Arizona Mining Reform Coalition ♦ Arizona Inter-Faith Power and Light ♦ Center for Biological Diversity ♦ Community Water Coalition of Southern Arizona ♦ Concerned Citizens and Retired Miners Coalition ♦ Concerned Climbers of Arizona ♦ Earthworks ♦ Maricopa Audubon Society ♦ Oklahoma Indigenous Theatre Company ♦ Natural Allies ♦ Patagonia Area Resource Alliance ♦ Save the Scenic Santa Ritas ♦ Save Tonto National Forest ♦ Sierra Club—Grand Canyon Chapter ♦ Sky Island Alliance ♦ Tucson Audubon Society ♦ Valley Unitarian Universalist Congregation—Green Sanctuary ♦ WildEarth Guardians

November 7, 2019

Mr. Neil Bosworth, Supervisor
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Resolution Copper EIS
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U.S. Army Corps of Engineers
Department of the Army, Los Angeles District
U.S. Army Corps of Engineers, Regulatory Division
Attn: Michael Langley
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Phoenix, AZ 85012-1939

Comments hand delivered to the above addresses on electronic media

RE: Resolution Copper Mine Project and Land Exchange DEIS

Dear Mr. Bosworth and Mr. Langley:

The above groups wish to thank the U.S. Forest Service (USFS) for the opportunity to comment on the Resolution Copper Mine (RCM) Project and Land Exchange Draft Environmental Impact Statement (DEIS). As you are aware, these groups submitted detailed scoping comments for the project on July 18, 2016. These comments are also intended to address the Draft Practicability Analysis In Support of Clean Water Act 404(B)(I) Alternatives, prepared by Westland Resources on Behalf of Resolution Copper for the U.S. Army Corps of Engineers (Corps) as well the proposed 404 permit application and Corps review.

These comments represent the work of 18 groups (descriptions below) with notable expertise in environmental, mining, and social issues, as well as numerous professional scientific consultants. The comments that follow demonstrate that the DEIS is inherently flawed and a revised or supplemental DEIS is needed under current law. Individual groups may also be submitting separate comments on their own behalf.

We incorporate by reference all previous comments submitted by the groups described below, including scoping comments entitled "Scoping Comments for the Resolution Copper Mine DEIS" dated July 18, 2016. These comments adopt and incorporate by reference the comments submitted by the Inter Tribal Association of Arizona, Inc. (ITAA), Earthworks, and the Access Fund, which are included as an attachment to these comments. These comments also incorporate by reference comments that will be submitted at a later date by the San Carlos Apache Tribe.

I. INTRODUCTION

The proposed Resolution Copper Mine would be located east of Superior, Arizona, on public land that is part of the Tonto National Forest. The mine would destroy Oak Flat, including the campground and thousands of additional acres of public land. The project includes an underground block cave mine directly under Oak Flat that would create a crater roughly two miles wide and 1,000 feet deep due to subsidence of the land. The mine would extract and dump nearly 1.4 billion tons of toxic mining waste into an unlined tailings dump--the preferred alternative tailings site will ultimately cover six square miles with a dam 490 feet high. This mine would use significant amounts of water--enough to supply the City of Tempe, Arizona, for 40 years as climate change intensifies our droughts, resulting in less water flowing in our rivers and streams.

Oak Flat is sacred to Indigenous people, including the Apaches, and is on the National Register of Historic Places (NRHP) as a traditional cultural property (TCP), the Chí'chil Biłdagoteel historic district. It is a world class recreational area, attracting climbers from all over, not to mention a place of biological diversity. Several endangered species will be harmed by the mine, including the Arizona hedgehog cactus, yellow-billed cuckoo, and narrow-headed garter snake.

The DEIS is deficient in numerous critical areas, fails to provide a full range of reasonable alternatives, fails to provide a full analysis of the impacts of those alternatives, fails to apply the full scope of federal laws applicable to the project, improperly regulates/reviews the mine under assumed "rights" under federal mining laws without the required factual support, fails to take the required "hard look" under NEPA, and otherwise violates federal law. The USFS/Corps must

prepare a revised DEIS for public review in compliance with NEPA and federal law. The following issues raised throughout these comments must be fully addressed by the USFS and Corps, and are presented in no particular order.

The USFS has not fully considered and has inappropriately dismissed the No Action alternative. The USFS/Corps should revise the DEIS to consider fully and select the No Action Alternative for the following reasons:

- The proposed mine is not in the public interest, because it will have unacceptable, irreversible, and unmitigable adverse effects on public health, safety, and welfare, including additional risks to public safety from increased traffic; the use and transportation of hazardous materials; noise pollution; and reduced quality of life and health for local residents;
- The proposed mine would have unacceptable, irreversible, and unmitigable impacts on cultural resources and the spiritual, familial, educational, scientific, economic, and communal values embedded in these resources, especially for Native Americans;
- The proposed mine would have unacceptable adverse effects on air quality;
- The proposed mine would have unacceptable, irreversible, and unmitigable adverse effects on biological resources and wildlife, including endangered and threatened species;
- The proposed mine would have unacceptable, irreversible, and unmitigable adverse effects on visual resources, dark skies, and the aesthetics of Oak Flat;
- The proposed mine would have unacceptable, irreversible, and unmitigable adverse effects on recreation in Oak Flat;
- The proposed mine would have unacceptable, irreversible, and unmitigable adverse effects on groundwater quantity and quality; and
- The proposed mine would have unacceptable, irreversible, and unmitigable adverse effects on surface water quantity and quality.

At the outset, it should be remembered that although Congress directed the USFS to exchange the federal parcels at/around Oak Flat described in the FY15 National Defense Authorization Act (NDAA), it required the agencies to otherwise comply with all applicable laws, for both the review/approval of the Exchange, as well as the mine plan of operations. Notably, NDAA did not authorize, require, or otherwise direct the agencies to approve the mine plan of operations (PoO)/ General Plan of Operations (GPO), CWA Section 404 permit, or any of its associated infrastructure/facilities. NDAA did not authorize or direct the agencies to exclude, minimize, or discount analyses of the no action alternative.

II. Description of Groups

Arizona Mining Reform Coalition works in Arizona to improve state and federal laws, rules, and regulations governing hard rock mining to protect communities and the environment. AMRC works to hold mining operations to the highest environmental and social standards to provide for the long term environmental, cultural, and economic health of Arizona. Members of the Coalition include: Apache Stronghold, Center for Biological Diversity, Concerned Citizens and Retired Miners Coalition, Concerned Climbers of Arizona, Dragoon Conservation Alliance, EARTHWORKS, Empire Fagan Coalition, Environment Arizona, Groundwater Awareness League, Maricopa Audubon Society, Save the Scenic Santa Ritas, Grand Canyon Chapter of the Sierra Club, Sky Island Alliance, Spirit of the Mountain Runners, Tucson Audubon Society, and the Valley Unitarian Universalist Congregation.

Arizona Inter-Faith Power and Light is a spiritual response to the climate crisis. Members include 20,000 congregations in 40 states across the country.

The **Center for Biological Diversity** is a non-profit public interest organization with headquarters located in Tucson, Arizona, representing more than 1.6 million members and supporters nationwide dedicated to the conservation and recovery of threatened and endangered species and their habitats. The Center has a long standing interest in projects of ecological significance undertaken in the National Forests of the Southwest, including mining projects.

The **Community Water Coalition of Southern Arizona** promotes water conservation, river and riparian area protection and environmental justice through policy development, education and advocacy. We work via multicultural and intersectional collaborative endeavors in Southern Arizona and the U.S./Mexico border region and directly with policy makers, water professionals, Non-Governmental Organizations, educational institutions and businesses to develop public sector policy recommendations. For all water resources in our region, we advocate for demand reduction and pollution prevention.

The **Concerned Citizens and Retired Miners Coalition** is a group of citizens who: 1) reside in Superior, Arizona, or do not reside in Superior, Arizona, but are affiliated with relatives who are residents; 2) are retired hard-rock miners who previously worked in the now non-operational mine in Superior, Arizona, and were displaced due to mine closure or personal disability; or 3) are individuals who are concerned that important U.S. public recreational land will be conveyed to a foreign mining company for private use.

The **Concerned Climbers of Arizona** was organized in 2010 for the purpose of preserving climbing access and the climbing environment. The group advocates for continued recreational access to climbing areas that are threatened by development or other forms of encroachment. Based in Phoenix, Arizona, the Concerned Climbers of Arizona is the primary group representing the interests of rock climbers in central Arizona.

