic Test Range is found in the DEIS. A SEIS should disclose the proposed emissions and address the effects.
643. The effects of the Rosemont project upon the Blue Jay mine, which is located on the other side of mountain (Helvetia mining district) close to Imerys, should be disclosed. The Blue Jay is a small underground mine. Water for operations is withdrawn from a mine shaft. If the mine shaft goes dry as a result of the Rosemont mine, this may impair the ability of the owners of the Blue Jay mine to renew operations. The Tetratech model would predict impacts on this side of the Santa Rita Mountains.

644. Economic viability of the project is one of the scoping issues identified by the public. A number of mines in southern Arizona, including Carlota and Johnson Camp, have proved to have less-than-favorable economics in the last few years, despite the high price of copper. This is a significant issue to the public because of its socioeconomic effects on labor and the potential for leaving the taxpayer holding the bag for reclamation.

645. The SEIS and FEIS should identify and evaluate the likely economic circumstances under which the heap leach and sulfide processing would be curtailed.

646. The socioeconomic impacts of mining curtailments should be disclosed.

647. This mine has the potential to push Pima County over the ozone standard. The consequences of exceeding the ozone standards are substantial in terms of socioeconomic effects. The SEIS should recognize that not all of Rosemont's contributions to ozone could be abated through on-site mitigation measures, and that Rosemont would "eat up" some of the regions capacity for maintaining the standard. The SEIS should disclose that required actions might include requiring
cleaner burner gasoline, stricter vehicle emission inspections, speed limit reductions, stage II vapor recovery, limiting VOC content of consumer products, additional controls on stationary sources, and diesel idling restrictions, all of which could affect sectors other than the subject mine. Otherwise, Pima County might lose access to federal transportation funding. The socioeconomic impacts of exceeding the standard should be discussed.

Page 701, Roadway Improvement Costs

648. This section, in general, does a poor job of identifying and determining the costs of roadway impacts resulting from the project. Specifically, it fails to list the cost to Pima County taxpayers of public roadway improvements, repairs, maintenance, and replacement that will be required as a result of this project. Besides State Route 83, impacts are anticipated on County roadways such as Sahuarita Road and Santa Rita Road, which will provide secondary access to the project. All affected roadways should be listed and costs estimated for project-related roadway costs. Specifically, costs for required roadway improvements should be distinguished from roadway maintenance costs.

649. Page 701 describes the methodology used to calculate increased emergency service costs. The methods tie the rate to increases in population due to the mine which of course are negligible. The increase in emergency services directly related to the mine will be those caused by increased truck traffic transporting products for export to the port of Tucson and an increase in accident frequency and severity.

Page 706, General Management Direction

650. On page 706 the DEIS correctly identifies that; “Federal decisions can be materially affected by participating groups and individuals.” The lack of significantly different alternatives along with exclusion of a decision option for the Supervisor to select the no action alternative is contrary to this environmental justice policy.

Page 708 Pima County

651. On page 708 there appears to be a typo or sentence construction error in the second sentence of the first paragraph regarding 2010 Pima County population which is said to be 136,517. The number from Table 172 which this most closely resembles it is 1,360,157. However that is the 2025 projected figure. It is recommended that the authors revisit this paragraph, to check data and conclusions.

Page 716, Recreation Related Employment

652. Page 716 makes the hypothesis that of the industries contributing to the local economy only “arts, entertainment and recreation” and “accommodation and food services can likely be attributed to recreation activities on Forest service Lands”. There are five industries at least that have been left out that should be considered, retail, other services, educational services, Construction and Real Estate. Each of these sectors is heavily based on outdoor recreational opportunities, particularly so for certain businesses. An argument could also be made that outdoor recreational opportunities contributed to certain elements of the health sector. Therefore the conclusion on Page 718 that: “In terms of Coronado National Forest related recreation, labor income contributions to area employment are not substantial”, is erroneous and substantially underestimates potential losses. While these
elements are identified on page 727 there exclusion here is vexing.

Page 727, Recreation and Tourism
653. Page 727 notes that OHV vehicle purchases are "not necessarily related to the availability of recreational opportunities on Coronado National Forest. On the other hand it could also be noted that three of the regions most popular OHV areas (Gunsight Pass, Three Feathers/Chivo falls and Charalou Gap) are within the Coronado, including one that will be irretrievably lost under all action alternatives.

Page 729/730, Public facilities and Services
654. Pima County is described as having typical levels of service. It is notable that Pima County has been nationally recognized for its efforts to preserve the Sonoran Desert and to recognize it's place in the local economy, quality of life and future. Perhaps more importantly and germane Pima County has been recognized for the scientific basis of it's land use planning efforts including the adoption of Regulated Riparian Habit Maps and the Conservation lands System.

Page 730, Future Roadway Maintenance Costs
655. This section documents known historical roadway maintenance costs, but it fails to also estimate future roadway maintenance costs which will likely exceed historical expenditures. Future maintenance costs should be estimated and provided.

Page 736, Employment
656. Page 736 states that under the no action alternative "Jobs would not be created..." It could also be stated that under the no action alternative no jobs in the tourism sector would be lost. While the authors may argue this issue is addressed under Recreation and Tourism the statement therein that "no measurable impacts are anticipated" is incorrect and unreasonably dismissive. The DEIS has identified impacts it has simply called them negligible against the scale of the Coronado and the local economy taken as a whole. This is a flawed argument. The impacts were measured; the Coronado has concluded that they are not regionally significant. But they are to the impacted individuals and localities. All impacts should be acknowledged and not dismissed due to the huge scale of the analysis area. Negative employment sector impacts ripple effects have not been assessed in a way that allows cost benefit analysis.

Employment
657. Contrary to the tone of Augusta Resource robust PR campaign the DEIS acknowledges that:"...the total number of direct mining jobs required under the proposed action would be quite modest, compared with the total employment...” (pg 739) in the region. Still no comparison to the potential numbers of lost jobs has been included, it is simply stated that "recreation related employment is not expected to change to a measurable degree...” When the wages and benefits of direct mine employees are expected to be approximately .1 percent of Pima County salaries one must ask: Would this be measurable if the numbers were not provided? A better synthesis and weighted comparison of negative impacts to positive employment impacts is needed in the final FEIS.

Employee Spending
658. The local Employee (annual) Spending amounts on page 741 are simply
unreasonable. Taking the high end of the range of annual employees (480) and the low end of spending (21.7 million) each employee is credited with spending over $45,000, annually. Conversely using the low end of employees (35) and the high end of spending (29.2 million) results in over $83,000 annual spending per employee. The way the Applied Economic (2011) study is reported or the study itself, if these are its conclusions is apparently misinterpreted. It may be that a multiplier is being used that is not explained fully. A more complete explanation is requested.

Vendor Spending
659. It does not appear as though the same vendor spending models used to predict mine employment impacts on page 742 have been applied to lost direct forest recreational users and tourists.

Property Values
660. On page 744 the last sentence of the last paragraph describing the impact on property values cites a study that..."indicates that proximity to forest positively influences property value" and then immediately dismisses this by stating; "however, given community values associated with the project vicinity this seems unlikely." This is a gross error and completely unfounded. Pima County in which the project lies has adopted the SDCP which reflects its values and supports the current forest service plan with which the proposed mine plan of operations does not comply. The mine is in direct conflict with this expression of community values as well as the Forest Service’s own plan! The County has adopted low density zoning requirements within one mile of any National Forest to further ensure the integrity of this highly valued local resource. Please describe what community values prevent an increase in property values adjacent to the Coronado to justify this conclusion in this location. Without this information this becomes yet another example of how the DEIS fails to meet it’s NEPA and other obligations to use the best available verifiable information. In fact the conclusions are contrary to the best available information in this case. Furthermore this conclusion directly contradicts statements and service commissioned studies cited within the DEIS asserting that there is a positive relationship between proximity to the Coronado and property values in the study area on page 725.

Recreation and Tourism
661. While one of the major economic impacts studies cited concludes that even a one percent drop in tourism would exceed payroll and thus have a negative regional economic impact during the life of the mine, the impact is said to be absorbed by the scale of regional resources. While this fact means the loss may be absorbed elsewhere it is still a loss which would result in closure of particular businesses while customers find alternative locations and activities. Impacts of this project should be assessed regardless of the capacity for activities to shift elsewhere. The DEIS has not shown that the economic impact will be positive during or after the mines life.

Page 746, Preproduction Roadway Improvement Costs
662. This section fails to include the costs of required roadway improvements such as turning and passing lanes, not to mention pavement overlay which will likely be required. This cost information can and should be provided. Pima County estimates the cost of constructing truck lanes along State Route 83 to be as much
as $13 million. However, the Arizona Department of Transportation has recently proposed to spend $76 million on State Route 83 improvements, ostensibly to safely accommodate mine-related traffic and truck traffic. The DEIS fails to disclose any cost estimates for roadway improvements.

Page 747, Production Roadway Overlay Costs
663. The report states that "damages resulting from ...(heavy truck traffic) ... would be difficult to quantify", but roadway maintenance costs can be estimated. Pima County estimates that a structural overlay of all affected roadways would cost as much as $14.6 million. A mitigation measure of simply "conducting a baseline analysis of road conditions along State Route 83" is wholly inadequate and is only the first step in providing roadway mitigation for the project.

Page 747, Gas Tax Revenues and Funding
664. Gas tax revenues are stated as a way of paying for required roadway improvements and maintenance. However, gas tax revenues alone resulting from vehicle fuel purchases will be wholly inadequate to pay for all roadway improvements and maintenance as required for this project. Gas tax revenues from project-related truck traffic and vanpools should be estimated and then compared to anticipated roadway expenditures described in the comments above. Unless the project sponsor agrees to pay the full cost of required roadway improvements, the burden will be shifted to Pima County taxpayers to pay for needed roadway improvements and maintenance that will occur during the lifetime of the project.

Page 747, Transportation and Road Maintenance
665. While the Transportation and Roads Maintenance section on page mentions potential barriers to cyclists and potential accident increases these factor are well known and should be further evaluated. Road biking and motorcycle rentals/rides are a very popular use if Rt. 83. Currently this stretch of highway has one of the highest rates of Motorcycle fatalities in the state. Even if the projected 56 roundtrips a day for ore tucks is spread evenly over 24 hours that is nearly 5 trips per hour or one truck passing every 13 minutes. A reasonable person would assume that the introduction of these trips may be a last straw in the attractiveness of the road for these users. While this data is readily available from ADOT no attempt appears to have been made to quantify these users.

Page 747, Community Values
666. In the description of "Community Values and Social Trends" on page 747 of the DEIS states that 63 percent of the land "that surrounds Tucson..." are public lands. Please provide a breakdown by agency. It would appear that Tribal Trust lands have been mistakenly included in this figure. Tribal Trust lands do not contribute to the recreational opportunities or serve as permanent open space, they are not public. Use of the 63 percent figure is erroneous for valuing open space and the impact of the mine on that value in the community.

Environmental Justice
667. Page 749 refers to the "San Xavier Pascua Yaqui Tribe". There is no such entity or place. There is the Pascua Yaqui Tribe and the Tohono O'odham Nation. San Xavier is a Reservation and District under the Constitution of the Tohono O'odham Nation. The resources listed as potentially having a disproportionate impact on
these environmental justice communities erroneously excludes culturally important plants and animals. In some cases these plants and animals also have an economic use such as the Beargrass used in basketry. The conclusion that vegetation impacts are limited to the project area and therefore does not have a disproportionate impact is erroneous as these areas have been used for centuries, prior to creation of the Coronado or the mining laws of this Nation. Using today's reservation boundaries as the extent of the environmental justice community is inherently flawed. The Tohono O'odham ancestral adjudicated area used for the cultural resources sections should be applied.

Cumulative Impacts
668. Cumulative impacts described on page 752 are grossly underestimated both in scope and magnitude. One example, the third bullet states that maintenance of FS roads to support grazing is a cumulative impact. What about other uses? They appear to have only considered positive cumulative impacts.

Mitigation Effectiveness
669. The list of mitigation measures referred to on page 753 is said to have cross issue effects. Thus replacing water sources for cattle will help wildlife. This is so but direct mitigation is better such as replacing lost springs and riparian habitat.

670. The concluding paragraph uses the relocation of the Arizona Trail as an example of a potentially successful mitigation measure while admitting some impacts cannot be mitigated. Unfortunately this is a bad example as the trail has not been shown to be locatable such that it meets trail standards. Its use as an example of success is contradicted by the DEIS itself.

671. Environmental Consequences: Impacts Common to All Action Alternatives: Housing: Production and Postproduction, Pages 739 through 742

By not understanding the implications associated with the technical references cited in the DEIS, USFS has either failed to adequately address impacts caused by changes in housing demand in the study area as a result of the Rosemont Copper project or failed to adequately critique the assertions made in the technical references.