Earthworks is a nonprofit organization dedicated to protecting communities and the environment from the adverse impacts of mineral and energy development while promoting sustainable solutions. Earthworks stands for clean air, water and land, healthy communities, and corporate accountability. We work for solutions that protect both the Earth's resources and our communities.

The **Maricopa Audubon Society** is a group whose mission is to protect the natural world through public education and advocacy for the wiser use and preservation of our land, water, air and other irreplaceable resources. Maricopa Audubon Society members have led the Superior Christmas Bird Count in and around Oak Flat and Tonto National Forest for years. Our members bird, hike, camp and enjoy other activities in the natural areas which this project proposes to convert to a mine and tailings pile.

Oklahoma Indigenous Theatre Company produces indigenous theatre that comes from a land-based praxis, which is integral to creating new works based in performance. We indigenous artists and board members fully support the Southeastern Arizona community in opposing this proposed Resolution Copper Mine that would potentially devastate cultural lands that are sacred to people who are indigenous to the area.

Natural Allies defends the landscapes that sustain our cultural and natural heritage. With grassroots organizing, Natural Allies advocate for permanent protection of threatened places. We work with communities of shared interest, forge new partnerships, and advise on conservation strategies.

Patagonia Area Resource Alliance is a non-profit community watchdog organization that monitors the activities of mining companies, as well as ensures government agencies' due diligence, to make sure their actions have long-term, sustainable benefits to public lands and water resources in Patagonia and the State of Arizona.

Save the Scenic Santa Ritas is a non-profit organization that is working to protect the Santa Rita and Patagonia Mountains from environmental degradation caused by mining and mineral exploration activities.

Save Tonto National Forest works to protect our National Forest and promote safe and responsible use by all groups of outdoor enthusiasts. We are based in Queen Valley, Arizona and have around 260 members concerned about the direction the Tonto National Forest is going.

Sierra Club is one of the nation's oldest and most influential grassroots organizations whose mission is "to explore, enjoy, and protect the wild places of the earth; to practice and promote the responsible use of the earth's ecosystems and resources; and to educate and enlist humanity to protect and restore the quality of the natural and human environments." Sierra Club has more than 3.5 million members and supporters with 60,000 in Arizona as part of the Grand Canyon (Arizona) Chapter. Our members have long been committed to protecting and enjoying the Tonto National Forest and have a significant interest in the proposed Resolution Copper Mine and related activities.

Sky Island Alliance works to protect and restore the biodiversity and natural heritage of the Sky Islands in the Sky Island region of the southwestern United States and northwestern Mexico. We work with volunteers, scientists, landowners, and government agencies to establish protected areas, restore healthy landscapes, and promote public appreciation of the region's unique biological diversity.

Tucson Audubon Society was established in 1949 and is a 501(c)(3) non-profit conservation organization serving Southeast Arizona. Tucson Audubon inspires people to enjoy and protect birds through recreation, education, conservation and restoration of the environment upon which we all depend. In partnership with Audubon Arizona, Tucson Audubon coordinates the Important Bird Area program for Arizona. Tucson Audubon advocates statewide for the sustainability, resilience, preservation, restoration and connectivity of habitats utilized by birds and other wildlife.

Valley Unitarian Universalist Congregation—Green Sanctuary of Chandler Arizona is an environmental advocacy group, accredited by the national Unitarian Universalist Association. The Work of our team focuses on projects that (1) worship and celebrate nature and the Earth; (2) sustain and conserve our natural resources; (3) promote environmental justice; and (4) educate members of the community on environmental issues.

WildEarth Guardians is a nonprofit conservation organization with offices in seven states. WildEarth Guardians has more than 160,000 members and activists across the United

States and the world. WildEarth Guardians protects and restores wildlife, wild places, wild rivers, and the health of the American West. Toward this end, Guardians and its members work to protect the natural and cultural features of landscapes within national forests and other public lands, including their wildlife.

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IV. THE TONTO NATIONAL FOREST MUST PREPARE A REVISED OR SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT

"If a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion." 40 C.F.R. § 1502.9(a). The agency must then seek public comment on the revised draft EIS. 40 C.F.R. §§ 1502.9(a), 1503.1(a)(4); *see also* California v. Block, 690 F.2d 753, 771 (9th Cir. 1982) ("Only at the stage when the draft EIS is circulated can the public and outside agencies have the opportunity to analyze a proposal and submit comments. No such right exists upon issuance of a final EIS."). An EIS that fails to enable meaningful public review and understanding of the agency's proposal, methodology, and analysis of environmental consequences violates NEPA. California ex rel. Lockyer v. U.S. Forest Serv., 465 F. Supp. 2d 942, 948-50 (N.D. Cal. 2006) (finding a national monument management plan "incomprehensible" and that the corresponding EIS violated NEPA where it contained conflicting and confusing statements regarding applicable management standards).

Special Circumstances for the Resolution Copper NEPA process

It is essential that the Forest Service recognize that this EIS process is unique due to the legislation imposed by Congress on the normal EIS process. Specifically, Section 3003 of the FY 2015 NDAA states:

"Not later than 60 days after the date of publication of the final environmental impact statement, the Secretary shall convey all right, title, and interest of the United States in and to the Federal land to Resolution Copper."

When Congress imposed this language on the RCM EIS, it did not reduce or eliminate the agencies' duties to fully comply with NEPA, the CWA, Forest Service Organic Act, Federal Land Policy and Management Act (FLPMA) and all other federal laws. The language above merely directs the Secretary of Agriculture to convey the approximately 2,422 acres of public land at Oak Flat to RCM after the Final EIS is published—and requires said transfer of ownership no later than 60 days after final EIS publication.

The NDAA did not require the agencies to approve the mine GPO, 404 permit, or any other request by the company. Although it could be argued that the NDAA eliminated the USFS Objection process for the Exchange, which we do not concede, it did not remove those procedural and substantive safeguards for public review and challenge for the GPO or any other agency action. That means that any Final EIS/Draft ROD objection period, resolution of objections, and Final Record of Decision on the RCM GPO must occur, although possibly after RCM has already taken title to the public land at Oak Flat. Since transfer of title to this currently public land will cause irreparable harm to the public, including Native Americans, recreational users of Oak Flat, and surrounding communities, and to the environment, this is highly problematic and demonstrates exactly why the Forest Service must treat this DEIS somewhat differently than a normal DEIS.

Because there will very likely be no meaningful opportunity to comment after the FEIS is published, the DEIS for this proposed project must be complete and inclusive of all aspects of the mine project. The DEIS must include any and all impacts on which the public should have an opportunity to comment. Unfortunately, the current version of the DEIS is severely lacking. There are numerous significant areas of analyses that were identified during the project scoping period that have not been addressed in the current DEIS.

V. DISCUSSION OF ISSUES

Improper Statement of Purpose and Need

Given the numerous significant deficiencies in the DEIS, the standard for preparing a supplemental draft EIS, *see* 40 C.F.R. § 1502.9(c), is far exceeded in this instance, and a revised draft EIS is necessary. A draft EIS must give "full and meaningful consideration to all reasonable alternatives" to the action. 42 U.S.C. § 4332(2)(E); 40 C.F.R. § 1508.9(b). The alternatives considered may not be entirely driven by a private applicant's preferences. *See* Forty Most Asked Questions, at Question 2a. ("[T]he emphasis is on what is 'reasonable' rather than on whether the proponent or applicant likes or is itself capable of carrying out the particular

alternative."). Here, by narrowing its purpose and need statement, USFS considered an unreasonably narrow range of alternatives.

The Council on Environmental Quality's regulations implementing NEPA require all EISs to contain a statement that briefly specifies the underlying purpose and need for which the agency is responding to when proposing alternatives to the proposed action. 40 C.F.R. § 1502.13. The statement of purpose and need is crucially important because it dictates the range of reasonable alternatives to the proposed action. City of Carmel-By-The-Sea, 123 F.3d at 1155. The purpose and need statement cannot be so narrow as to limit the range of reasonable alternatives. Id. at 1155 ("The stated goal of a project necessarily dictates the range of reasonable alternatives and an agency cannot define its objectives in unreasonably narrow terms."); *see also* Nat'l Parks & Conservation Ass'n v. Bureau of Land Mgmt., 606 F.3d 1058, 1070 (9th Cir. 2010). Agencies cannot avoid NEPA's requirements by unreasonably restricting the statement of purpose:

> One obvious way for an agency to slip past the strictures of NEPA is to contrive a purpose so slender as to define competing "reasonable alternatives" out of consideration (and even out of existence). The federal courts cannot condone an agency's frustration of Congressional will. If the agency constricts the definition of the project's purpose and thereby excludes what truly are reasonable alternatives, the EIS cannot fulfill its role. Nor can the agency satisfy the Act.

Simmons v. U.S. Army Corps of Engineers, 120 F.3d 664, 666 (7th Cir. 1997); Citizens Against Burlington, Inc. v. Busey, 938 F.2d 190, 196 (D.C. Cir. 1991) ("an agency may not define the objectives of its action in terms so unreasonably narrow that only one alternative from among the environmentally benign ones in the agency's power would accomplish the goals of the agency's action").

"[A]n applicant cannot define a project in order to preclude the existence of any alternative sites and thus make what is practicable appear impracticable." Sylvester v. U.S. Army Corps of Engineers, 882 F.2d 407, 409 (9th Cir. 1989). While the USFS is permitted to take the applicant's purposes into consideration, it cannot draft a narrow purpose statement that restricts the consideration of alternatives to one motivated by private interests. Nat'l Parks & Conservation Ass'n, 606 F.3d at 1072. Federal courts have routinely found that NEPA prevents federal agencies from effectively reducing the discussion of environmentally sound alternatives to a binary choice between granting and denying an application. *See e.g.,* Save Our Cumberland Mountains v. Kempthorne, 453 F. 3d 334, 345 (6th Cir. 2006).

The DEIS fails to comply with these requirements.

Section 1.3 (DEIS, page 6) says that the purpose and need for this project is "To consider approval of a proposed mine plan governing surface disturbance on NFS lands outside of the exchange parcels from mining operations that are reasonably incident to extraction, transportation, and processing of copper and molybdenum" and to "consider the effects of the exchange of lands between Resolution Copper and the United States as directed by Section 3003 of the NDAA."

Yet the Proposed Action Section 1.4 (DEIS, page 8) says that the proposed action consists of "approval of a mining plan of operations on NFS land associated with a proposed large-scale mine…."

This articulation fails to describe the purpose and need of the actual proposed project here in southern Arizona. First, as discussed in detail below, the DEIS needs to be revised or supplemented to determine whether Resolution Copper's mining claims on federal lands outside of the properties to be exchanged under the NDAA are valid under existing law, as well as a detailed analysis of the factual basis for any rights asserted by the company to determine the proper scope of the USFS's authority.

The DEIS asserts that the Forest Service's goal is to "foster and encourage private enterprise in the development of economically sound and stable domestic mining, minerals, and metal and mineral reclamation..." (DEIS at 8). Yet, on the other hand, this particular proposed mine would be inconsistent with numerous, important aspects of the forest plan, the purpose and need statement fails to make any judgment on the dichotomy between these two statements (DEIS at 10).

The agency's focus on the general need to support mineral development under the 1970 Mining and Mineral Policy Act (DEIS at 8) is misplaced. First, that Act, which merely notes general principles, creates no controlling statutory mandate on the agency. Instead, the USFS's primary mandate is to protect the forest from destruction and depredations under the 1897 Organic Act. The agency's guiding congressional mandate regarding the national forests is "to regulate their occupancy and use and to preserve the forests thereon from destruction." 16 U.S.C. §551.

Instead of following its mandate, the USFS proposes to amend the Forest Plan without credible analysis as to whether the purpose and need of the project warrants such a significant amendment to the forest plan. To credibly evaluate the purpose and need for this project and associated

features of it, the entire section needs to be rewritten following determination of the legal status of Resolution Copper's claims and other asserted rights.

In addition, the DEIS incorrectly omits other federal requirements, such as the issuance of a Right-of-Way (ROW) under FLPMA. The agencies propose to expand existing ROWs (e.g. MARRCO Corridor) apparently under the guise of the existing railroad ROW, yet the agencies would approve substantially different and expanded uses of the existing ROW, which requires a new FLPMA review. For the new ROWs (such as to the Skunk Camp tailings facility), an entirely new ROW review under FLPMA is required.

The DEIS Is Based on the Wrong Regulatory Structure

The USFS is under the mistaken belief that its review and approval of Resolution's proposed uses of federal land, and all of the proposed activities, are solely under the GPO and the agency's hardrock mining regulations at 36 CFR Part 228. *See* DEIS at 13. According to the agency, this is because there are some unpatented mining claims on some of the lands to be covered by project facilities. *See* DEIS at 148. The DEIS also states that the existing Forest Plan must be amended to accommodate the GPO. DEIS at 10-11.

In Section ES-2.1 the DEIS says: "however, the responsible official -- the Forest Supervisor, Tonto National Forest -- does not have discretion to select the no action alternative, because it would not be consistent with the requirements of 36 CFR 228.5…" In 1.5.1.1 General Plan of Operations the DEIS says: "Regulations that govern the use of surface resources in conjunction with mining operations on NFS lands are set forth under 36 CFR 228 Suppart A."

According to the USFS, Resolution has "a right to conduct mining activities." DEIS at 135. In "Relevant Laws, Regulations, Policies, and Plans" the DEIS says: "Administration of locatable mineral resources on NFS lands follow direction in federal regulations (36 CFR 228 Subpart A)." DEIS at 135. Yet, for the federal lands remaining after the exchange, there are no "locatable mineral resources on NFS lands" to be regulated, as according to the USFS and Resolution Copper, all the valuable locatable minerals are in the ore body to be exchanged away to the company.

The mere fact that the company submitted a GPO does not mean that all, indeed any, aspects of the project that remain in federal ownership are regulated only under Part 228 or that approving the GPO is the USFS's only choice. Indeed, because the record lacks any evidence that the company has statutory rights under federal mining laws, including the 1872 Mining Law, to any of the lands to remain in federal ownership, review and regulation of the project is not under Part

228, but rather the agency's special use and multiple use authorities (36 CFR Part 251/261), including ROWs under FLPMA.

The USFS' overly-restricted interpretation of its authority was squarely and recently rejected by the federal court in Arizona. On July 31, 2019, the Federal District Court for the District of Arizona issued its decision in Center for Biological Diversity v. U.S. Fish and Wildlife Service, --F.Supp.3d--, 2019 WL 3503330 (D. Ariz. 2019), in which the court vacated and remanded the USFS's approval of a large copper mine (the Rosemont Mine) due to the agency's erroneous interpretation and application of the 1872 Mining Law, federal public land law, and NEPA.

The Arizona federal court squarely rejected the same federal government position taken in the DEIS – that mining claimants are entitled to use and occupy mining claims absent any evidence that the claims are valid under the Mining Law, or that the Part 228 regulations are the proper regulatory vehicle for operations proposed off of valid claims – and ruled that the government's statutory interpretation was contrary to the plain language and controlling case law under the Mining Law, Organic Act, NEPA, and other laws. The Rosemont decision rejected the government's position that it has no authority to apply its broader public land regulations to mining operations proposed on lands that fail to meet the Mining Law's statutory prerequisites for rights against the United States.

The DEIS's review of the RCM project is based on the legal view that the entire project is regulated by the Part 228 regulations based on the fact that it involves mining on soon-to-be private lands, or that the other uses of federal land are related to a mining operation. Here, although it is difficult to ascertain the exact number and nature of the claims from the DEIS, or the purported source of Resolution Copper's "right to conduct mining activities," DEIS at 135, the agency believes that it is precluded from choosing the no-action alternative, as well as being significantly restricted in its review authority over the RCM Project.

The Arizona federal court decision ruled that the USFS' position erroneously interprets the 1872 Mining Law as well as other public land and mining laws. The court held that unless sufficient evidence exists in the agency record that mining claims proposed for use and occupancy met the requirements of the Mining Law and were valid (i.e., each mining claim contained the requisite "valuable minerals"), neither the Mining Law, nor the Part 228 regulations, govern the agency's review of the proposed use/occupancy of those lands. The agency could not simply assume rights under the Mining Law that limit the federal land agency's full and broad authority to protect public land and resources.

> [H]aving a piece of paper reflecting that one has unpatented mining claims does

> not show that one actually has *valid* unpatented mining claims. If there is no valuable mineral deposit beneath the purported unpatented mining claims, the unpatented mining claims are completely *invalid* under the Mining Law of 1872, and no property rights attach to those invalid unpatented mining claims.

Center for Biological Diversity 2019 WL 3503330, *5 (emphasis in original).