USFS concludes "there would be minimal demands on the local housing supply during the operational phase of the mine" [p. 739] because "the vast majority of the skilled mining personnel needed for the Rosemont Project are available in the greater Tucson area' (WestLand Resources Inc. 2007a)" [p. 740] and "the number of workers needed for the operation of the mine ... and the resulting population changes ... would not be more than the number of vacant housing units in Cochise, Pima, and Santa Cruz Counties..." [p. 739]. Such a conclusion, which is based on the USFS' undocumented assumption that only 10 percent of mine operations employees in-migrate to the study area, may be possible given current economic and real estate market conditions, but it certainly contradicts the impacts claimed in Economic Impacts of the Rosemont Copper Project on Pima County, Arizona, June 2001, the analysis prepared by Applied Economics from which USFS cites various mine operations impacts regarding jobs, payroll, output and tax revenues that would result from the Rosemont Copper project.
Applied Economics purports to measure the impact on the local economy as a result of the Rosemont Copper project, which includes "the direct activity created by the mining and processing operations, as well as the impacts created by local supplier purchases and employee spending" [Applied Economics, p. 2]. Because Applied Economics has prepared an impact analysis, the results reported in Economic Impacts of the Rosemont Copper Project on Pima County, Arizona are new additions to the local economy that would not exist without the project and are not the contributions made by an existing business to the existing structure of the local economy. When USFS cites Applied Economics to indicate a mine operation workforce of approximately 350 to 480 workers that directly and indirectly supports 1,600 jobs and $75.2 million in personal income each year [p. 740], it means these are additional new jobs and income that did not previously exist in the local economy.

USFS cites Applied Economics indirect state and local tax revenue impacts averaging $4.7 million per year, or $107.6 million in total over the life of the mine, due to spending by direct and indirect employees generated by mine operations [p. 742]. Figure 10 of the Applied Economics impact analysis [Applied Economics, June 2011, p. 14] indicates $58.2 million of these state and local tax revenues are associated with local property taxes paid by direct and indirect employees during mine operations. Because Applied Economics claims direct and indirect employee spending has an impact of $58.2 million in additional local property tax revenues, the implication is new housing units must be built to satisfy the demand for housing by these new direct and indirect workers; otherwise, there would be no additional property tax revenues received by local governments if no new housing units are needed over the life of the mine project. Therefore, the effects on the study area associated with these new housing units, as indicated by Applied Economics, have not been addressed by USFS in the DEIS. Conversely, if USFS is correct in concluding no need exists for additional housing, then USFS should have critiqued the Applied Economics the tax revenue on this point rather than simply accepting the tax revenue impact as given by Applied Economics.

672. Environmental Consequences: Impacts Common to All Action Alternatives: Taxes and Revenues, Page 742

USFS cites "annual property taxes paid by the company are estimated at $3.5 million per year" [p. 742]. This amount, which was reported in the Rosemont Copper Project Feasibility Study, Volume 1, August 2007 [p. 1-105 and 1-112] and the Rosemont Copper Updated Project Feasibility Study, Amended March 2009 [p. 111], overstates direct company property taxes as a result of subsequent legislative changes in taxation. Laws 2011, Second Special Session, Chapter 1, Section 84, reduces the current 20% assessment ratio for taxation of commercial property, including operating mines, by 0.5% each year from 2013 through 2016. Therefore, realized company property taxes would be at most $3.15 million per year (i.e., 90% of the amount referenced above) should the Rosemont Copper Project commence mining operations in 2016.

A notation in the Rosemont Copper Project Feasibility Study indicates a "property tax allowance of $3.5 million per year was included in the cash flow analysis, "the basis was a study performed by Donald Ross Consulting" [p. 1-105]. The Donald Ross Consulting study predates the feasibility study, so it is unclear what
assessment ratio was utilized in the pro forma cash flow analysis reported in the feasibility study. Since the assessment ratio for operating mines was 24% in 2007, it possible that realized direct company property taxes may be only 75% of the amount cited by USFS in the DEIS.

ENVIRONMENTAL JUSTICE

Water Supply

673. Small public water systems and individual well owners are more vulnerable than large public or private water companies to changes in water quality and water availability. Their wells serve one or a few families located in a relatively small area, so relocation of the well away from areas of depletion will not possible. Water quality sampling is typically limited and infrequent, compared to the more extensive requirements imposed on large private and municipal providers, so ability to detect changes in water quality is lower. In addition, most of their wells are not drilled as deeply as municipal, agricultural, or industrial users, making them inherently more vulnerable to groundwater depletion.

674. The SEIS should have a figure showing the relationship of colonias, public water wells regulated by Pima County, domestic exempt wells, and the 100-year drawdown area. Pima County can provide the first two types of information in shapefiles for further analysis (see example below).

675. Rosemont has indicated its willingness to provide insurance for well-owners who sign an agreement with them limited their right to damages. The agreement would only cover wells in a certain area. That area should be shown on the same map as the public water wells regulated by Pima County and the domestic exempt wells in the area.
676. A number of colonias have been identified in the general vicinity of Sahuarita (see figure above). These lie outside the groundwater protection area for mitigation. HUD defines a colonia as an unincorporated community within 150 miles of U.S.-Mexico border, population <10,000 that is low and very low income, lacks safe, sanitary and sound housing, as well as services such as potable water, adequate sewage & drainage. In these areas, access to infrastructure financing to address the effects of drawdowns and changes in water quality is typically limited.

677. The 20-year time frame is inappropriate for impacts analysis on water supply and water quality in colonias and on the San Xavier District of the Tohono O'odham Nation. Water is the basis for occupancy of the land, which should continue after 20 years. Without access to potable water, individuals may be forced to pay for water delivery or even move.

678. A SEIS should address effects of the 100-year drawdown and proposed uses of CAP on the Southern Arizona Water Rights Settlement Act. In particular, identify how the drawdown imposed on the San Xavier District may affect the buffer zone objectives of the SAWRSA.

General

679. The Environmental Justice requirement was established by Executive Order 12898 (February 11, 1994). The U.S. EPA defines environmental justice as:

"Fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies.

"Meaningful involvement means that 1) people have an opportunity to participate in decisions about activities that may affect their environment and/or health; 2) the public's contribution can influence the regulatory agency's decision; 3) their concerns will be considered in the decision-making process, and 4) the decision makers seek out and facilitate the involvement of those in the potentially affected." (emphasis added)

The following groups were identified in the draft EIS as protected groups (minority, low income, or living below poverty level) for the purposes of the Rosemont Copper Project:

1. Santa Cruz County
2. San Xavier Pascua Yaqui Tribe
3. Tohono O'Odham Nation

(Chapter 3, page 38, lines 10-14)

"FAIR TREATMENT" REQUIREMENT IS NOT SATISFIED
The Fair Treatment standard mandates an analysis of any serious disparate impact on protected classes by the Rosemont Copper Project.
First, it is notable that the draft EIS devotes 38 pages of narrative, charts, and diagrams to description and explication of social and economic factors characterizing the Rosemont Analysis Area and the methodology for identifying protected groups. (Chapter 3, pages 1-38)

However, only one-half of one page is dedicated to analyzing the impact on the three identified groups affected by the Rosemont project. (Chapter 3, page 50, lines 42-44 and page 51, lines 1-17).

On its face, this brief and superficial statement does not meet the "Fair Treatment" standard for determining disproportionate high and adverse impacts on individuals in the three protected classes. The conclusions are not supported by objective data or information, and there is no recognition or discussion of the fact that protected classes do not have the same resources possessed by more privileged groups. The latter have more mobility and adaptability when confronted with changing conditions, such as the multiple impacts of the Rosemont Copper Project.

680. The draft EIS dismisses any environmental justice health concerns by stating that other, non-protected groups are present in the Rosemont impact area so that negates any environmental justice issue. (Chapter 3, page 51, lines 6-11) This approach would render the Environmental Justice Executive Order meaningless, as there are very few relevant geographic areas in the United States which do not include at least one unprotected class of citizens in addition to protected classes.

Concerning serious and disparate economic impact on protected classes, the draft EIS states simply that the low income population may have greater employment opportunities as the mine is constructed and operated. (Chapter 3, page 51, lines 3-5)

At a minimum, the environmental justice Fair Treatment standard requires that the EIS include objective health risk and economic assessments of the preproduction and production phases of the Rosemont copper project on Santa Cruz County residents, Tohono O'Odham Nation members, and Pascua Yaqui Tribal members.

Human health assessments would include but not be limited to air and water quality, noise pollution, and water supply impacts. The economic evaluation would assess the loss of tourism and recreation revenue and the disproportionate impact on low wage workers in the protected classes, and compare such loss, if any, to the offsetting increase in protected class employment opportunities presented by the preproduction and production phases of the project.

It is impossible to determine from the draft EIS if there would be disparate impacts on protected classes because the document completely fails to provide sufficient data and analysis for a complete and accurate assessment.

681. "MEANINGFUL INVOLVEMENT" REQUIREMENT IS NOT SATISFIED
The draft EIS section on Environmental Justice fails to mention any action taken to satisfy the Meaningful Involvement legal requirement.
The draft contains no information or discussion concerning any community outreach efforts, undertaken to ensure that the identified protected groups had sufficient opportunity to provide feedback on the Rosemont copper project, which is mandated by the Meaningful Involvement standard described above.

A generally noticed area-wide meeting or series of meetings is insufficient to provide outreach to the three protected classes, Santa Cruz County residents, Tohono O'Odham Nation members, and Pascua Yaqui Tribe members.

Protected classes by definition require special attention and effort, and communication methods which may suffice for the mainstream non-minority, non-poverty population are inadequate means for involving the protected groups. The reasons include:

- lack of access to electronic and print media
- economic barriers to travel to meeting sites
- inability to read or comprehend the English language, and
- cultural barriers limiting participation in large contentious public forums

Meaningful outreach to the three protected classes might include

- small local meetings chaired by community leaders
- workshops with participants selected from the protected groups
- use of local media (e.g., monthly newsletters or newspapers), and
- attendance and participation at various community events

Without verification of meaningful Involvement of the protected classes, the EIS does not comply with Executive Order 12898.

CONCLUSION

682. Without a credible exploration of adverse and serious impacts on the three identified protected groups, there can be no exploration of mitigation strategies, monitoring needs, or preferences of the affected communities.

Without targeted outreach and communication with the protected groups, there is no assurance that there has been meaningful involvement of that population.

The draft EIS fails to meet the Fair Treatment and Meaningful Involvement requirements established by Executive Order 12898, which defines environmental justice standards. At a minimum, a supplemental EIS is needed to address these legal mandates.
Technical Memorandum
Review of the Proposed Rosemont Ranch Mine Draft Environmental Impact Statement
Water Resources–Related Sections
Prepared for Pima County and Pima County Regional Flood Control District
January 5, 2012
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The Coronado National Forest Service has released the Draft Environmental Impact Statement for the Rosemont Copper Project (DEIS). This technical memorandum reviews the water resources/hydrogeologic aspects of that project. This author had reviewed the administrative DEIS (ADEIS) on behalf of Pima County. This review focuses first on whether the Forest Service (FS) accounted for the previous comments. Second, there is an overall review of the water resources/hydrogeologic aspects of the DEIS, with emphasis on issues not previously raised (Myers 2011, 2010a and b, 2008). These reviews were of various technical reports regarding groundwater modeling, conceptual models, and the pit lake model, that have been used for the DEIS. These reviews are not repeated herein, although the summary of two of the reports have been quoted herein.

Third, this technical memorandum provides a review of fate and transport study for the waste rock, tailings, and heap leach facility. An impetus for reviewing this document was the decreased recharge simulated by the groundwater models in the area of pit due to these facilities.

SUMMARY AND CONCLUSIONS

The DEIS did not adequately accommodate comments previously made by Pima County. Most of the changes the FS made between the administrative DEIS and this DEIS, noted below, are cosmetic. The FS did not complete any new or change any of the previous analyses in response to Pima County’s comments.

The DEIS did not consider partial or complete backfilling of the pit as an action alternative because the FS wants to maintain a pit lake as a hydraulic sink because of a fear the backfill could contaminate the water flowing through the pit, although elsewhere the FS argues the backfill will not generate substantial contaminants. The FS fails to analyze the advantages of backfilling the pit: vastly decreased drawdown in the watershed and not creating a lake that essentially isolates almost 96,000 af of water in a dry desert region that is running low on water supplies.

A rock drain would be provided to pass surface drainage beneath the waste rock dump and tailings impoundment. The DEIS does not provide adequate discussion about how the drain would be maintained in perpetuity and what occurs if the 100-year design storm is exceeded, as will occur at some point in perpetuity.
Mountain front recharge is not accurately analyzed in the DEIS, and this leads to a potentially gross under-estimation of the impact on this component of the water budget. The predictions that runoff will decrease up to 50 percent indicate that recharge through the stream bottoms will decrease substantially. Because much of the runoff becomes recharge along the stream channel both above and below the model point, the proposed project could have an exceptional impact on mountain front recharge, which includes recharge further north in the Cienega watershed from the Davidson Canyon. The amounts could be as high as 700 af/y, which is not considered by any of the groundwater model reports or the DEIS, which does not estimate changes to mountain front recharge. The decrease in recharge could extend north into the lower Cienega Basin because less water will discharge onto the basin near the outlet from Davidson Canyon.

The DEIS should consider in more detail whether there are periods during which the forming pit lake may not be terminal. The preferred action, and all of the action alternatives, would allow a pit lake to form in the pit once dewatering ends to create a terminal sink with groundwater and contaminants from most mine facilities flowing towards it. However, as it fills, groundwater flowing in from one area may flow out through a different area. This would occur if the groundwater level recovery differs on different sides of the pit, such as water levels recovering faster on the west side of the pit due to more area draining to that area even though the model simulates a flow boundary on that side of the domain.