The Forest Service's review of Resolution Copper's mine is very similar, and based on the same legal positions, as its illegal review of the Rosemont Mine. The Arizona court detailed how the agency never inquired into whether the mining claims away from the mine pit met the Mining Law's prerequisite for use/occupancy rights (discovery of valuable minerals), yet the agency "accepted, without question, that those unpatented mining claims were valid" and "assumed that Rosemont had the right to use those 2,447 acres to support its mining operation (i.e., by dumping 1.9 billion tons of waste on that land)." Center for Biological Diversity, at *5. "This was a crucial error as it tainted the Forest Service's evaluation of the Rosemont Mine from the start." Id.[1] The court held that such use/occupancy, without verification that such rights under the Mining Law actually exist on those lands/claims, was ***not*** authorized by the Mining Law, and thus was not governed by the agency's mining regulations.

The court also noted that its ruling does not require that the federal agency conduct a full-scale mineral validity review for every proposed long-term or permanent use/occupancy.

> The Forest Service argues that it is not required to conduct a validity determination before approving a mining plan of operations. However, a validity determination differs significantly from establishing a factual basis upon which the Forest Service can determine rights. A validity determination invokes a separate administrative procedure carried out by the BLM (which is within the Department of the Interior). **In contrast, the Forest Service** (which is within the Department of Agriculture) **merely needed a factual basis to support Rosemont's assertion of rights.** Such a finding would not preclude another individual from bringing an adverse proceeding to determine mineral rights, or the Government from initiating a validity determination. As referenced above, the fact that Rosemont proposed to dump 1.9 billion tons of waste on its unpatented

[1] At Rosemont and at Resolution Copper, the Mining Law's provision that lands are "free and open to exploration," 30 U.S.C. §22, is not at issue, as none of the alternatives involve exploration under the Mining Law, as compared to long-term or permanent use/occupancy of federal land which the USFS proposes to approve.

> claims on 2,447 acres of the Coronado National Forest was a potent indication that Rosemont's unpatented claims on the land in question were invalid (i.e., if Rosemont was voluntarily proposing to bury its unpatented claims under 1.9 billion tons of its own waste, there is a strong inference that there is no valuable mineral deposit lying below the waste site).

Center for Biological Diversity, at *17. The situation is the same here, as there is nothing in the record that provides "a factual basis to support [the claimant's] assertion of rights." Under basic principles of administrative law, "Any decision made without first establishing the factual basis upon which the Forest Service could form an opinion on surface rights would entirely ignore an important aspect of the problem. *See State Farm,* 463 U.S. at 43. [Motor Vehicles Mfrs. Ass'n of U.S. v. State Farm Mut. Auto Ins. Co., 463 U.S. 29 (1983)]." Center for Biological Diversity, at *14.

The court also relied upon over a century of Mining Law court precedent which holds that the presence of valuable minerals on one claim (or on private land) cannot support claim validity on adjacent or nearby claims or other federal lands. "A claimant may not use the deposit present in one location to lend validity to an adjacent location. *See Waskey v. Hammer*, 223 U.S. 85, 91 (1912) ("A discovery without the limits of the claim, no matter what its proximity, does not suffice."); *Lombardo Turquoise Milling & Mining Co. v. Hemanes*, 430 F. Supp. 429, 443 (D. Nev. 1977)." Center for Biological Diversity, at *11.

> Defendants also argue that the Forest Service must allow these extralimital activities because Rosemont owns valid claims in the mine pit area. However, as explained, a separate discovery must support each claim. *See Best*, 371 U.S. at 337; *Waskey*, 223 U.S. at 91; *Lara*, 820 F.2d at 1537. Discovery in one claim cannot lend validity to an adjacent claim in which no valuable mineral deposit exists. *See id.* Rosemont's extralimital rights springing from its valid claims in the mine pit do not permit surface occupancy outside the boundaries of these claims. *See* 30 U.S.C. § 26. No limiting principle would conscript surface use under the Forest Service's interpretation of the Mining Law. This interpretation would render the act of location moot – an individual would need only discover a deposit before gaining a right to all the surface of public lands not withdrawn. This simply does not comport with the plain language of the Mining Law.

Center for Biological Diversity, at *18.

Indeed, it is very likely that these ancillary lands do not contain sufficient mineralization to

qualify as "valuable mineral deposits" and are in fact simple "common varieties" of rock and sand covering the non-mineralized portions of the RCM Project site. Such lands are governed by the Common Varieties Act of 1955, 30 U.S.C. § 611, not the 1872 Mining Law. Discoveries of "common varieties of sand, stone, gravel, pumice, pumicite, or cinders" do not qualify as "valuable mineral deposits" and therefore do not confer validity upon a mining claim. *See* 30 U.S.C. § 611. Through section 611, Congress intended to remove the disposition of lands containing only common minerals from the Mining Laws. *See Coleman*, 390 U.S. at 604." Center for Biological Diversity, at *10.[2]

Based on USFS's erroneous view of "rights" under the Mining Law, the DEIS asserts that only USFS mining regulations at 36 C.F.R. Part 228 (which have no public interest requirement and no required compliance with the agency's multiple use mandate) apply to every aspect of the project.

The Forest Service mining regulations at 36 C.F.R. Part 228 only apply to "operations authorized by the mining laws." 36 C.F.R. §228.1. The Arizona federal court held that only upon the

[2] Regarding mining/millsite claims at the site, the DEIS states that a number of unpatented mining claims within RCM's proposed project footprint are not owned by Resolution Copper. This includes: For Alternatives 2 & 3, there are one unpatented placer claim and 10 to 30 unpatented lode claims within the footprint of the Tailings Storage Facility. Within the tailings pipeline corridor there are between 20 and 30 unpatented lode claims. For Alternative 4, there are 70 to 80 unpatented lode claims owned by 3 different owners within the footprint of the Tailings Storage Facility. For Alternative 5, there are "a number" of unpatented claims within the footprint of the Tailings Storage Facility. There are 80 to 90 unpatented mining claims owned by 2 different owners within the eastern pipeline route and between 40 to 50 unpatented claims within the western pipeline corridor. For Alternative 6, there are between 120 - 130 unpatented claims along the southern pipeline corridor and 10 to 20 along the northern pipeline route. The DEIS says that: *"Some unpatented mining claims not belonging to Resolution Copper are located within the project footprint, and access to these claims may be inhibited."* The DEIS is silent on the impact of the ownership of mining claims by non-Resolution Copper owned mining claims on the financial and physical viability of project. Presumably Resolution Copper would have to either make a financial arrangement with the owners of those claims or find a different Tailings Storage Facility or pipeline route. One wonders why Resolution Copper is moving forward with a project to which it does not have control of the land it wishes to destroy or why the Forest Service even released the DEIS knowing that some entity other than the operator of the proposed project has mining claims within the footprint of the proposed project. How would it even be legal for the Forest Service to approve a mining project where another mining claim owner has "control" over land needed for the project to be permitted? The entire NEPA exercise must be halted until the Forest Service and/or Resolution Copper cleans up mining claim ownership and a new/supplemental DEIS must be written.

satisfaction of the Mining Law's prerequisite requirements for statutory rights against the United States are "operations authorized by the mining laws."

> [I]t does not follow that the Forest Service must use these Part 228 regulations merely because an action falls within the regulation's definition of operations. The Forest Service's reliance on its definition of operations ignores the purpose of its own regulations. Part 228 regulates "use of the surface of National Forest System lands in connection with operations *authorized* by the United States mining laws (30 U.S.C. 21-54 [Mining Law of 1872])." 36 C.F.R. § 228.1. Therefore, **authorization under the Mining Law of 1872 acts as a precursor to any regulation** through Part 228.

Center for Biological Diversity, 2019 WL 3503330, *19 (italics emphasis in original, bold added).

As the Court held: "the regulations state that mining activities on Forest Service land are permitted only as specifically authorized by the Mining Law of 1872. As Rosemont has no rights under the Mining Law as to the land at issue, it follows that the regulations certainly do not create independent rights that do not exist under the Mining Law." Center for Biological Diversity, at * 6.

Here, at Resolution, none of the proposed facilities, ROWs, and associated operations are "authorized by the Mining Law of 1872." As such, use of the Part 228 regulations, instead of the Part 251/261 special use regulations, is illegal. "Based on the administrative record, the Forest Service improperly applied its Part 228 regulations to actions not authorized under the Mining Law of 1872." Id. at * 19.

The Court also rejected the legal position taken by USFS here, where it asserts that it cannot choose the No-Action Alternative for the project.[3] In the Rosemont Mine decision, after discussing the agency's erroneous assumption of "rights" under the Mining Law (detailed above), the court discussed how this erroneous legal position also violated the agency's duties under NEPA:

[3] As noted herein, although the NDAA directed the USFS to exchange certain federal lands (assuming the USFS complied with all federal laws, including NEPA), it did not imply in any way that the USFS was precluded from choosing the No-Action Alternative for the mine and rejecting any proposed use of federal lands.