The DEIS must justify the parameters used and complete a sensitivity analysis of the parameters to demonstrate that the results of the seepage modeling are feasible; this is especially needed since there is no data to calibrate to. They must also justify ignoring preferential flow paths through the waste rock. The mine facility seepage analysis predicts there will be essentially no seepage through waste rock facilities, a result that is simply not feasible. The modeling used parameters in which the conductivity for relatively dry rock is six orders of magnitude less than when saturated. These parameters would allow a wetting front to move through unsaturated waste rock only very slowly; even most of a large event would be stored in the top few feet. After the storm ends, the close proximity of most of the seepage to the ground surface would allow the water to be evaporated away because evaporation would quickly establish an upward matric potential gradient.

The DEIS does not adequately describe a monitoring plan for groundwater levels or quality. It is not appropriate to allow a major portion of the mitigation plan to be established as part of the groundwater discharge permitting process.

The DEIS is an incomplete disclosure of potential impacts because it suggests that some analyses are still being completed and will be a part of the final EIS. The DEIS has also indicated that three things might be analyzed prior to the FEIS. These are aggradation/degradation analysis of the change in sediment load, longer term kinetic tests, and a biological resource analysis of the surface water quality exceedance in the pit lake. The DEIS indicates the fate and transport studies for seepage through waste rock and tailings are being updated to reflect the peer review reports.

PREVIOUS HYDROLOGIC COMMENTS MADE BY PIMA COUNTY
This reviewer made comments on behalf of Pima County regarding the administrative DEIS (ADEIS). This section considers the responsiveness of the agency to those comments. The comments are quoted verbatim, indented and in *italics*, from the County’s comment form. Then, I searched the DEIS to determine whether it had been changed in response to the comment. Finally, I make recommendations, which are numbered, as to how the comment should be implemented.

The first ADEIS comment is:

*The project description indicates that process water will be obtained from wells in Santa Cruz Valley as well as from pit dewatering. The DEIS should note whether all dewatering water will be used onsite. Especially if they collect the water from sumps on the pit floor, the water could have poor quality. It may require treatment before it can be used for process. The DEIS should discuss the alternative uses for this water. Dust control is one obvious use for dirty water, but there may be more dewatering water than needed for dust control. ADEIS Ch 2, p 14.*

According to DEIS Figure 5, pit dewatering would report to the PW and TS Pond and be cycled through the reclaimed water tank to use for ore processing, from which it would report to the tailings or concentrate load. The amount of dewatering water (DEIS, p 230) would be about 20 percent of the amount expected to be obtained for processing on the west side. Because they are mixing it with tails water, the quality should not be an issue during mining.

The DEIS does not indicate what would be done with excess dewatering water. The DEIS also does not indicate what would be done with excess process water.

*Mitigation on the east side must include a system of water level monitoring wells to verify the predicted changes in the water level due to dewatering. The mitigation plan should also include triggers for action if the drawdown at certain points reaches certain levels. There is also a need for water quality monitoring wells.*

Groundwater monitoring as mentioned in the DEIS (p 32, 80, 234) is not specific as to locations. DEIS Appendix C has a monitoring section for both groundwater quantity and quality (DEIS Appendix, p 127). The plan states only that water levels “will be regularly monitored near the operational pumping areas”. It does not specify frequency or provide a location. Measuring and reporting annually, as also suggested (Id.), is insufficient, at least initially, because annual monitoring will not establish season trends, although the mining company has in the past argued against reporting relatively small water level changes because they are within the natural variability (Tetra Tech 2010a). For the east side, it is not clear what is meant by “operational pumping area” because the dewatering will mostly occur inside the pit. The plan to compare the results with the groundwater model predictions every five years is probably sufficient if there are sufficient wells to compare. The following recommendations apply to groundwater level monitoring on the east side:

1. *Groundwater model drawdown predictions should be used to site monitoring wells to determine whether the models are predicting*
drawdown as expected. All three models should be considered, especially where there is variation among models. Monitoring wells should be sited far enough from the mine and early enough to establish a pre-mine baseline.

2. The monitoring wells should be monitored monthly until a seasonal trend can be established, or for five years minimum.

3. Beyond the seasonal water level monitoring period, the wells should be monitored twice a year, in perpetuity or until the water levels have recovered to steady state post mining, at the times coinciding if maximum and minimum levels.

Additional mitigation should include plans to accommodate more dewatering than currently forecast. If there is more water in the bedrock than currently estimated, the dewatering needs could exceed forecasts substantially. Alternatively, if the pit intersects a fault zone, the pit could start drawing groundwater from much further than expected, which could cause drawdown outside the current expected drawdown cones.

The DEIS does not discuss the potential for there being substantially more dewatering water than predicted. As noted, this could occur due to intersecting especially productive fracture zones or the pit intersecting a substantial amount of water relatively isolated from the environment.

4. The DEIS must include a plan for discharging or using dewatering water beyond the expected amount.

5. The monitoring plan should require the mining company to note the location of excessive amounts of groundwater inflow. If from a fracture zone, the mining company should map the fracture trace to determine the source of the water. If this increases the expected amount of dewatering substantially or changes the expected source, they should prepare a new hydrogeologic study predicting future amounts of dewatering and planning to monitor and mitigate it.

6. If dewatering rate surpass a given trigger point, the mine should be required to complete a supplemental environmental impact statement to consider the ramifications of the additional dewatering.

7. The trigger point could be dewatering at 60 percent higher than expected for two months. This is the trigger used for similar considerations at the proposed Montanore Mine in Montana (Kootenai National Forest, Environmental Impact Statement for the Montanore Project, 2011).

The DEIS refers to “dewatered tailings” that will have just 8% water content. The DEIS should explain how they are dewatered and how the water is disposed of. If it is through evaporation, the DEIS should analyze the air quality issues with the disposal.

The DEIS does not address this concern further; there is still no information on how the tails are dewatered or what is done with the excess water.
The DEIS should define “process water”.

It is defined in the glossary as water that has been used to process ore.

There will be a central drain under the waste rock dump to pass stormwater from above. Apparently it will be just large rocks pile to form the drain. There are several concerns with this design. First, fine material from above could settle into the space between the rocks and decrease the flow capacity. Second, a substantial amount of water will contact this waste rock, including the settled fines, and could leach contaminants. Third, seepage through the waste rock will discharge into this drain and create potential poor water quality downstream. The central drain also must be included in mitigation. There must be a plan to inspect the drain after the mine closes to assure it, and the storage pond upstream, is working properly.

The DEIS mentions that the central drain will be constructed of rock selected for size and chemical inertness (DEIS, p 49), but does not specify how this would be done. The central drain design would pass the 100-year, 24-hour storm event volume within 30 days (DEIS, p 51); detention storage of 436 af would occur in the upstream attenuation pond. The DEIS does not indicate what happens during a larger volume storm. Water passing the drain will discharge to a compliance pond. Chapter 2 does not describe the compliance pond, other than refer to Figure 10 which shows its location at the downstream side of end of drainage. The drain would be changed to a “series of flow-through drains and drainage basins” in all alternatives other than the proposed action.

The compliance point dam forms a “final sediment pond located at the outlet of Barrel Canyon” (DEIS, p 340); it would be constructed as part of all alternatives of large inert waste rock. Its’ size is just two af, so it may be overtopped frequently. The central drain would report to this pond.

Since this drain must work in perpetuity, the DEIS must consider the fate of additional water.

8. The DEIS should discuss what occurs if the flow exceeds the capacity of the central drain or volume detained above it exceeds the available storage capacity.

9. A similar concern exists for all of the flow-through drains. The DEIS must discuss what happen to excess water, especially once the facility has been closed.

10. The DEIS should discuss the long-term maintenance plan for the central drain or the flow-through drains.

The DEIS improperly dismisses complete or partial pit backfill. The primary reasoning appears to be the desire to create a hydrologic sink in the pit lake, rather than having a flow-through system as backfill would potentially create, unless it is filled just to the level that would maintain it as a sink. This reasoning is flawed for three reasons. First, the DEIS notes elsewhere that seepage through waste rock will not degrade the ground water. If this is the case, groundwater flowing through the backfilled rock will not degrade groundwater either. Second, the concern about the backfilled material including that which
has contacted process water is not legitimate because it could be backfilled above the projected water table. If seepage into the unsaturated backfill is a problem, then leaving the material on the surface in a tailings impoundment or waste rock dump surely must also cause leaching which could affect groundwater. Third, the backfilled pit could have the same cover as proposed for the above ground facilities; the DEIS argues that this cover will prevent significant infiltration. If a cover could work on the facilities, it could also work on the top of the backfilled pit. Therefore, keeping the worst material unsaturated should satisfy concerns about leaching contaminants. If this cannot be accomplished in a backfilled pit where the surface area requiring a cover is much less, then it would certainly not be accomplishable on the separate facilities remaining above ground.

Although the 10 percent seems questionable since the pit lake would be over 1200 feet deep, the argument that moving this amount of rock and maintaining a sink “would not appreciably reduce the impacts” is flawed. Backfilling the pit so that a lake does not form would save from being in a terminal lake with no possible use more than 90,000 acre-feet of groundwater. This would be one of the larger human-made lakes in Arizona. Clearly, allowing the continued use of this water justifies the additional cost and other impacts.

The DEIS treated partial or complete backfilling of the pit as an alternative considered but eliminated from future study (DEIS, p 84-85). They eliminated backfill because they indicate that “maintaining a hydrologic sink” would capture any contaminants, which is “an acceptable and desirable condition ... should pit water become contaminated” (DEIS, p 85). The FS argues that backfill would eliminate the hydraulic sink and increase “the risk of detrimental impacts to groundwater chemistry from potential contaminants in pit lake water” (Id.). Elsewhere in the DEIS, the FS indicates that seepage through the waste rock would be relatively clean. With backfill, any potentially acid generating (PAG) rock could be segregated and placed above the water level; alternatively, PAG rock could be placed very deeply so that it is submerged deeply so that oxidation, if it occurs, ends quickly. If seepage through the backfilled waste rock could be a problem, then it can also be a problem dumped on the ground surface.

Additionally, the DEIS fails to analyze the advantage of backfilling the pit, and that is vastly decreased drawdown in the watershed and not creating a lake that essentially isolates almost 96,000 af of water (DEIS, p 291) in a dry desert region that is running low on water supplies. Other advantages include eliminating a visual blight on the land, the waste rock dump, and better containing potential seepage through the waste rock; if seepage does leach contaminants from the waste rock dumps, it could contaminate surface water.

11. The DEIS should analyze and disclose the advantages of pit backfill so that the decision makers have both sides to consider.

12. The DEIS should consider the value of the water lost to the pit lake.

13. The DEIS should disclose the steps that the mining company would have to take if the pit lake did become contaminated to protect wildlife.

The DEIS should specify where the monitoring wells will be located and from what level the samples will be taken.
The DEIS only refers to groundwater quality monitoring as being necessary for the Arizona Aquifer Protection Permit (APP). Therefore, the DEIS does not disclose to the public where groundwater quality will be monitored. The APP overlaps with the groundwater level monitoring in that the model for a “hydrologic sink [must] be updated periodically” (DEIS Appendix, p. 128); the pit and future pit lake are the hydrologic sink. This coincides with the requirement to update the groundwater model discussed above.

14. The DEIS should provide locations for future water quality wells, not just allow their location to be a part of a future APP process.

Also, any pit lake subject to evaporation will concentrate constituents in the lake by virtue of evapoconcentration.

The table presents the fact that “modeled water quality in mine pit lake meets standards”. Pit lake models are notoriously uncertain. Models at the McCoy Cove Mine, Lone Tree Mine, and Sleeper Mine in Nevada failed to predict they would either turn acidic or vastly under-predict sulfate.

There are many potential problems with disclosure in the DEIS of the potential and probable conditions to be found in the pit lake. The DEIS presents just one snapshot in time of the predicted conditions, at 200 years when the pit was at approximately 75 percent of its ultimate depth; this would have been less than 75 percent full because of there being more volume per unit depth the higher the water level becomes. The DEIS discloses that the pit lake water quality would exceed surface water standards for silver, cadmium, copper, lead, mercury, selenium, and zinc (DEIS, p 294). Sometimes, pit lake water quality can be substantially different at different times. Acid conditions can occur early if PAG rock drains into the pit before significant buffering occurs.

Pima County identified many shortcomings with the pit lake modeling and presented them to the FS in 2010 (Myers 2010). The DEIS did not improve the pit lake model in response to those comments. The following list, from the summary of Myers (2010), is of items that had not been considered or were improperly considered in the pit lake modeling:

Precipitation through Pit Walls - the model ignores precipitation that percolates through the pit walls to the groundwater table or to the pit lake as interflow. It ignores both the water and chemical loading.

Groundwater Chemistry in Pit Walls - the model ignores changes that occur to background groundwater as it flows through the disturbed rock on the pit walls to the forming pit lake.

Effects of Weathered Rock on Inflow Water Chemistry - the model does not account for the higher initial inflow of constituents that occurs due to weathering in pit wall; the tests used to determine chemistry of inflow to the pit does not use weathered rock.

Pit Wall Surface Area - the runoff model does not account for changing proportions of exposed surface area in the pit walls.

Variations in Groundwater Chemistry - the model ignores the different groundwater chemistries by treating the inflow as a simple average of eight wells in proximity of the pit.

First Flush of Oxidation Contaminants - the model ignored the first flush of contaminants resulting from oxidation of weathered wall rock.
Differential Pit Wall Formation Flow Rates - the model ignores the differential flow rates to the pit for different pit wall formations with different properties.

Oversimplification of Pit Lake Dynamics - the model assumes away simple pit lake dynamics such as the potential for stratification and seasonal mixing.

Inaccurate Estimate of Percentage of Groundwater Inflow - the report inaccurately estimates groundwater inflow as being 95% of all inflow.

Pima County’s report also included the following list of recommendations, which the FS did not consider by redoing or improving the pit lake model (Myers, 2010).

- Improved pit wall runoff estimates or better justification for the current assumptions
- Estimates of water and chemical loading for pit wall interflow
- Estimates of water and chemical loading for recharge to the groundwater table through the pit walls.
- Loads from the leaching of the fractured rock subsequent oxidation in the pit wall
- Differential inflow rates by geologic formation
- Oxidation products due to dewatering the aquifers
- Better justify their assumptions the pit lake will not stratify or they should include stratification in their model.
- Run the model using the MWMP results rather than SPLP results because dissolution is the more important process. This could be considered to provide an upper bound on the pit lake chemistry. This might help to minimize the bias introduced by using unweathered rock in the tests.
- Use input chemistry that varies with time based on the number of pore volumes of leachate that has passed the samples.
- Description of how the model accounts for changing rock-type proportions.
- The report should at a minimum discuss the evolution of water quality with time.

The DEIS should consider the following additional recommendations.

15. The FS should improve the pit lake predictions in the DEIS by considering the comments presented above.
16. The DEIS should present pit lake water quality results for 20, 50, 100, 200, and 750 years rather than just for 200 years. This would provide better disclosure of how the pit lake water quality evolves with time.
17. The DEIS should also present the effects the surface water quality exceedances could have on biological resources.

If there were 48 instances of laboratory error in detecting organic constituents, the FS should require the samples be redone at a different lab.
The DEIS (p 285) repeats this error, which affects the quality of the organic constituent analyses.

It does not seem reasonable that infiltration from waste rock be close to zero because natural recharge in this area is not zero. Blasted waste rock is almost certainly more conductive than the in-situ rock. It is also unlikely that the one-foot thick cover will result in less infiltration than the natural soil and vegetation regime.

Similarly, it is not reasonable for the seepage through a leach pad to cease. Leach pads are designed to conduct flow. All water that gets through the cover will become seepage. Based on experience, the long-term seepage through heaps in more arid climates in Nevada do not approach rates as

Experience has shown that waste rock dumps in much drier climates will have seepage.

These three comments refer to the estimates of infiltration through waste rock, which have been estimated to be near zero. These comments had been made without reviewing the waste rock seepage study.

Most of the modeling is based on Tetra Tech (2010). A separate review of that report is included below. This section responds to the cursory presentation in the DEIS.

The DEIS indicates the fate and transport studies for seepage through waste rock and tailings are being updated to reflect the peer review reports. This means the basis for the DEIS analysis may be changed and the public will not have a chance to review the updates prior to the final EIS.

The DEIS does not specify a treatment system for heap drain down, but states that two systems are being considered. How will the agency decide?

The DEIS does not discuss drain down in Chapter 2, where it describes the alternatives. It mentions that “[g]eochemical modeling of the heap leach facility indicates that conceptually at least one type of passive treatment system is capable of preventing discharge of contaminants to groundwater” (DEIS, p 296). This claim is meaningless because treatment does not prevent discharge; only a collection system that captures 100 percent of the drain down would prevent discharge. Treatment never removes 100 percent thereby eliminating the discharge. “Continued drain down ... will require collection and treatment under the aquifer protection permit; details of the technology are not yet determined” (Id.). This is another example of how the DEIS fails to disclose a very important aspect of the mine plan – how to treat heap drain down and prevent contamination.

18. The DEIS must present a plan for treating heap drain down and for closing the heaps, before they are buried in waste rock.

This table presents the results of four hypothetical scenarios for modeling the long-term pit lake chemistry. The table shows that most of the modeled constituents will be much below the drinking water standard after 200 years. The revised pit lake modeling did not take into account the recommendations for
considering all loads to the lake that Pima County had made in a previous review of the pit lake model. The exception was that the revised model considered the blasting effect creating a six-foot thick skin. See the Society of Mining, Metallurgy and Exploration book: Mine Pit Lakes: Characteristics, Predictive Modeling and Sustainability, ed. By Devin N. Castentyk and L. Edmond Eary.

The table referred to was 3.7 in the ADEIS which is Table 68 in the DEIS. The comments above regarding pit lake modeling apply here as well.

It is common to use 10 feet as the drawdown of concern for a private water well. The problem is that 10 feet could cause serious harm if it draws the water level below the most productive aquifer zones. In other words, most well logs reveal stratification much finer than the layers that are simulated in a model. Although screened over tens of feet, a majority of the water may emanate from a relative thin section. If that is within the top 10 feet of the screen, a 10-foot drawdown can be very detrimental.

A five-foot drawdown is too high of a limit to consider whether springs could be affected. The drawdown caused by this project adds to the natural variability. If a spring is naturally dry part of the year, as a little as a one-foot drawdown could cause a big difference. Springs discharging from bedrock could be significantly affected by a one-foot drawdown if it represents a change in the gradient controlling the discharge.

This section (DEIS, p 210) has not been changed, and the comments still apply. Specifically, if drawdown lowers the water table below the productive zone in a well, the well will be affected. The U.S. Geological Survey recently published a modeling study predicting 1-ft drawdown in Snake Valley of eastern Nevada (Halford and Plume 2011). They utilized 1 foot so that they could demonstrate the zones of groundwater capture; lowering the water table as little as a foot will affect spring discharge and groundwater ET. Because springs are of primary interest at Rosemont, there is no reason to not consider 1 ft drawdown as a threshold of concern.

This section describes the development of the numerical model, but ignores the important role of the conceptual model. Without an accurate conceptual model, a numerical model is wrong, EVEN IF IT REPLICATES THE OBSERVATIONS CORRECTLY. An accurate conceptual model helps to make the numerical model unique.

It is incorrect to equate verification with validation. Validation is the process of completing a post audit on the model to determine whether it was accurate years after being used for decision making. See Anderson and Woessner, 1992, Applied Groundwater Modeling, page 9.

It is true that “unverified” models can be used for predictions. However, it should be noted that even if the model were verified by showing it accurately simulates conditions over a period of years even with observed local pumping, the mine construction and dewatering will stress the aquifer far beyond the range of calibration or verification. This is more important than the uncertainties caused by running the simulations far into the future. The DEIS should make this clear because it represents how uncertain the model predictions actually are.
Pima County also completed peer review of the groundwater models. The DEIS should list the major problems with the models that the county identified.

It is inappropriate to use a model for which a new sensitivity analysis has been requested because that sensitivity analysis could show the model to be conceptually wrong. The Pima County review of the Tetra Tech model also raised the issue of the porphyry dike. Geology maps suggest the porphyry dike is not continuous but TT modeled it as though it is. There must be hydrologic data to justify the use of such a feature that is a major impedance to flow – impedance that limits the effect of the mine on downstream features.

The review of the groundwater models is too cursory. The write-up provides no adequate description that the public could understand, yet in its attempt to explain the models it uses terms that only a modeler would understand. For example, the term “boundary” immediately conjures an image to a member of the public but that image would be very incomplete regarding these models because in a numerical model boundary means to set certain conditions regarding

One of the ways the ADEIS compares models is to discuss boundaries. It would be useful if the ADEIS presented some guidelines as to how the boundaries are selected, to aid in comparison. From Anderson and Woessner (1992), p. 100, “It is advisable to select physical boundaries whenever possible...A two order of magnitude contrast in hydraulic conductivity may be sufficient to justify placement of an impermeable boundary...”

It would be more accurate to refer to “Withdrawal Sinks”. A “Source of Withdrawal” seems a contradiction in terms. Hydrologists refer to sources and sinks.

These comments on the ADEIS all refer to the way the DEIS presents the groundwater modeling effort. The DEIS has removed the reference to verification being the same as validation, but they fail to acknowledge how the stress to be caused by dewatering exceeds any transient stress observed to date. It also acknowledges having received a peer review from Pima County. The DEIS descriptions of the groundwater models has not increased or improved in any meaningful way from the ADEIS.

One comment concerns the modeling of the porphyry dike in the Tetra Tech model. The ADEIS indicated that a sensitivity analysis of the dike “has been conducted and is currently being reviewed”; the DEIS repeats this section verbatim (DEIS, p 223). Even though more than three months passed between the ADEIS and DEIS, the FS failed to include the results of the sensitivity analysis of perhaps the most important conceptual feature in the Tetra Tech model.

The DEIS should include results and responses to the peer reviews completed by Pima County regarding the groundwater models; Myers (2011) reviewed both the Montgomery and Tetra Tech models and compared them with the Myers (2010) model, prepared for Pima County (and discussed in the DEIS). The following excerpt of summary points from Myers (2011) have specifically not been considered in the DEIS nor have been responded to in any substantial way by the modelers. M&A is Montgomery and Associates.
• The Tetra Tech model includes a horizontal flow barrier (HFB) simulating the quartz-porphyry dike damming off the groundwater flow from the upper reaches of Davidson Canyon to the lower parts. Neither M&A nor Myers included this feature and it is not supported by the data. Comparisons of drawdown figures show that it limits the extent that drawdown reaches down Davidson Canyon.
  o Without specific data showing the hydraulic effect of this feature, Tetra Tech has not justified its use; at present, the model is a good interpretative model of what would occur if there were an impervious and horizontally and vertically continuous dike at that location. Specific data could include cores of the dike, geophysical tests, or aquifer tests with monitoring wells up- and downgradient of the dike.

• The M&A model directly simulated the new Backbone and Flat Faults with specific parameter zones to simulate these features. The primary difference between the conceptualization of these parameter zones with the other zones in the model was in anisotropy – M&A allowed for a higher north-south and vertical conductivity. The vertical conductivity allowed recharge to circulate more deeply, which is supported by the idea that the Questa Spring has 1000-year old water. Both Tetra Tech and Myers had conductive zones on the west side of the proposed pit, but neither specifically analyzed this as a feature; nor did they consider the Flat Fault.
  o Simulating these features is justified by the data; its effect on the long-range predictions is unclear.

• Tetra Tech's model allows much more groundwater inflow through its boundaries than did M&A, although each model had boundaries in the same locations.
  o Tetra Tech did not appropriately constrain its calibration with flow data which allows this additional groundwater inflow. The simulation of this excess groundwater inflow is not supported by any data or geologic mapping.
  o The inflow should be constrained by an estimate of recharge that would have occurred between the model domain boundary and the basin boundary.
  o The excess groundwater inflow in the Tetra Tech model may limit the expansion of drawdown into the Cienega Basin.

• Tetra Tech has much more steady state recharge near and above the pit than does M&A. They simulated in excess of 0.53 in/y all along the crest; they essentially forced water into non-receptive bedrock. M&A had simulated similar rates over the Backbone fault but near-zero rates over the granodiorite (pCb) outcrops along the crest of the Santa Rita Mountains. Myers' rates were high near the fault zone but very low south along the ridge near the granodiorite outcrops.
- The extra recharge as simulated by Tetra Tech provides more water nearer to the proposed pit. This extra water entering the pit area from the west would limit help to fill the groundwater deficit created by dewatering and pit development. It may limit the extent that drawdown moves downgradient into Davidson Canyon.

- The simulation of recharge near and through the mine facilities is a large difference between Tetra Tech's and M&A's model. Tetra Tech has reasoned there would be about 75 af/y more recharge after than before mining; M&A has reasoned that recharge will decrease by a similar amount.

- Both estimates are inaccurate, but Tetra Tech's estimate provides additional water that helps to satisfy the pit lake deficit which decreases the predicted impacts due to pit lake development downstream in Davidson Canyon.

- The Tetra Tech and M&A models used the same rectangular domain with head-controlled flux boundaries on most sides.

- Most modeling guidance suggests that the boundaries of a model should be at a point where conditions are known; usually this means the boundaries coincide with a topographic divide or significant change in formation. The ideal is for the boundaries to be a flow line, except for specified inflow and outflow reaches at locations where the flow is constrained.

- M&A and Rosemont should implement a much more extensive analysis of the intrusive rock formations west of the pit to determine whether impacts will extent westward, or not, and whether the model boundary should be on the topographic divide.

- Myers had modeled the region between the topographic divides, and this would have been preferable for both Tetra Tech and M&A because it is preferable to simulate boundaries at locations where conditions are known.

- Both models used the same grid discretization; however 200-foot spacing near the pit may be more detailed than the understanding of the hydrogeology justifies. Smaller grid spacing should not be interpreted as providing more accurate or more precise model results.

- M&A used ten and Tetra Tech used twenty model layers. The only advantage Tetra Tech gained would be improved mathematical solution near the pit whether the gradients are steep.

- It is not likely they know the details of the formations accurately enough to justify the vertical precision added by the additional layering. Even if they did know the formation depths and thicknesses perfectly, they assumed the same parameter values applied to the entire formation, so they did not
take advantage of the additional precision obtained by detailed geologic mapping.

- Both the Tetra Tech and M&A models are run for 1000 years after which time the pit lake is close to equilibrium. Myers (2010) ran his model for 7500 years after which the pit lake level is essentially stable at a level about 300 feet lower than the other two models. Myers’ water level is lower because he simulated more volume at depth in the pit lake.

- Each model based their parameter zones on the ten hydrogeological units determined from the geologic mapping. Tetra Tech determined just one parameter zone for each unit, adding just two during calibration – for the Backbone fault and for basin fill in the Tucson basin. M&A allowed the parameter values to vary within a zone.
  - Because there are sufficient monitoring wells to justify this and to achieve an adequate solution to the solver, this is preferable and gives a more accurate representation. Myers divided his original zones into 36 units.
  - The following table suggests that Myers’s steady state solution was more accurate, based on the absolute value of the standard deviation. The percent that standard deviation was of the range was not as low for Myers because his simulation did not include the low elevation areas in the Tucson basin, so the range was just 1100 feet.