Based on the administrative record, the Forest Service improperly applied its Part 228 regulations to actions not authorized under the Mining Law of 1872. This mistake infected the FEIS and led to the Forest Service misinforming the public and failing to consider reasonable alternatives within the scope of its duties under the Organic Act.n

For example, in response to a public comment requesting the Forest Service "give true consideration to selection of the No Action Alternative", the Forest Service responded: "The Forest Service may reject an unreasonable Mine Plan of Operation but cannot categorically prohibit mining or deny reasonable and legal mineral operations under the mining laws." *Id.* at G-10 [Final Rosemont EIS]. In response to a comment requesting the Forest Service "consider other locations for copper mining", the Forest Service responded: "The Forest Service lacks the authority to deny Rosemont Copper's proposal if it can be legally permitted." *Id.* at G-12. And in response to a comment that the Forest Service "should scale down the size of the project or limit it to private lands only", the Forest Service repeated: "The Forest Service may reject an unreasonable Mine Plan of Operation but cannot categorically prohibit mining or deny reasonable and legal mineral operations under the mining laws." *Id.* These examples did not occur in isolation. Rather, they illustrate how heavily the Forest Service relied upon this rationale in its decision-making process.

Under the Part 251 regulations, the Forest Service could limit the mine to any of the above options if it found they ran afoul of the public interest. The Forest Service failed to take the requisite hard look at these alternatives by informing the public that it could not truly consider any alternative that rejected the MPO or substantially modified it as to make the mine economically unfeasible. *See Nat. Res. Def. Council*, 421 F.3d at 813-14. A "thorough discussion of the significant aspects of the probable environmental consequences" will include the regulatory framework in which the Forest Service analyzes those consequences. *See California v. Block*, 690 F.2d 753, 761 (9th Cir. 1982). No amount of alternatives or depth of discussion could "foster[ ] informed decision-making and informed public participation" when the Forest Service bases its choice of alternatives on an erroneous view of the law. *See Westlands Water Dist. v. U.S. Dep't of Interior*, 376 F.3d 853, 868 (9th Cir. 2004).

Center for Biological Diversity, at * 19-21 (internal footnotes omitted).

As the court stated, the agency's erroneous interpretation of federal mining law resulted in a violation of the Organic Act and NEPA. "[A] grant to use the surface when the administrative record shows such a right does not exist would contravene the Forest Service's duty to protect the forest from depredations and offer an opinion that runs contrary to the evidence." Ctr. for Biological Diversity, at *14. "In the absence of any statutory right on the part of Rosemont, the Forest Service could deny Rosemont's off claim activities as part of the Forest Service's Organic Act obligations." Id. at *17.

The court further rejected the agency's view that alternatives that greatly reduced environmental impacts to public land could be dismissed because they were too expensive for the company. "As discussed throughout this Order, the administrative record before the Forest Service reflects that Rosemont did not have valid surface rights for thousands of acres of its unpatented mining claims. Thus, rather than summarily rejecting this claim as 'technically and financially infeasible,' further consideration and evaluation of this alternative was warranted as it greatly reduced the impacts to the Coronado National Forest." Id. at *20, n. 15. Thus, with the RCM project, the USFS must fully comply with all federal laws and is not constrained by the limits in Part 228.

Here, as at Rosemont, this means that the USFS must regulate the project under its Part 251/261 special use regulations, as well as FLPMA's ROW provisions, and not under the Part 228 regulations. The agency's authority under the Part 251 regulations are very different from, and much more environmentally protective, than the Part 228 regulations. For example, the agency must deny the project if "[t]he proposed use would not be in the public interest." 36 C.F.R. §251.54(e)(5)(ii).

> The Forest Service could not apply its Part 228 regulations to these activities because the Mining Law did not authorize them.
>
> In contrast, the Forest Service's Part 251 regulations apply to "all uses of National Forest System lands, improvements, and resources." 36 C.F.R. § 251.50. Any use not regulated under the Part 228, or several other groups of Forest Service regulations, falls into the Part 251 special use regulations. *See id.* These regulations provide a dual screening process in which the Forest Service may deny any activity that does not meet several standards or otherwise comport with the public interest. *See id.* § 251.54(e). **The Part 251 regulations provide significant authority and discretion to prohibit activity on Forest Service lands, whereas the Part 228 regulations merely balance competing interests.**

Center for Biological Diversity, at * 19 (emphasis added).

The Part 251 regulations apply to occupancy and use of National Forest System lands. 36 C.F.R. §§ 251.54–251.64. The applicant must file a special use proposal with the District Ranger or Forest Supervisor having jurisdiction over the affected land. § 251.54(b). The Forest Service conducts an initial screening to determine whether the proposed use meets the "minimum requirements applicable to all special uses." § 251.54(e)(1). If the proposal passes this initial screening, the Forest Service conducts a second-level screening which requires, among other things, a showing that the proposed use is in the public interest. § 251.54(e)(5)(i)–(v). If the proposed use satisfies the Forest Service's screening criteria, the Forest Service may grant a special use permit, but must include terms and conditions to "[m]inimize damage to scenic and esthetic values and fish and wildlife habitat and otherwise protect the environment," among other requirements. § 251.56(a)(1)(i)(B). The Forest Service must also "[o]therwise protect the public interest." § 251.56(a)(1)(ii)(G). In addition, under the related Part 261 regulations, the Forest Service is required to prohibit the destruction of cultural resources on public lands, *see* 36 C.F.R. §§ 261.9(g)-(h), 261.10(a), (b).

(a) *General.* (1) Each special use authorization must contain:
(i) Terms and conditions which will:
(A) Carry out the purposes of applicable statutes and rules and regulations issued thereunder;
(B) Minimize damage to scenic and esthetic values and fish and wildlife habitat and otherwise protect the environment;
(C) Require compliance with applicable air and water quality standards established by or pursuant to applicable Federal or State law; and
(D) Require compliance with State standards for public health and safety, environmental protection, and siting, construction, operation, and maintenance if those standards are more stringent than applicable Federal standards.
(ii) Such terms and conditions as the authorized officer deems necessary to:
(A) Protect Federal property and economic interests;
(B) Manage efficiently the lands subject to the use and adjacent thereto;
(C) Protect other lawful users of the lands adjacent to or occupied by such
use;

(D) Protect lives and property;
(E) Protect the interests of individuals living in the general area of the use who rely on the fish, wildlife, and other biotic resources of the area for subsistence purposes;
(F) Require siting to cause the least damage to the environment, taking into consideration feasibility and other relevant factors; and
(G) Otherwise protect the public interest

§ 251.56 Terms and conditions. These regulations also require the payment of fair market value for the of the public's land. "(a) …special use authorizations shall require the payment in advance of an annual rental fee as determined by the authorized officer. (1) The fee shall be based on the fair market value of the rights and privileges authorized, as determined by appraisal or other sound business management principles." § 251.57 Rental fees.

Because the USFS makes the same errors here as it did at Rosemont, the agency must redo the DEIS and regulate the project under the correct legal regime. Further, USFS has not shown that the project would meet all the requirements in Parts 251/261 to protect the public interest and the natural and cultural resources at/around the site. As such, the USFS must deny the proposed uses of public land.

The DEIS Fails to Comply with the Requirements for Rights of Ways under FLPMA Title V.

Like with the other facilities proposed on the remaining federal lands, the USFS is under the mistaken belief that the pipeline and other corridors and uses thereof are subject only to the Part 228 regulations. As noted above, that is wrong. For the corridors, the DEIS fails to meet the strict public interest, environmental protection, and financial requirements of FLPMA.

The legal flaw in the USFS' refusal to require a FLPMA ROW is shown in the DEIS' Table of "permits, licenses, and authorizations required for the Resolution Copper Project," DEIS at 19 (Table 1.5.4-1). There, in addition to failing to recognize the need for a FLPMA ROW, the agency notes that for the Peg Leg tailings corridor in Alternative 5, a FLPMA ROW would be required to cross/occupy BLM lands: "To use BLM-managed public lands for right-of-way purposes, Resolution Copper would need to obtain surface use authorization from BLM for any right-of-way that crosses BLM-managed public lands." DEIS at 19.

Yet, the USFS ignores the fact that the FLPMA ROW requirement applies equally to USFS lands as well as BLM lands. **Thus, as the agency admits, if FLPMA requires Resolution Copper to obtain a ROW for crossing BLM lands for the tailings corridor, then FLPMA necessarily**

requires a similar ROW to cross USFS lands. In other words, the USFS cannot use the GPO to approve the corridors to cross USFS lands, when it admits that a FLPMA ROW would be required to cross BLM lands.