<table>
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<tr>
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<td>26.2</td>
<td>11.3</td>
<td>-1.18</td>
<td>-4.8</td>
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<tr>
<td>Absolute Res. Mean (feet)</td>
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<td>61.0</td>
<td>97.7</td>
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<tr>
<td>Standard Deviation (feet)</td>
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<tr>
<td>Std. Dev./Range of Obs Data (%)</td>
<td>2.8</td>
<td>2.8</td>
<td>4.6</td>
<td>4.5</td>
</tr>
</tbody>
</table>

* - unweighted calibration

- The Myers model is most unique because it was constrained for flow into and out of the domain. The other two models could have had the same calibration statistics with different flows because the inflow was not constrained.

The predicted drawdown cones for mine dewatering and pit lake development provide a vivid example of how the differences between the models affect the simulation results.

- Tetra Tech Figures 8-5, -10, -11, -12, and -13 show the 100-, 10-, and 5-foot drawdown contours for the end of mine and 20, 50, 150, and 1000 years after mining. M&A Figures 110, 111, 112 and 113 show drawdown contours at the end of mining, and 20, 150, and 1000 years after mining ceased.
• At the end of mining, the Tetra Tech model had predicted the 5-foot drawdown had expanded further than had the M&A model. Tetra Tech’s 5-foot drawdown contour approached the dike and contained the Questa Spring. However, the M&A 100-foot drawdown contour had extended further north along the ridge than had the Tetra Tech 100-foot drawdown contour.

• Twenty years after mining had ceased, the Tetra Tech drawdown, defined by the 5-foot drawdown, continues to be more expansive than in the M&A model. It has reached the quartz-porphyry dike. However, the M&A 100-foot drawdown contour covers a larger area.

• After 50 and 150 years, the quartz-porphyry dike defines the downstream location of the five-foot drawdown in the Tetra Tech model while in the M&A model the five-foot drawdown has extended about three miles further downstream.

• After a thousand years, the Tetra Tech five-foot drawdown is about a mile past the dike while in the M&A model it is about five miles further downstream, within a mile of Interstate 10. Even after 1000 years, the Tetra Tech 100-foot drawdown is only about half as extensive as is the M&A 100-foot drawdown.

• The drawdown cone is much more circular in the Tetra Tech model for all time periods. This reflects its simpler parameterization with just one conductivity value for each hydrogeologic unit. Tetra Tech did not consider heterogeneity within the parameter zones. M&A drawdown contours are more convoluted, following the different parameter zone values. The M&A results show the drawdown may be more complicated than expected from the simple conceptualization modeled by Tetra Tech.

• Drawdown in both the Tetra Tech and M&A models extends west of the Santa Rita ridge crest. Both the Tetra Tech and M&A models had conceptualized a connection with the west side, even though the granodiorite has low conductivity and the deeply dipping Paleozoic rock in which the pit is constructed may not be connected in a significant way to the formations on the west.
  o Allowing this connection allows the dewatering and pit lake development to draw water from areas west of the ridge that may not in reality be connected to the pit. This extra water provided to the pit introduces a bias in both models and limits the distance the drawdown extends down Davidson Canyon. If the models had not included this connection, the drawdown in Davidson Canyon may have been larger.
  o Myers’ model did not simulate this connection because it had set a boundary at the ridgeline based on the geology and topography.

• Myers’ model simulated drawdown in Davidson Canyon to about the same distance as did the Montgomery model. His model simulated drawdown further
into the Cienega basin than did either of the other models because he simulated more connection between the bedrock and basin fill in that basin; he also constrained the flows through that basin based on the flows through the Narrows — Tetra Tech did not. Because there are no hydraulic data showing no connection — the pump tests were much too short — impacts into Cienega basin could occur.

Myers (2011) expands further on these points, with the following recommendation.

- The granodiorite intrusive rock west of the pit should be drilled to conceptualize the extent of fracturing. This would verify whether this area should be treated an impervious boundary or as a source of water to the model. Without such investigation, the model boundary west of the pit should be the ridgeline and should be no flow.
- Rosemont should conduct test of the quartz-porphyry dike that crosses Davidson Canyon. This should include several boreholes to assess its density and thickness. The tests should include long-term pump tests with multilevel pumping on one side and multilevel monitoring on the others; the design could be similar to the long-term pump test completed near the pit. This test would help determine at what levels the dike is a flow barrier, if any.
- The long-term pump test should be redone, possibly in multiple stages. The wells should be pumped from specific layers, not over all of the screened lengths and different geologic formations at the same time.

The description of different water levels for shallow and deep wells would be enhanced with a map showing groundwater contours for shallow and deep wells. That way the reader would get a sense of the vertical gradient and its variation across the area being discussed, and how big that area is.

The DEIS does not consider different groundwater contours maps for different well depths. Such a map would show vertical gradients, which provides information on recharge and discharge areas. Such analysis is critical for writing a conceptual model of an area.

19. The DEIS should include a map of groundwater levels for both shallow and deep wells, for both sides of the project area. The DEIS should also reconsider the conceptual model for the area in consideration of the vertical flow paths.

The description in the previous paragraph is an "indication of a perched shallow ground water aquifer". The ADEIS should provide longer-term hydrographs to demonstrate whether the shallow wells follow the trends in the deeper wells or whether there truly is a disconnect.
This comment referred to observations concerning shallow wells on the west side, near the Rosemont production wells. The description refers to water levels "in the shallow residential wells" being "approximately 60 feet higher in the area on the west of the Rosemont Copper property" (DEIS, p 232). The DEIS states the "variation in water levels reflects complex subsurface aquifer units and a dynamic aquifer system" with "groundwater movement ... controlled by location and quantity of groundwater recharge and discharge" (Id.). This certainly does describe a potential perched system.

20. The DEIS should identify areas of perched groundwater tables on the west side and discuss what pumping at the Rosemont property means for those areas.

Figure 3.3 presents groundwater contours, not "ground water level measurements". Also, it should state whether the contours are from measurements or the steady state solution to a groundwater model. The domain shown in Figure 3.3 looks like a model but neither the caption nor the texts specifies the source of the contours.

The DEIS changed the description in the text to reflect the figure showing contours based on measurements rather than the "measurements."

It is not correct to say "almost no hydrogeologic information" existed prior to 2008. There were several studies available from the time the mine was almost developed in the 1970s.

The DEIS changed the description to reflect that they commenced an intensive hydrogeologic investigation in 2008 rather than saying no information existed prior to that time.

The ADEIS should provide estimates of the amount of groundwater in bedrock v. the amount in fill and alluvium. This would provide some context to the amount of water to be removed by dewatering.

The DEIS does not address this comment, thus the reader still has no context with which to judge the predicted amounts of dewatering. The bedrock aquifers are clearly much larger than the alluvium along the channels, but the relative amount of water stored in each may be more similar.

21. The DEIS should estimate of the amount of groundwater in both the bedrock and alluvial aquifers. The discussion on DEIS p 236 is a necessary beginning, but is strictly qualitative.

22. The DEIS should also discuss how dewatering affects each of these aquifers, both qualitatively and quantitatively.

The differing domain sizes are a reason to provide maps of the model domains.

The DEIS does not include maps of the model domains.
Are these groundwater contours in bedrock or fill? If not specified, there is an implication of direct connectivity between bedrock and fill that may not really exist.

It would be useful for the figure to label the springs.

This referred to ADEIS Figures 3.4 and 3.5. Figure 3.4 is now Figure 31 in the DEIS. The figure label has not been changed, but the figure now shows two fault zones. Figure 3.5 is now Figure 35, and the map does now label many of the springs.

23. DEIS Figure 31 should specify whether the contours are for the bedrock or basin fill aquifers.

It is good to have shown how far the drawdown expands even after pumping ceases. This needs to be considered in any mitigation required for this area.

Most of the proposed mitigation and monitoring does not include plans to monitor water levels for a long period after the mine closes. As the pit lake fills, water will be drawn from a long distance.

24. The monitoring plan effectively should be planned, and funded, to operate in perpetuity.

The ADEIS notes that they couldn't use all of the models at all locations and times. This primarily refers to the fact that the Myers model, provided by Pima County, did not have output for desired time periods. Had the Forest Service informed Pima County that the model was going to be use, it would have been a simple process to provide the desired maps or drawdowns at specific points.

The FS did not request updates or new maps from Pima County for the DEIS.

The figure shows 5-ft drawdown 20 years after mining ceases for the Tetra Tech and M&A models. These drawdown contours demonstrate vividly why the boundaries both models used were inappropriate. As the ADEIS correctly notes, the core of the mountain west of the pit is an intrusive rock, mostly impermeable. By setting their GHB boundaries far west of the ridgeline, the models inappropriately draw water from the west side of the ridge, as shown by the drawdown cone extending in that direction.

These figures also show drawdown for areas west of the divide and the previous comment continues to apply. However, at these later dates when the flux from the pit lake controls the amount of water drawn toward the pit lake, allowing water to draw from west of the divide biases the result toward underpredicting the effects downgradient in Davidson Canyon. The bias is caused by the pit lake evaporation drawing water from an area that in reality will not contribute flow to the pit — the area west of the divide. The bias is toward less water drawn from downcanyon which decreases the predicted drawdown in that direction.

There has been no change in this for the DEIS. In fact, this concern continues in DEIS Figures 41 through 44. These figures show the model domain and that the five-foot drawdown reaches the model boundary after 150 years (Figure 43). If the
conceptualization that flow on the west side of the mountain could satisfy pit lake deficit requirements is correct, the west model boundary would not be far enough from the mine. However, because the mountains are essentially impervious and the mine is above the valley to the west of the mountains, the boundary is misplaced; as discussed in Myers (2011), the west boundary should be a no-flow boundary to better simulate area geology. The assumption made here would limit the extent down the Davidson Canyon that the projected drawdown extends.

25. The DEIS should present results from revised modeling that uses proper boundaries on the west side of the project area. This issue is further discussed in Myers (2011).

This figure is redundant because the monitoring points are shown on the drawdown map, where they are more instructive.

The figure has been removed from the DEIS.

The table indicates that Myers (2010a) does not include 50-year drawdowns. That is not correct. Figure A.7 in that report does include 50-year drawdown for layer 4.

The DEIS has corrected this error.

These figures and tables are misleading because they do not present which model layer was used for the data. This is important when considering drawdown at a point. Consider Rosemont Spring. This spring may discharge from bedrock fractures, therefore drawdown in the bedrock controls the discharge from the spring. The Myers model presented drawdown in the fill (layer 1) and bedrock (layer 4), but the others did not. The tables, where they present Myers’ drawdown values, do not specify the model layer used.

The DEIS has corrected this error in both figures and tables.

Drought will also cause low flows, but this statement is irrelevant in this context unless the ADEIS emphasizes that drawdown will make the drought conditions, for a given natural return interval drought, much worse.

The statement remains in the DEIS. Drawdown will only exacerbate natural drought conditions.

The ADEIS mentions artificial recharge as a means to mitigate the drawdown cause by pumping process water. The artificial recharge should be simulated with the groundwater model to demonstrate its effectiveness and demonstrate whether the groundwater reservoir can accept the water. If the recharge site is outside the model domain, another model could be necessary because the recharge will be of water volumes commensurate with the amount being pumped. The statement here counters the lines referenced in the previous comment. This states that recharge will occur “far from the influence area of the mine water supply wells”, which is counter the mitigation measure of placing the recharge in the drawdown cone of the wells.
These comments pertain still to the DEIS, but was meant to apply to the mitigation of recharging with Central Arizona Project water. It is understood that artificial recharge may occur far from the point of production. The effectiveness of this mitigation cannot be determined without knowing the location of recharge. Merely recharging it into the same basin as the production water is being pumped from may help to balance the basin-wide water budget, but not remedy the drawdown near the Rosemont production wells.

Other Hydrologic Issues Not Previously Raised

This section considers issues in the DEIS that have not previously been raised, either by comments on the ADEIS and discussed above, or by Myers (2010a, b, or c, 2011). Specifically, the groundwater models have been reviewed elsewhere (Myers 2011). Comments herein are specific to the discussion in the DEIS.

Groundwater Quantity

1. Edit Figures 29 and 30 to show bedrock and alluvial aquifers evaluated the basins considered and the delineation

The DEIS refers to the bedrock and alluvial systems as one regional aquifer (DEIS, p 206). This is wrong in several ways, most specifically in that the connection between bedrock and alluvium is not well established. The comment in the previous section regarding relative amounts of water in each system would be illustrative here. Figure 29 does not demonstrate that “fractured rock and basin fill form the regional aquifer of that groundwater basin” (Id.); the figure does not even highlight a groundwater basin, although it does show the study area boundary (which is not the same as the basin).

2. Adjust Issue 3a to include a comparison of the pit lake volume to the water budget of the basin.

Issue 3a (Id.) is a relatively complete list of factors to consider on the east side. However, it should include a comparison of the pit lake volume to the water budget of the basin, because having a pit full of water essentially removed from the groundwater system is a huge deficit for the basin that will affect water resources for eons. DEIS Table 47 compares the pit lake loss with the water budget, but also fails to consider the total volume as having been drawn from the basin water budget.

3. Add to Issue 3b a comparison of the amount of water proposed to be pumped with the basin water budget.

4. The DEIS should compare the pit lake volume to the water budget of the basin and to consider the total pit lake volume as having been drawn from the basin water budget.

5. The DEIS also should compare the current and proposed pumpage for the Upper Santa Cruz sub-basin to the basin water budget.
Issue 3b (DEIS, p 208) also leaves off a comparison of the amount of water proposed to be pumped with the basin water budget. As a proportion of the basin, it is useful to compare the proposed action with the water availability, or the perennial yield of the basin. This is mentioned on DEIS, p 210, however. The DEIS also compares the proposed pumpage with total pumpage in the Upper Santa Cruz sub-basin (DEIS, p 253). Without a discussion of recharge or the amount of water available, these comparisons with existing pumpage do not provide much information. Full disclosure requires that the DEIS include information about the water budget of the basin for pumpage information to be useful.

The temporal bounds used for analysis (DEIS, p 209) is adequate, although the DEIS should acknowledge that true equilibrium in the Davidson Canyon region took much longer, as discussed by Myers (2011).

The thresholds for concern are poorly delineated however. Regarding the depth of drawdown, this was discussed in the previous section. The grouping of qualitative thresholds, major, minor, possible, and unlikely (DEIS, p 210) leaves out the category of major reduction in flow but with some significant uncertainty. The grouping considers a reduction to be major only if it can be estimated with “high certainty”. The point of monitoring and mitigation, discussed elsewhere, is to watch for and plan to mitigate the possible significant impacts.

6. Conduct a comprehensive geochemical and isotopic study for full disclosure to identify spring source and potential to be impacted by mining activity.

All springs, for example, that fall within any drawdown prediction, are at risk of being dried or having their flow significantly reduced. The uncertainty depends on whether the springs are perched. There is a decent description of the potential sources (DEIS, p 237), but no attempt to assign a source to a specific spring. Table 50 lists numerous springs and describes the discharge, but does not attempt to identify the source. The agencies did not complete a geochemical study, including isotopes, regarding these springs, so there is no way to really determine whether they are perched. The agencies should not allow a threshold to be considered as less than major as a result of a failure to collect easily available data. Myers (2008), on behalf of Pima County, had recommended collection of this type of data to better understand the springs. Some had been reported in Tetra Tech (2010a), but the DEIS should present a summary of this discussion and how isotopes can help to characterize the springs. Also, isotopes could be used to better assess the sources of more of the isolated springs which are considered as unknown sources. The agencies have failed to collect easily available data and have therefore failed to disclose essential information about the springs - which ones are most susceptible to the proposed project. Merely stating that “all identified springs were assumed to exist and have the potential to be impacted” (DEIS, p 237) is not adequate disclosure.

7. The FS should have finished its review of groundwater model data before publishing the DEIS.

The FS is currently considering the electronic data files for two of the three groundwater models being use in the DEIS. They claim they are still reviewing the models “for
consistency with the published reports” (DEIS, p 212). If the reports are inconsistent with the models, the DEIS will have been based on incorrect data and/or reports.

8. Combine the model for the east side with the model for the west side so that combined effects can be considered, if the agency and consultants continue to believe the west boundary of the models have been appropriately conceptualized

One issue with groundwater modeling not previously raised is that of overlap between the impacts of the west and east sides. Previously, in Myers (2011) and in the section above, I had discussed the inappropriateness of the model boundary west of the Santa Rita ridge crest; it should have been a no flow boundary. If and only if the boundary as conceptualized by the two consultants is correct and the 5-ft drawdown actually reaches the boundary on the west (see discussion concerning the groundwater models above and in Myers (2011)), there is a potential for drawdown from Rosemont production water pumping on the west side to overlap with that from the east side.

The DEIS reports that Tetra Tech tested the sensitivity of their model to different types of boundary conditions on the west side, changing from constant head to general head and no flow boundaries. They found little difference between constant head and GHB boundaries, as one should expect if the GHB conductance values are similar to the conductivity in the formation adjacent to the boundary. They found the no-flow boundary “to cause conditions that could not be feasibly modeled” (DEIS, p 223). That is also, of course, correct, because a no-flow boundary only works along a flow line or at a groundwater divide, which in this case should coincide with the Santa Rita ridge crest (Myers 2011).

9. The DEIS should better explain the reasoning for accepting a poor calibration for the West side model, or have the model recalibrated; and the calibration needs to be more fully explained.

The DEIS presents a few basics about the west side model, which is apparently an adaptation or modification of an Arizona Department of Water Resources model (DEIS, p 213). I had not reviewed this model for Pima County. However, as reported in the DEIS, Montgomery and Associates apparently telescoped the active management area model, and then tried to fine-tune the calibration for the area near the proposed Rosemont pumping. The DEIS presents some calibration statistics (p 213, 214), but does not explain them. They presented statistics from a transient calibration they had completed. It is difficult to understand the statistics without knowing the time step or how many residuals are obtained from one observation well. Even with those reservations, a residual mean of 20.7, absolute mean of 21.66, standard deviation of 25.26 or standard deviation/range of 10 percent is not very good. It is not understandable why the peer reviewers would accept such a poor calibration.

10. Show the inflection point northeast of the pumping mine wells (figures 39 and 40) that fully describes the zone of capture for the extraction wells

The drawdown maps for pumping the west side show that the mine water pumping would cause a drawdown of up to 70 feet after 20 years of pumping (DEIS, Figure 36). This drawdown caused the overall drawdown, due to all pumping in the area, after 20
years to be more than 50 feet greater than had been projected without the project pumping. Because the aquifer is unconfined, drawdown is not a linear response, but the figures show that drawdown is almost additive among sources (DEIS, Figures 37 and 38). The water level contour maps show that water will flow toward the wells from all directions.

11. The DEIS should include drawdown maps for existing conditions for the West side model.

The DEIS notes that the Montgomery model already includes projections for future development in the area, so the higher drawdown amounts are those that would occur with the project and projected growth (DEIS, p 276).
The Forest Service was correct to require the west side model be run for 140 years to assess the full expansion of the 10-foot drawdown (DEIS, p 251). The drawdown would continue to expand and encompass a much larger area than at the end of mine pumping.

12. Change “mine water supply pumping” to “pit dewatering pumping” in specific factors, p.253

The DEIS describes a list of “specific factors” regarding the impacts on the east side of the mountain due to the pit, but states these impacts result “from mine water supply pumping” (DEIS, p 253). This is incorrect as mine water supply pumping occurs on the west side and does not include the factors listed.

13. The DEIS fails to use available updated modeling information for some results

The DEIS presented results for the three different models for a group of different areas (DEIS, p 258). The areas are springs and stream reaches. Rather than just presenting drawdown for these areas, the FS should have requested the authors of the models to present either groundwater discharge changes or specific drawdown amounts. Rather than presenting what the models presented, the FS could have made the DEIS results comparative among models by actually requesting that various components be simulated (DEIS, p 262). For example, the Myers model (Myers 2010) could have been altered to present flows to Cienega Creek or could have been queried to show the results for the 2010 version (Id.).

14. The DEIS needs to quantify reduction in ephemeral flow in perpetuity and the DEIS is inadequately disclosing the impacts that the proposed mine could have on spring and streamflows in the canyons. Changes in ephemeral flow need input into models.

Runoff predictions “indicate that outflow of Barrel Canyon will decrease by approximately 23 to 46 percent ... as a result of capture by mine facilities” (DEIS, p 264), that the reduction of ephemeral stream flow near “Reach 2 Spring and Escondido Spring ... is predicted to be approximately 10 percent” (Id.), and that “some reduction in ephemeral flows would persist in perpetuity” (Id.). The DEIS has not disclosed what the estimate for reduction in ephemeral flows in perpetuity would be. Also, the DEIS has not considered the roll that reduction in surface flow would have on springs associated with the alluvial
drainages due to a reduction in runoff recharge. None of the groundwater models accurately address the details of changing recharge of ephemeral runoff, because they all simply consider annual recharge in steady state, therefore the DEIS is inadequately disclosing the impacts that the proposed mine could have on spring and streamflows in the canyons.

15. The DEIS misstates the reduction of ephemeral flow as a result of mining impacts to lower Davidson Canyon.

The DEIS misstates the impacts to lower Davidson Canyon, where it suggests that the 10 percent decrease in ephemeral flows that feed the Reach 2 Spring, “would lessen following mine closure” (DEIS, p 264, 265). This contradicts the discussion (DEIS, p 264) and in the previous paragraph wherein the reduction could be 23 to 46 percent and the recovery would be to about 10 percent. If the report cited in the DEIS is correct (DEIS, p 265), the proposed mine could have substantial effects on spring flow associated with the alluvial channels and ephemeral runoff.

16. The DEIS inaccurately discloses the effects that the proposed mine could have on mountain front recharge.

The DEIS inaccurately claims that the proposed mine would have just a 1 percent reduction in mountain-front recharge (DEIS, p 267). That is not possible with the runoff reductions just cited above; the DEIS inaccurately discloses the effects that the proposed mine could have on mountain front recharge.

17. The DEIS fails to properly disclose the relative differences among alternatives.

The DEIS is also incorrect in stating that the effect of the various alternatives on mountain-front recharge is the same (DEIS, Table 8, p 98). Because the different alternatives involve size facilities, the recharge quantity intercepted by each would vary among alternatives.

18. The DEIS should present drawdown predictions for the different alternatives for which the recharge changes have been considered. The DEIS currently fails to disclose the differential impacts caused by intercepting mountain-front recharge at different points around the mine.

Additionally, simple consideration of the difference in mountain-front recharge is not sufficient to demonstrate the impacts of the alternatives. Recharge helps to replenish the deficit created by dewatering, so recharge further from the site replenishes the deficit slower than recharge at the site. Although the area covered by the different alternatives varies, the more significant difference could be due to location of the covered areas in relation to the pit and predicted drawdown. Preventing recharge in a zone within the pit’s capture zone may slow the recovery but also limit the overall extent of the drawdown; alternatively, preventing recharge outside the pit’s capture zone, especially early in the mine life, may extend the drawdown beyond that predicted.

19. Mitigation Effectiveness does not address protection of mountain front recharge. Pit refill could solve this issue.
The only substantive, non-monitoring-related mitigation is for the surface water diversions to be designed consistent with topography, which "is pertinent because the springs ... have their source from storm flow stored in shallow alluvial sediments" (DEIS, p 276). This is important, but certainly not sufficient to protect mountain-front recharge. The waste rock and tailings may effectively divert runoff from the channels for a long time.

20. The description of irreversible and irretrievable impacts to groundwater quantity is incomplete (DEIS, p 278). Pit lake water stored is lost to the system. The DEIS should disclose the amount of water in the pit lake as an irretrievable loss to the groundwater system.

The description of irreversible and irretrievable impacts to groundwater quantity is incomplete (DEIS, p 278). The DEIS properly acknowledges that Rosemont's proposed pumping of 113,400 af is irreversible because the proposed mitigating recharge of CAP water would occur far from the mine water supply wells. The DEIS implies these losses are retrievable due to water level recovery after the mine operations cease; the DEIS apparently incorrectly states "these impacts are irretrievable" (Id.). The DEIS only accounts for the water actually pumped for dewatering during operations or lost to evaporation from the pit lake as a loss.

21. The DEIS has failed to provide an adequate disclosure of the potential pit slope failure issues after operations cease.

One groundwater quantity issue discussed in the Geology section is that of pit wall stability (DEIS, p 133). The DEIS does not present an analysis or assess the risk beyond saying that it will be addressed by numerous programs, including the "pit slope and catch-bench designs, dewatering programs to depressurize the pit walls, and routine monitoring programs" (Id.). The designs are not described, nor are the monitoring programs. The proposed Rosemont pit is very deep and the shape is circular; the pit walls are steep. As the groundwater levels recover, slope stability issues could occur, thus the concerns occur after operations cease. Pit walls sometimes fail as pit lakes form. These failures present water quality concerns for the pit lake; wall failures were not considered a part of the pit lake analysis.
Groundwater Quality

22. The DEIS should consider in more detail whether there are periods during which the forming pit lake may not be terminal.

The preferred action, and all of the action alternatives, would allow a pit lake to form in the pit once dewatering ends to create a terminal sink with groundwater and contaminants from most mine facilities flowing towards it. When the pit lake approaches steady state, it may be terminal in all areas. However, as it fills, it is possible that groundwater flowing in from one area may flow out through a different area. This would occur if the groundwater level recovery is different on different sides of the pit. There is a substantial possibility that the groundwater level on the east side would recover faster than on the west side because of a substantially larger area supporting the east side. However, because of the modeling conceptualization extending the model domain west of the Santa Rita Crest, could cause groundwater levels to recover unrealistically quick.

23. Pit lake modeling should be more sophisticated and consider the water quality discharging from portions of the waste rock dumps that consist primarily of the different rock types.

DEIS Table 65 provides the water quality expected from waste rock seepage. The seepage chemistry is a weighted average of the chemistry as determined using a meteoric water mobility procedure (MWMP) (Tetra Tech 2010). The values are weighted according to the proportion of different rock types expected to be placed as waste rock. The error with this is that it assumes perfect mixing of the different rock types. This should not be used for modeling in the DEIS. The preferred method is to estimate the flow rate and chemistry draining from various portions of the pit wall.

24. The FS should assume its responsibility for avoiding degradation to the resources it manages rather than delegating it to other agencies.