Under FLPMA Title V, Section 504 (which applies to both the USFS and BLM), the agency may grant a Right-of-Way (ROW) only if it "(4) will do no unnecessary damage to the environment." 43 U.S.C. § 1764(a). Rights of way "shall be granted, issued or renewed … consistent with … any other applicable laws." Id. § 1764(c). A right-of-way that "may have significant impact on the environment" requires submission of a plan of construction, operation, and rehabilitation of the right-of-way. Id. § 1764(d). A Title V SUP/ROW "shall contain terms and conditions which will … (ii) minimize damage to scenic and esthetic values and fish and wildlife habitat and otherwise protect the environment." Id. § 1765(a). In addition, the ROW can only be issued if activities resulting from the ROW:

> (i) protect Federal property and economic interests; (ii) manage efficiently the lands which are subject to the right-of-way or adjacent thereto and protect the other lawful users of the lands adjacent to or traversed by such right-of-way; (iii) protect lives and property; (iv) protect the interests of individuals living in the general area traversed by the right-of-way who rely on the fish, wildlife, and other biotic resources of the area for subsistence purposes; (v) require location of the right-of-way along a route that will cause least damage to the environment, taking into consideration feasibility and other relevant factors; and (vi) otherwise protect the public interest in the lands traversed by the right-of-way or adjacent thereto.

FLPMA, § 1765(b).

At least three important potential substantive requirements flow from the FLPMA's ROW provisions. First, USFS has a mandatory duty under Section 505(a) to impose conditions that "will minimize damage to scenic and esthetic values and fish and wildlife habitat and otherwise protect the environment." Id. §1765(a). The terms of this section do not limit "damage" specifically to the land within the ROW corridor. Rather, the repeated use of the expansive term "the environment" indicates that the overall effects of the ROW on cultural/historical, wildlife, environmental, scenic and aesthetic values must be evaluated and these resources protected. In addition, the obligation to impose terms and conditions that "protect Federal property and economic interests" in Section 505(b) requires that the USFS must impose conditions that protect not only the land crossed by the right-of-way, but **all** federal land affected by the approval of the ROW. This includes the federal waters and water rights that will be eliminated or significantly reduced by the project.

The requirements in Section 505(b) mandate a USFS determination as to what conditions are "necessary" to protect federal property and economic interests, as well as "otherwise **protect[ing] the public interest in the lands traversed by the right-of-way or *adjacent thereto***." (emphasis added). This means that the agency can only approve the ROW if it "protects the public interest in lands" not only upon which the road would traverse, but also lands and resources adjacent to and associated with the ROW. As noted herein, USFS would be unable to make a legitimate finding that industrial use of the lands served by the ROW, given the massive adverse impacts from the Mine, would "protect the public interest."

Third, is the requirement that the right-of-way grants "do no unnecessary damage to the environment" and be "consistent with … any other applicable laws," *id*. §§ 1764(a)-(c). This means that a grant of a ROW supporting other activities must satisfy all applicable laws, regulations and policies, including FLPMA, the Endangered Species Act, Organic Act, NFMA, NHPA, Clean Water and Air Acts, all state and local laws, etc.

The federal courts have recently and repeatedly held that the federal land agency not only has the authority to consider the adverse impacts on lands and waters outside the immediate ROW corridor, it has an obligation to protect these resources under FLPMA. In County of Okanogan v. National Marine Fisheries Service, 347 F.3d 1081 (9th Cir. 2003), the court affirmed the Forest Service's imposition of mandatory minimum stream flows as a condition of granting a ROW for a water pipeline across USFS land. This was true even when the condition/requirement restricted or denied vested property rights (in that case, water rights). Id. at 1085-86.

The USFS thus cannot issue a ROW that fails to "protect the environment" as required by FLPMA, including the environmental resource values in and out of the ROW corridor. "FLPMA itself does not authorize the Supervisor's consideration of the interests of private facility owners as weighed against environmental interests such as protection of fish and wildlife habitat. FLPMA *requires* all land-use authorizations to contain terms and conditions which will protect resources and the environment." Colorado Trout Unlimited v. U.S. Dept. of Agriculture, 320 F.Supp.2d 1090, 1108 (D. Colo. 2004)(emphasis in original) *appeal dismissed as moot*, 441 F.3d 1214 (10th Cir. 2006).

The Interior Department, interpreting FLPMA and its right-of-way regulations, has held that: "A right-of-way application may be denied, however, if the authorized officer determines that the grant of the proposed right-of-way would be inconsistent with the purpose for which the public lands are managed or if the grant of the proposed right-of-way would not be in the public interest or would be inconsistent with applicable laws." Clifford Bryden, 139 IBLA 387, 389-90 (1997)

1997 WL 558400 at *3 (affirming denial of right-of-way for water pipeline, where diversion from spring would be inconsistent with BLM wetland protection standards).

Similar to the County of Okanogan and Colorado Trout Unlimited federal court decisions noted above, the Interior Department has held that the fact that a ROW applicant has a property right that may be adversely affected by the denial of the ROW does not override the agency's duties to protect the "public interest." In Kenneth Knight, 129 IBLA 182, 185 (1994), the BLM's denial of the ROW was affirmed due not only to the direct impact of the water pipeline, but on the adverse effects of the removal of the water in the first place:

> [T]he granting of the right-of-way and concomitant reduction of that resource, would, in all likelihood, adversely affect public land values, including grazing, wildlife, and riparian vegetation and wildlife habitat. The record is clear that, while construction of the improvements associated with the proposed right-of-way would have minimal immediate physical impact on the public lands, the effect of removal of water from those lands would be environmental degradation. Prevention of that degradation, by itself, justified BLM's rejection of the application.

1994 WL 481924 at *3. That was also the case in Clifford Bryden, as the adverse impacts from the removal of the water was considered just as important as the adverse impacts from the pipeline that would deliver the water. 139 IBLA at 388-89. *See also* C.B. Slabaugh, 116 IBLA 63 (1990) 1990 WL 308006 (affirming denial of right-of-way for water pipeline, where BLM sought to prevent applicant from establishing a water right in a wilderness study area).

In King's Meadow Ranches, 126 IBLA 339 (1993), 1993 WL 417949, the IBLA affirmed the denial of right-of-way for a water pipeline, where the pipeline would degrade riparian vegetation and reduce bald eagle habitat. The Department specifically noted that under FLPMA Title V: "[A]s BLM has held, **it is not private interests but the public interest that must be served by the issuance of a right-of-way**." 126 IBLA at 342, 1993 WL 417949 at *3 (emphasis added). As the IBLA recently held:

> The public interest determination is more than a finding that no laws will be violated by granting the ROW. Even if UUD [Unnecessary or Undue Degradation] can be avoided, degradation to public resources posed by a requested ROW may factor into BLM's determination of whether that ROW would be in the public interest. For example, in *Sun Studs,* we upheld BLM's rejection of a logging road ROW permit based on environmental considerations

> without any suggestion that the environmental harm rose to the level of unlawful degradation.

Klamath-Siskiyou Wildlands Center, IBLA 2019-75, at 9 (April 29, 2019), citing Sun Studs, 27 IBLA at 282-83.

The Interior Department has ruled that pipelines and associated infrastructure, including those across public land related to a mining operation, are not covered by statutory rights under the Mining Law. "[A] right-of-way must be obtained prior to transportation of water across Federal lands for mining." Far West Exploration, Inc., 100 IBLA 306, 308 n. 4 (1988) *citing* Desert Survivors, 96 IBLA 193 (1987). *See also* Alanco Environmental Resources Corp., 145 IBLA 289, 297 (1998) ("construction of a road, was subject not only to authorization under 43 C.F.R. Subpart 3809, but also to issuance of a right-of-way under 43 C.F.R. Part 2800."); Wayne D. Klump, 130 IBLA 98, 100 (1995) ("Regardless of his right of access across the public lands to his mining claims and of his prior water rights, use of the public lands must be in compliance with the requirements of the relevant statutes and regulations [FLPMA Title V and ROW regulations]."). Although these cases dealt with BLM lands, they apply equally to Forest Service lands. As noted in Alanco, ROWs for access roads (as opposed to internal mine roads) are subject to FLPMA's Title V requirements.