In general, the DEIS apparently relegates protection of the aquifer to the Arizona Department of Environmental Quality. While that department surely has responsibility, the Forest Service cannot forgo its responsibility to avoid degradation to the resources it manages. Those resources include springs and streams, so the FS should assume more responsibility that is apparent in this DEIS.

Also, in general, the DEIS relies on the pit dewatering and forming pit lake to capture any seepage before it escapes the mine area (DEIS, p 290). The pit lake and pit lake model was discussed above and the report (Myers 2010b) reviewed the pit lake model in detail.
Surface Water Quantity

The DEIS correctly identifies the two major factors that could change surface water flows (DEIS, p 296). The proposed mine facilities would alter the topography which could lead to significant alterations of the surface water flow regime. Also, the pit dewatering and pit lake formation could divert flow from surface springs and discharge to stream baseflow.

25. The failure to consider ephemeral channel recharge is an unacceptable failure to disclose an impact caused by the project.

DEIS Table 69 shows the reduction in the volume of stormwater flow and in the 100-year, 24-hour peak flow from the project area could be very substantial, exceeding 45% for the proposed action and ranging from 23 to 50% for the alternative action scenarios. The table acknowledges that the “reduction in recharge” has not been determined. DEIS Tables 82 through 86 show the reduction in flow volume is from 1407 af/y to 762, 784, 932, 816, and 1086 af/y for alternatives 2 through 5, respectively. Because much of the runoff becomes recharge along the stream channel both above and below the model point, the proposed project could have an exceptional impact on mountain-front recharge, which includes recharge further north in the Cienega watershed from the Davidson Canyon.

26. The DEIS should include estimates from PRISM for the different sites to better estimate the precipitation to be expected at the site.

As part of the surface quantity section, the DEIS reports the different estimates for precipitation at the site. Tetra Tech (2010) claimed that the 1971-2000 estimate for the Santa Rita Experimental Range, 23.41 in/y, was too high and chose to use the lower Rosemont estimate, 17.12 in/y, because it was closer to other estimates (shown in Table 71)(DEIS, p 303). The difference is that the differences are potentially due to different periods of record. It would be preferable to use PRISM methods to estimate annual precipitation at this site because it accounts for elevation, aspect, latitude and other parameters that may affect precipitation.

27. Funding the Barrel Canyon gage for 5 years is insufficient because the effects would occur long after this time period. Also, this is monitoring without a plan to mitigate flow losses, if they occur.

Surface Water Quality

28. Scour must be considered in the DEIS for a complete disclosure of impacts.

The primary changes to surface water quality, other than the pit lake, concern sediment transport and scour. The DEIS predicts the sediment yield from the watershed could be decreased substantially in relation to the decreased runoff volume. However, there was no runoff sediment data collected (DEIS, p 337), but the DEIS reports results of a sediment yield model that includes an estimated concentration. The model would certainly benefit from some calibration data. Also, the DEIS reports that “[m]odeling of
aggradation or scour effects resulting from the project may be conducted prior to the FEIS. Here, the FS is proposing to disclose predicted aggradation or scour as part of the FEIS, at which point the public would not have adequate time to review it.

29. The DEIS should much better analyze the sediment/runoff routing through the site so that the DEIS presents full disclosure of potential impacts.

Overall, the reduction in sediment yield is based on the reduction in runoff. Based on that, the DEIS appears to conclude there will be no significant aggradation or degradation resulting from the change (DEIS, p 338, 339). Reality depends on peak flows, which are also predicted to decrease. However, the whole analysis is based on major assumptions concerning the source of runoff. It may be likely that some storms will generate much more runoff from some areas and the combination of runoff and lack of sediment could cause aggregation.

30. The DEIS must describe the proposed encapsulation of potentially acid generating rock in Chapter 2.

Encapsulation of potentially acid generating rock is a mitigation measure proposed to avoid acid mine drainage (DEIS, p 347). It is barely mentioned in Chapter 2 where the alternatives are described.

REVIEW OF SPECIFIC SUPPORTING DOCUMENTS

The DEIS depended on the output from three groundwater modeling studies. Those studies relied to an extent on predicted future recharge through the mine facilities. The DEIS also relied on predicted seepage through those facilities when considering potential groundwater pollution. The studies Tetra Tech (2011 and 2010c) present the results of the fate and transport studies for the waste rock, tailings impoundment, and heaps which is then used for the DEIS analyses. This section reviews that fate and transport study.

Tetra Tech (2010c) provides their conceptualization of flow through the facilities in three figures, Illustrations 5.1 through 5.3. For waste rock dumps it shows seepage through unconsolidated rock at the surface flowing downward through semi-consolidated and consolidated rock (Tetra Tech 2010c, Ill. 5.1). Flow through the bottom layer, consolidated rock, would recharge into alluvium. There is no discussion of the lower layer being consolidated beyond that which occurs due to piling rock on top of it (Tetra Tech 2010c, p 22). The three layers are surrounded by a rock buttress.

The heap leach pads will be underlain by a liner to capture the lixiviant; the liner prevents seepage through to the underling alluvium, if it is not breached (Tetra Tech 2010c, Ill. 5.2). After closure, waste rock would be stacked around the heaps as part of an extension of the waste rock dump. The tailings impoundment is consolidated tailings placed on the alluvium and constrained by a buttress made of waste rock. The plan is to operate the heaps for six years and collect continuing draindown for three additional years (DEIS, p. 287). This is based on the assumption that draindown will be complete within that time period. If it is not, there will be no way for the company to collect the draindown and it could be a point source of pollution to the groundwater. It is a point source because the heap liner collects all seepage and it reports to a discharge point.
The DEIS (p 56) considers the critical determining factor limiting seepage through the tailings to be their low permeability.

The modeling is effectively water balance modeling among layers in the facility, with flow between layers controlled by unsaturated flow equations, or saturated in areas where saturation occurs. Unsaturated flow modeling solves the equations of soil physics, most specifically the flow equation relating the matric potential gradient to the conductivity, which varies as a function of matric potential. Unsaturated flow is toward the lower matric potential which occurs at the point where the media is drier, all other conditions being equal. When saturated the equation becomes Darcy's law and the matric potential gradient becomes the head gradient. Matric potential becomes negative as soil dries, so during dry conditions water from depth can be drawn to the surface and evaporated in a process known as exfiltration.

Tetra Tech utilized a two-dimensional variably saturated flow model, VADOSE/W, for this simulation (Tetra Tech 2010c, p. 20). The code solves the flow equations using a finite element routine. Two-dimensional means flow in a vertical cross section. Tetra Tech emphasizes that it "can simulate heterogeneous material, and can account for changes in material conditions due to compaction and underlying alluvial and/or bedrock formations" (Id.). This simply means that different model elements may be defined by different material property parameters and that those parameters can represent any material including compacted waste rock. The modeling presented in this Tetra Tech study is strictly based on conceptual flow models for the various materials because there are no data to which to calibrate. Material parameters depend on textbook or small-scale test values. The predicted values are not verified in any way to previously observed data.

The model simulates precipitation and evaporation, using various sequences of climate data for the simulations. Climate data provides the daily precipitation, temperature, wind speed, and evaporation. Using data from the Nogales site (Tetra Tech 2010c, p. 21) is not unreasonable, but the scenario using average daily values is not representative. TT states that the average conditions "dataset has small amounts of precipitation everyday because of the averaging of many years of data" (Id.) and call this "conservative". In a response to a review memorandum, TT (2011) responded that "[t]he average conditions dataset, as noted in previous memos, has precipitation nearly every day of the year. This is not likely to occur in Arizona, but would be a worst case scenario. Water is more likely to readily infiltrate into a facility if the upper surface is wet, so considering a climate conditions with a small amount of precipitation each day would produce such a condition and provide a result of the worst case infiltration" (TT, 2011, p. 2, emphasis added).

Tetra Tech apparently considers this to be conservative, but the evaporation likely exceeds precipitation most days so there would rarely be an excess of precipitation to infiltrate. Even during winter, average precipitation may exceed the average evaporation by only a small amount, but the model would accumulate moisture in the top layers. This modeled soil moisture may just be stored and later evaporated as conditions warm and dry in the spring. Infiltration through the surface zone would occur when moist antecedent conditions precede a large daily rainfall; this type of situation which would result in seepage has been ignored in the Tetra Tech study. This is not uncommon during late winter or spring snow melt and subsequent spring showers.
The mine development periods and reclamation scenarios simulated are reasonable (TT, p. 22). Whether the parameters used for the scenarios were proper remains a question.

Tetra Tech discusses steady state modeling as a means of determining starting moisture concentrations for the transient simulations (Tetra Tech 2010c, p 37). In a system that should be event driven, steady state should never be approached, much less achieved.

The assumed parameters for the waste rock control the seepage through the waste rock facilities. The so-called permeability reported by Tetra Tech is actually saturated hydraulic conductivity (K). The values are very high, but the unsaturated values decrease very rapidly.

The figures showing the relationship of conductivity with matric suction and moisture with matric suction are poorly labeled. For example, Illustration 5.6 shows the relations for run-of-mine (ROM) rock, with saturated K equal to 174 ft/hr; the matric suction on the conductivity graph does not obviously match the axis for the moisture content, and does not have labels. Even the conductivity axis does not have labels for ROM rock.

Considering III 5.7 for semi-consolidated rock, the conductivity decreases over five orders of magnitude from saturated to dry (moisture 0.4 to 0.05). At the beginning of a storm with dry antecedent conditions, infiltrating precipitation increases the moisture content which increases the effective conductivity. As noted, the parameters for the surface ROM layer are hard to read, but dry (moisture about 0.16), the conductivity is significantly less than 174 ft/hr. Assuming no runoff, the ROM would rapidly saturate at a wetting front. Because of the low conductivity the wetting front would advance very slowly with conditions above the front being saturated. This means that significant amounts of ROM above a wetting front would be saturated. According to III 5.6, the difference between saturated and dry moisture content is the difference between 0.27 and 0.18, or about 0.09. Using these numbers, a three-inch infiltration event would be completely stored in just 33 inches of initially dry ROM, based on the available porosity between 0.18 and 0.27 being 0.09. The modeling assumes that it completely fills. Once the infiltration event ends, water would continue to seep downward, drawn by gravity and a negative matric potential. However, evaporation would begin at the upper end and, as the surface soil dries, a negative matric potential would develop on the surface and begin to counter the downward movement of the stored water.

The example just given allows the soil above the wetting front to become saturated because of the large difference in effective conductivity at the wetting front, which keeps the water close enough to the ground surface for evaporation to begin to quickly remove the water after the precipitation event ends. During summer, when the larger short-duration events are most likely, the daily potential evaporation is as much as half an inch per day which means that most of the precipitation stored in upper layers of the waste rock would quickly evaporate; it is clear why the modeling does not simulate deeper seepage of water.

The figures showing water content through a model cross-section are clear (III 5.15 and 5.16). Near the surface, the moisture content is about 0.1 which increases initially with depth to about 0.14 but then decreases to 0.04 in the consolidated zone. This moisture content is less than the lowest moisture content presented in Illustration 5.8 for consolidated material, so the accuracy of the data is questionable. Clearly the effective
conductivity at that moisture is $10^{-7}$ ft/hr ($2.4 \times 10^{-6}$ ft/d), an almost negligible conductivity. The effective gradient due to high negative matric potential may be significantly higher than 1. Even at 1000, the water would move only about $2.4 \times 10^{-3}$ feet in a day. These numbers should make clear why the model does not simulate seepage through the waste rock. The small amount of moisture below the unconsolidated ROM can be simulated to move only very slowly. These numbers suggest that increasing the moisture available significantly would not result in substantial differences in moisture content at depth, meaning that whether the model considers runoff accumulating at a location is irrelevant.

Many of the water balance figures, such as Illustrations 5.12 and 5.14, show precipitation entering the system and evaporation leaving the system; because the evaporation exceeds the precipitation, water leaves storage so that the moisture content decreases. These figures present a year's results, but presumably the waste rock would just become drier with time and evaporation would have to approach precipitation as stored water available to evaporate would dissipate. The figures also demonstrate that the model simulate almost no runoff.

The modeling does not account for preferential flow which can allow flow to move quickly through the piled waste rock. A preferential flow path in a waste rock dump is a pathway of larger pore spaces through which groundwater flow tends to funnel; it is similar to flow through fractures in in-situ bedrock. By ignoring preferential flow, the model underestimates seepage through any of the mine components, although waste rock would likely be most heterogeneous.

Tetra Tech's mention of preferential flow (TT, p. 20) refers to the fact that hydraulic conductivity for unsaturated flow varies with moisture content; different materials are preferentially more conductive at different moisture contents. More flow occurs through clay at low matric potential than through coarser sand because the sand is actually drier. The curves in TT Figure 5.5 may apply in a given facility but they would not apply at the same point (due to differing soil types at each point) so the flow cannot transition from one to the other.

**Conclusion and Recommendations**

- **The DEIS must present data justifying the conductivity parameters.**

It is not reasonable for ROM rock with saturated $K = 170$ ft/hr to only allow seepage to move a few feet before being sucked out by exfiltration.

- **The study should be redone to include a sensitivity analysis.**

If the conductivity for high matric potential rock is set higher and there is still no seepage, then the DEIS may be able to conclude there is no seepage. Otherwise, the results of this seepage study are simply uncalibrated estimates based on very unrealistic parameters.