The Interior Board of Land Appeals has expressly rejected the argument that rights under the mining laws apply to pipelines and roads associated with water delivery:

> Clearly, FLPMA repealed or amended previous acts and Title V now requires that BLM approve a right-of-way application prior to the transportation of water across public land for mining purposes. See 43 U.S.C. § 1761 (1982). As was the case prior to passage of Title V of FLPMA, however, approval of such an application remains a discretionary matter and the Secretary has broad discretion regarding the amount of information he may require from an applicant for a right-of-way grant prior to accepting the application for consideration. Bumble Bee Seafoods, Inc., 65 IBLA 391 (1982). A decision approving a right-of-way application must be made upon a reasoned analysis of the factors involved in the right-of-way, with due regard for the public interest. *See* East Canyon Irrigation Co., 47 IBLA 155 (1980).
>
> **BLM apparently contends that a mining claimant does not need a right-of-way to convey water from land outside the claim for use on the claim. It asserts that such use is encompassed in the implied rights of access which a mining claimant possesses**

under the mining laws. Such an assertion cannot be credited.

> The implied right of access to mining claims never embraced the right to convey water from outside the claim for use on the claim. This latter right emanated from an express statutory grant in the 1866 mining act. *See* 30 U.S.C. § 51 (1970) and 43 U.S.C. § 661 (1970). In enacting FLPMA, Congress repealed the 1866 grant of a right-of-way for the construction of ditches and canals (see § 706(a) of FLPMA, 90 Stat. 2793) and provided, in section 501(a)(1), 43 U.S.C. § 1761(a)(1), for the grant of a right-of- way for the conveyance of water under new procedures. In effect, Congress substituted one statutory procedure for another. **There is simply no authority for the assertion that mining claimants need not obtain a right-of-way under Title V for conveyance of water from lands outside the claim onto the claim.**

Desert Survivors, 96 IBLA 193, 196 (1987)(emphasis added). *See also* Far West Exploration, 100 IBLA 306, 309, n. 4 (1988)("a right-of-way must be obtained prior to transportation of water across Federal lands for mining"). The same analysis applies to water, tailings, and power either delivered to, or conveyed from the Resolution Copper sites. The leading treatise on federal natural resources law confirms this rule: "Rights-of-way must be explicitly applied for and granted; approvals of mining plans or other operational plans do not implicitly confer a right-of-way." Coggins and Glicksman, PUBLIC NATURAL RESOURCES LAW, §15.21.

The fact that the USFS mining regulations consider roads and pipelines associated with the project part of the mineral "operations," 36 CFR §228.3, does not override these holdings or somehow create statutory rights where none exist.

> [I]t does not follow that the Forest Service must use these Part 228 regulations merely because an action falls within the regulation's definition of operations. The Forest Service's reliance on its definition of operations ignores the purpose of its own regulations. Part 228 regulates "use of the surface of National Forest System lands in connection with operations *authorized* by the United States mining laws (30 U.S.C. 21-54 [Mining Law of 1872])." 36 C.F.R. § 228.1. Therefore, **authorization under the Mining Law of 1872 acts as a precursor to any regulation** through Part 228.

Center for Biological Diversity, 2019 WL 3503330, *19 (italics emphasis in original, bold added).

Overall, the DEIS and agency review of these facilities fails to apply the proper discretionary and public interest review applicable to Title V and its implementing regulations. This failure further undermines the agencies' NEPA alternatives and mitigation analysis, as well as the fundamental errors in assuming that Resolution Copper has a statutory right to receive approval of these delivery, conveyance, transmission, and access facilities.

Lastly, the USFS failed to comply with the financial requirements of the FLPMA regarding ROW applications and approvals. At a minimum, USFS must obtain "Fair Market Value" (FMV) for the use of federal land and resources. FLPMA requires that "the United States receive fair market value of the use of the public lands and their resources." 43 U.S.C. §1701(a)(9). "The holder of a right-of-way shall pay in advance the fair market value thereof, as determined by the Secretary granting, issuing, or renewing such right-of-way." 43 U.S.C. §1764(g). In addition, Resolution must fully "reimburse the United States for all reasonable administrative and other costs incurred in processing an application for such right-of-way and in inspection and monitoring of such construction, operation, and termination of the facility pursuant to such right-of-way." Id. USFS regulations state that: "(a) …special use authorizations shall require the payment in advance of an annual rental fee as determined by the authorized officer. (1) The fee shall be based on the fair market value of the rights and privileges authorized, as determined by appraisal or other sound business management principles." § 251.57 Rental fees.

Inadequate Identification and Analysis of Alternatives

Alternatives analysis

Alternative Mining Methods

Underground mining alternatives to block caving were eliminated from further consideration in the DEIS. These methods were eliminated from detailed consideration in the DEIS based largely on two factors, the cost of mining and the feasibility of large-scale tailings backfill. The DEIS identifies the environmental and social values that would be lost due to block caving, but does not give these factors the same weight as cost of mining and technical feasibility. As will be discussed, the preservation of environmental values (recreation, surface and groundwater loss) and social values (Native American heritage) should be given significant weight in the DEIS if it is reasonably possible to preserve these values.

The mine will provide some economic value to the region for 41 years, but the impacts due to subsidence will remain in perpetuity. A backfill-compatible underground mining method would allow preservation of environmental and social values predicted to be lost due to subsidence, would not sterilize part of the remaining mineral resource, would mine the ore body more efficiently, and would provide more jobs over a longer term to the local economy.

The USFS is obligated to evaluate the protection of existing uses and resources, including environmental and social values, as a part of its approval of a GPO.[4] The USFS is already proposing significant changes to the company's proposed plan of operation, including relocation of the tailings facilities, and construction of centerline/downstream dams instead of upstream dams as proposed by the Resolution Copper. A similar shift to an underground mining technique that would prevent surface subsidence would be similarly sound, for reasons that will be discussed.

The consideration of alternative mining methods that would allow mining to coexist with ongoing recreational use of Oak Flat (as it has for many decades) is inadequate and must be redone. Methods apart from block or panel caving were rejected on the faulty reasoning that other methods would allow RCM to only extract a smaller percentage of the ore body. Any land exchange involving Oak Flat that effectively vacates PLO 1229 will, by definition, convey 100% of the copper deposit to RCM. As the USFS has said many times, it is not the job of the Forest Service to determine how much profit a mine is allowed to make or can make. That is Resolution Copper's problem. The Forest Service should therefore perform a detailed mining study that evaluates other mining methods to block caving that would cause no surface subsidence and minimal surface disturbance—so that any future mining at Oak Flat would be compatible with continued recreational and cultural uses of Oak Flat. It is significant that the proposed Twin Metals mine project in Minnesota is envisioning exactly this scenario—backfilling mineworks with tailings to reduce the amount of above ground tailings storage.

The DEIS Failed to Address Alternatives We Raised During Scoping

In our scoping comments, we raised a number of alternatives that were not addressed at all. The DEIS should have either included these alternatives or offered an explanation as to why they

[4] As noted above, the USFS's proposal to regulate Resolution Copper's proposed uses of federal land via the Part 228 regulations and the GPO violates controlling federal law and regulation. References to requirements of the Part 228 regulations and review of the GPO are included herein to illustrate how even under the Part 228 regulations, the DEIS and USFS's position are contrary to law.

were rejected. Since they were not addressed we repeat them here as items missing from this DEIS.

In particular, the DEIS should have examined the reopening of the San Manuel mine which was opened by BHP, the minority owner of Resolution Copper. That mine was closed around 2004 at the same time the Resolution Copper proposal was gaining legs. The San Manuel mine was closed with at least a 30-year supply of copper and expensive mining equipment was left underground. Mining out this deposit would be preferable and more environmentally benign than building a new mine in an area with such high value for non-mining activity. The DEIS should have done a viability analysis of whether the mine could be reopened both technically and financially.

Mining Cost and Production Capacity

SWCA has used Dundee Capital Markets, 2012, *An Introduction to Underground Mining* to bracket underground mining cost estimates (DEIS 2019). SWCA also estimated that all of the underground mining methods evaluated, except block caving, could accommodate backfilling which could prevent subsidence. All the underground mining method costs, with the exception of cut-and-fill mining, were the same cost to approximately twice the cost of block caving (SWCA 2017). This cost range is not unreasonable to evaluate further as viable alternatives, given the uses and resources that could be saved by eliminating subsidence. Production volume for dry tailings for underground backfill was also a consideration, and was used as a discriminating factor for mining method evaluation in the DEIS alternatives screening. It was noted that "*The process of using dry stack tailings methods has not been done at the scale of the proposed GPO production scale (130,000 tons per day). The industry maximum of successful dry stack production is 20,000 tons per day*." (DEIS 2019).