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ADMIN EIS / DRAFT EIS REVIEWERS

Glenda Aguirre
Epidemiologist

Glenda Aguirre has a Bachelor of Science degree in Microbiology from the University of Arizona. She worked from 2006 through 2008 in a laboratory conducting sterility surveillance on medical surgical products. In 2008 she joined Pima County Health Department as a communicable disease investigator. She currently works as an epidemiologist.

Evan Canfield
Chief Hydrologist
PhD in Agricultural Engineering, Minor Hydrology; MS and BS Geology

Involved with Rosemont review since 2006. Reviewed Surface Water Hydrology report and APP permit report. Over 25 years experience working in hydrology and water resources, the last 15 in Pima County. Arizona Professional Civil Engineer with specialty in water resources. ASFPM Certified Floodplain Manager. Extensive experiences in hydrologic modeling, analysis and reviewing hydrology and hydraulic studies. Familiar with the Pima County Title 16, Floodplain and Erosion Hazard Management Ordinance. Developed technical policies (hydrology, hydraulic) and guidance for the Pima County Regional Flood Control to be used in all hydrologic and hydraulic analysis for development in Pima County. Supervise the section of the Flood Control District that maps floodplains. Experience evaluating extreme hydrologic events such as the 2006 floods in Pima County and the flooding following the Los Alamos Fire.

Neva Connolly
Senior Planner, Office of Sustainability and Conservation
BS Biology, Masters in Landscape Architecture

County responsibilities include contributions towards planning efforts for the Sonoran Desert Conservation Plan, Section 10 permit, and comprehensive NEPA training in 2007. Involved in review of the Rosemont proposal since 2006.

Jonathan L. Crowe
Principal Planner
M.S Urban and Regional Planning
B.A. Geography and Environmental Studies

Over 20 years experience preparing or reviewing traffic forecasts, traffic impact analysis, traffic safety reviews, roadway improvement project development, regional and local long and short-range transportation plans, public transit service plans and budgets, and bicycle and pedestrian improvements within Pima County.
Kathleen M. Chavez, P.E.
Water Policy Manager
BS Civil Engineering

Daily job responsibilities include the review of regional water policy and water resource issues; evaluation of water resource impacts to county facilities. Involved in the CAP water issues in Green Valley.

Carla Danforth
Environmental Planning Manager
Pima County Regional Flood Control
Water Resources Division

Responsible for developing and implementing the Pima County Riparian Habitat Mitigation Ordinance. Implements and manages riparian restoration projects such as Swan Wetlands and Cortaro Bosque.

Andrew D'Entremont
Emergency Management Coordinator
Pima County Office of Emergency Management and Homeland Security

My primary function is emergency operations planning for Pima County OEMHS. Also have 30+ years of prior law enforcement experience with the Pima County Sheriff's Department, including several years of service in the Green Valley District supervising emergency response to local mining operations.

James DuBois, R.G
Principal Hydrologist Regional Wastewater Reclamation Department

Jim DuBois is an experienced Hydrologist, Environmental Manager, and Registered Professional Geologist in the state of Arizona. He is currently employed as Principal Hydrologist for Pima County's Regional Wastewater Reclamation Department. He has been in this position managing groundwater recharge, aquifer protection, surface water discharge, and reuse permit issues since 2008. Prior to joining Pima County, Mr. DuBois spent 2 ½ years as an Environmental Project Manager handling the City of Tucson's MS4 permit responsibilities in the Stormwater Management Section of the Department of Transportation. Previously, Mr. DuBois served as a Senior Hydrologist for the Arizona Department of Environmental Quality (ADEQ) for 19 years. At ADEQ Mr. DuBois' experience with aquifer protection permits for mines included reviewing more than 20 major mines for APP, closure or remedial activities. He co-wrote the initial guidance document outlining Arizona's Best Available Demonstrated Control Technology (BADCT) for mining facilities. He developed the concept and statutory language for permitting mining facilities with an "areawide" approach. He served on ADEQ's TQM Committee in 1994-6 to expand/revise the Mining BADCT Guidance Manual into its latest version. He wrote agency policy regarding how to address in a permit the impacts from sulfate and other pollutants not covered by established numeric aquifer water quality standards. Jim has also worked for 5 years as a consulting geologist in Wisconsin, and for 3 years as an exploration geologist for Noranda Exploration, Inc., in Arizona and Wisconsin. Mr. DuBois holds a B.A. in geology from Carleton College and an M.S. in geology with an emphasis in geochemistry and geochronology from the University of Kansas.
Benjamin H. Goff, P.E.
Deputy Director
B.S. College of Engineering
Registered Professional Engineer

Over thirty years of experience preparing or reviewing traffic forecasts, traffic impact analysis, traffic safety reviews, roadway improvement project development, public transit service plans and budgets, and bikeway improvement plans within Pima County. Co-authored NEPA environmental documents related to roadway projects including:
- Kolb Corridor, Draft and Final EIS
- Palo Verde Corridor, Draft and Final EIS
- Campbell Corridor, Draft and Final EIS
- Kino Parkway Noise Analysis Report (principal author)
- River Road – La Cholla to Thomydale Section 4f Mitigation Report (principal author)

Craig Horn
Financial Projects Coordinator
Pima County Finance & Risk Management Department’s Budget Division since April 2006, is responsible for tax revenue projections, including property taxes, assessing impacts of legislative changes on County revenues, and performing economic and financial analysis for County administration. Prior to employment with Pima County, Mr. Horn was a financial and economic consultant conducting market analysis and industry studies for litigation, businesses and government agencies. His expertise includes preparation and analysis of economic and tax revenue impact studies associated with new business activities.

Julia Fonseca
Environmental Planning Manager
Office of Sustainability and Conservation
M.S. Geology, 25 years experience in inventory and protection of natural resources in Pima County Arizona. Hydrologist and Environmental Manager at Pima County Flood Control 1986-2007.

In her capacities at Pima County Regional Flood Control District, Pima County Natural Resources, Parks and Recreation, and Pima County Office of Sustainability and Conservation she worked to develop the natural resource inventories, plans and policies for the Sonoran Desert Conservation Plan. She currently oversees the development of a multi-species habitat conservation plan under the Endangered Species Act, and a related Environmental Impact Statement under the National Environmental Policy Act. In 2004 she evaluated the natural resources of Rosemont Ranch as a potential County acquisition, and have continuously maintained involvement in the Rosemont Ranch on behalf of Pima County, including participation in scoping, defining work objectives for staff and consultants and representing Pima County in Cooperator’s meetings.

Nicole Fyffe
Executive Assistant to County Administrator
Masters in Public Administration

Administers Pima County’s Conservation Acquisition Program since 2004
Coordinated the purchase of 50 properties totaling almost 50,000 acres
Involved in reviewing the Rosemont Mine proposal since 2006
Yves Khawam  
Pima County's Chief Building Official.

Dr. Khawam possesses over twenty years of building administration experience in various capacities including as a designer, builder, and code official.

Akitso Kimoto  
Principal Hydrologist  
PhD Agricultural Science

Review Hydrology sections of EIS and APP permit report. Extensive experiences in hydrologic modeling, analysis and reviewing hydrology and hydraulic studies. ASFPM Certified Floodplain Manager, Responsible for managing a floodplain mapping project in Pima County, Familiar with the Pima County Title 16, Floodplain and Erosion Hazard Management Ordinance, Experiences in reviewing applications for developments in regulated floodplain and riparian areas, Developed technical policies (hydrology, hydraulic) for the Pima County Regional Flood Control

Ursula Kramer  
Director, Pima County Department of Environmental Quality  
B.S. Civil Engineering

Involved in air quality regulatory issues for more than 25 years. Oversees all air quality permitting for projects within Pima County.

Mark Krieski, P.E.,  
Civil Engineering Manager  
Pima County Regional Flood Control District

B.S. - Geology, 1979, University of Arizona  
M.S. - Geological Engineering, 1984, University of Arizona

Mark Krieski is an Engineer and Geologist, and a registered professional Geological Engineer in the state of Arizona. He is currently employed as a Civil Engineering Manager for the Pima County Regional Flood Control District, where he has managed the Major Watercourse Program for five years, including watercourse management, infrastructure development and maintenance, and associated regulatory programs. Mr. Krieski previously spent 3 ½ years as Pima County's Solid Waste Manager, where he was responsible for siting, design, permitting, construction and closure services for a variety of solid waste management facilities. Prior to joining Pima County, Mr. Krieski served as a consultant with SCS Engineers for 14 years, performing geological engineering, geology, hydrogeology and environmental engineering services in Arizona and California. Investigation, design, permitting, construction, closure, compliance monitoring, and remediation services were performed for numerous waste management, mining, industrial, Superfund, and community facilities and contamination sites. Previously, Mark worked for 4 ½ years with Woodward-Clyde Consultants in California and Arizona, performing similar consulting work with an emphasis in earth hazards, foundation and earthquake engineering, and assessment and remediation of contaminated industrial facilities. After receiving his B.S. degree, Mr. Krieski also worked for 2 ½ years as an exploration geologist for Amax Exploration in Arizona, Nevada and California. During his undergraduate studies program, Mark performed a
variety of geophysical surveys for both Mining Geophysical Surveys and Zonge Engineering throughout the western United States.

**Tom Myers**  
Hydrologic Consultant  
PhD Hydrology/Hydrogeology

Preparation of a conceptual and numerical groundwater model for the Rosemont area  
Review of hydrology studies and ground model reports completed by Tetra Tech and Montgomery and Associates. Specializes in groundwater modeling, hydrogeology, environmental forensics, regulatory compliance, water rights, NEPA analysis, and environmental and water policy. He focuses on mining and water resource development issues, coal-bed methane development and groundwater contamination.

**Linda Mayro,**  
Director, Office of Sustainability and Conservation

**Loy Neff**  
Program Manager  
Office of Sustainability and Conservation  
Co-manager, Cultural Resources and Historic Preservation Division

Responsible for overseeing cultural resources compliance for County private sector development review and other permitting, as well as external agency/jurisdiction compliance issues. Participated in the County’s Rosemont review team from its inception, representing the Office of Cultural Resources and Historic Preservation. First involvement with Rosemont was review and comment of the proposed Mine Plan of Operations, 9/26/2006.

**Leslie Nixon, J.D**  
Program Manager  
Neighborhood Reinvestment Program  
Pima County Community Development and Neighborhood Conservation Department

Responsible for Pima County community revitalization initiatives, neighborhood reinvestment bond program, and outreach to stressed communities. Attorney/Administrator with 23 years of litigation, legislative, and executive experience on behalf of Arizona’s low income, minority, and tribal populations. First involvement with Rosemont Copper Project was review and comment on the Environmental Justice section of the draft EIS in July, 2011.

**Frank Postillion**  
Chief Hydrologist, Section Manager, Water Resources  
MS, Watershed Management and Hydrology

Responsible for coordination of review for impacts to water supply, water resources, shallow groundwater for this project (2006). 35 years of experience in water resource and water quality evaluations in the public and private sectors. Evaluated the effects of Tucson Copper Mining District copper mining and the effects tailing pond recharge on the ground-water quality of the Upper Santa Cruz Basin. His affiliation and management of the Upper Santa Cruz Basin Mines Task Force led to modeling and management recommendations to pump interceptor wells at a sufficient rate to contain the mineralized...
sulfate and TDS plumes, and to avoid contamination of public supply wells. Evaluated the effects of coal mining on the hydrology of Black Mesa in Northern Arizona.

**Brian Powell,**  
Program Manager  
M.S. in Wildlife Ecology from the University of Arizona School of Natural Resources and the Environment  
B.S. in Ecology and Wildlife

Responsible for implementing the effectiveness ecological monitoring program for the County's forthcoming Section 10(a)(A) permit from the U.S. Fish and Wildlife Service. Expert on wildlife habitat assessment and enumeration.

**Sherry Ruther**  
Environmental Planning Manager  
Master of Science-Renewable Natural Resources and Natural Resource Public Policy  
BS in Wildlife Biology

Appointed by DSD Director to be department's representative because of expertise in natural resources conservation and management as well as DSD regulatory authorities established in Pima County Zoning Code. Provided review and comment on Scoping and Mining Plan of Operation (2006).

**Greg Saxe**  
PhD, M.R.P., B.A., Environmental Planning Manager

Reviews rezoning, comprehensive plan amendment, variances, special use permits, ROW permits and any other Planning and Zoning Commission actions for compliance with Floodplain and Erosion Hazard Management and Riparian Habitat Ordinances. Pima County NFIP CRS Coordinator. Former Planning Director for the Tohono O'odham Nation and the Town of Sahuarita, Water Resources Planner for the Martha's Vineyard Land and Water Commission and consultant on Arizona/Sonora border area water and economic development issues. PhD in Geography and Regional Development, Master of Regional Planning, Bachelor of Arts in Environmental Science and Public Policy. 25 years experience in review of EIS and involved with Rosemont Review and monitoring since 2006. Involvement with Forest Service procedures includes developing impact analysis on behalf of the service for growth around the Cape Cod National Seashore and identification/evaluation of Roadless Areas and their impact on local economies and natural resources. 2000 Census Tribal Liaison and nationally recognized for census outreach efforts.

**Lisa Labita Woodson**  
Epidemiologist

Lisa Labita Woodson has a Bachelor of Science in Biology Conservation and a Masters in Public Health in Maternal and Child Health from the University of Arizona. She has received a Fulbright grant to study hygiene and sanitation practices in Nepal; has worked as a consultant for nutrition research in Senegal; and has studied HIV knowledge and attitudes in indigenous populations in Thailand. She currently works at the Pima County Health Department as an epidemiologist.