However, it should also be noted that the USFS recently approved dry stack tailings at the Rosemont Mine at a production rate of 75,000 tons per day. Since only approximately half of the tailings are typically backfilled in an underground mine, the dry tailings production rate approved at Rosemont would be virtually identical to the rate needed for backfill at the RCM.

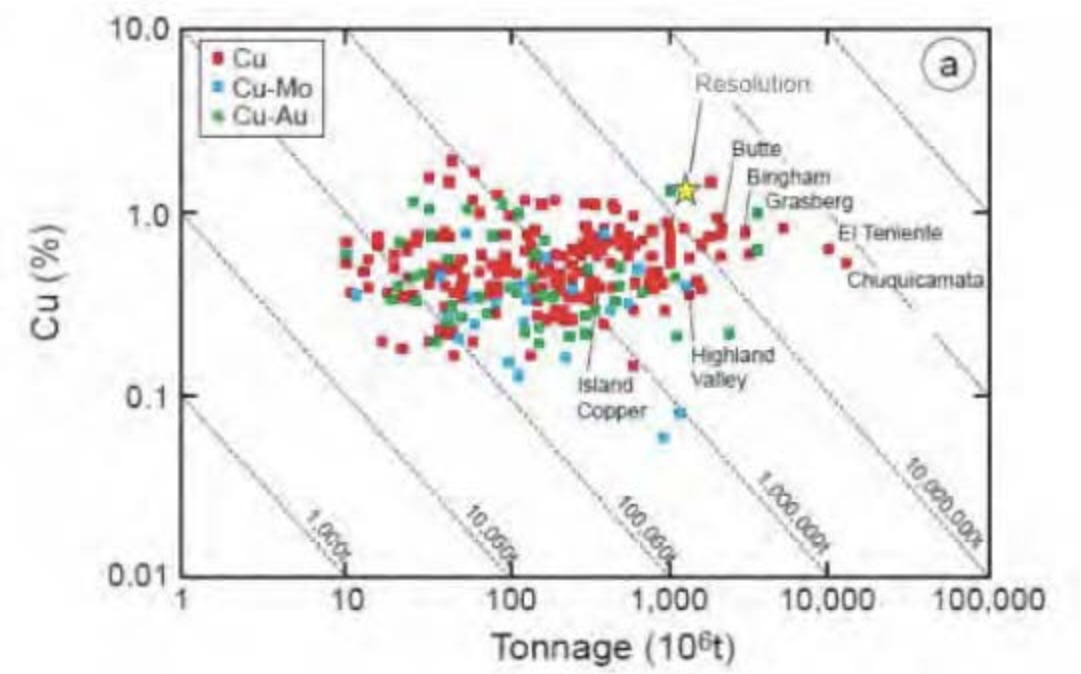

Figure 1: Grade and tonnage characteristics of the Resolution deposit compared to other porphyry-type deposits world-wide, copper (top), molybdenum (bottom). Selected, noteworthy deposits are labeled. The dashed diagonal lines represent the total contained metal. Modified from Seal (2012) and Sinclair (2007).

Dry tailings/backfill production rate should not be a barrier to underground mining at RCM.

The DEIS lacks complete, credible, up-to-date mitigation or monitoring plans.

The DEIS inclusion, as Appendix J, of outdated, incomplete, and flawed "descriptions of mitigation concepts being considered" (p. 556) constitutes an unfair, unjustified, and unnecessary USFS request for public trust and confidence that USFS will do what is warranted to avoid and reduce impacts. This is not acceptable. The public, tribes, and consulting parties need and deserve what NEPA and other laws and policies require in and from the DEIS: a full and detailed, if still not finalized, mitigation plan, including detailed analysis of the effectiveness of all mitigation measures (which the DEIS does not contain). That plan must be rigorously attentive to the avoidance and reduction of all foreseeable impacts and harms.

In particular, the DEIS fails to include a complete and current failure modes analysis. This failure both deprives the public of participation in the Failure Modes and Effects Analysis (FMEA) analysis and obliges USFS planning and deciding on the basis of partial and potentially faulty

information. According to the DEIS, "The less information available during the FMEA process, the more assumptions have to be made, leading to a less meaningful assessment that may not be representative of the true risks for the ultimate designed facility" (p. 557).

The failure to complete and provide for public review of a credible draft mitigation plan is symptomatic of a more *deeply rooted and nearly pervasive DEIS flaw*: a hurried and incomplete assessment of tailings storage facility (TSF) alternatives. That analysis has proceeded piecemeal, remains incomplete and flawed, and has never included analysis of parallel information for and concurrent assessment of all alternatives under consideration. In particular, the USFS failure to complete the soils and vegetation surveys and analyses for the preferred TSF (Alternative 6) has disabled and hampered public participation and corrupted the alternative selection process.

Neither the DEIS nor the supporting documents provide an adequate basis for discriminating among the TSF alternatives. Because the information is incomplete and the analysis remains in progress, *the DEIS fails the essential test of providing a reasoned and evidence-based rationale for the selection of Skunk Camp as the preferred TSF alternative*. The DEIS release in advance of opportunities for public and tribal involvement in the comparative analysis of TSF alternatives eliminated and foreclosed upon public participation in the hurried and incompletely disclosed identification of Alternative 6 as the preferred TSF alternative. One reasonable conclusion is that that USFS identified the TSF preferred alternative on the basis of factors not fully disclosed in the DEIS.

The identification of possible mitigation measures is an integral and important part of NEPA analysis. NEPA requires the identification of possible mitigation measures for adverse environmental impacts. As the Supreme Court has said:

> Implicit in NEPA's demand that an agency prepare a detailed statement on 'any adverse environmental effects which cannot be avoided should the proposal be implemented,' 42 U.S.C. §4332(C)(ii), is an understanding that the EIS will discuss the extent to which adverse effects can be avoided. [cite omitted] More generally, omission of a reasonably complete discussion of possible mitigation measures would undermine the 'action forcing' function of NEPA. Without such a discussion, neither the agency nor other interested groups and individuals can properly evaluate the severity of the adverse effects. An adverse effect that can be fully remediated by, for example, an inconsequential public expenditure is certainly not as serious as a similar effect that can only be modestly ameliorated through the commitment of vast public and private resources. Recognizing the

> importance of such a discussion in guaranteeing that the agency has taken a 'hard look' at the environmental consequences of proposed federal action, CEQ regulations require that the agency discuss possible mitigation measures in defining the scope of the EIS, 40 CFR § 1508.25(b) (1987), in discussing alternatives to the proposed action § 1502.14(f), and consequences of that action, § 1502.16(h), and in explaining its ultimate decision, § 1505.2(c).

Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 352 (1989).

The DEIS's identification/discussion of mitigation measures for the many severe adverse impacts identified in the document is woefully inadequate. For a number of serious impacts, there are simply no mitigation measures identified in the DEIS. In some cases, there are mitigation measures identified in referenced technical reports that are not even mentioned in the body of the DEIS. In other sections, such as transportation, mitigation is proposed that is severely inadequate to address serious safety concerns. The enforceability of mitigation measures for a number of types of impacts is never addressed.

Similarly, there is little to no discussion of monitoring for most affected resources in the DEIS. Thus, the public has no way of commenting on whether and how the USFS, other involved public agencies, and the affected communities could determine whether any mitigation measures chosen for implementation are actually implemented and what their effectiveness might be over the lifetime of the proposed mine and following its shutdown.

The DEIS addresses Mitigation and Monitoring in Section 2.3.1 in the DEIS. A Mitigation and monitoring plan appears in Appendix J, pages J-1 - J-38. The first paragraph of this section points out clearly that the full suite of mitigation measures intended to avoid or reduce environmental effects is not known and won't be known until many or most of the permits have been issued. This huge disclaimer makes this section hard to take seriously. As we've pointed out throughout these comments, the public must have an opportunity to comment on a final plan before a decision is made. And as with many parts of the DEIS, we are aiming at a moving target. In general, mitigation and monitoring measures suggested in the DEIS are woefully inadequate to avoid or meaningfully reduce the severe environmental effects of the proposed project. Many of the measures would be implemented by Resolution Copper. It is not at all clear that Resolution Copper would have the means or the incentive to implement the meager mitigation and monitoring measures outlined in the DEIS. Further, it is not clear exactly which measure would be required, and if required, what oversight USFS would have over the implementation of those measures.

The DEIS is unclear about evaluating and reporting requirements and how these would be enforced and there is no indication of the amount of a financial assurance or reclamation bond that would be able to be used to continue mitigation and monitoring measures. The DEIS discusses other agencies that would require financial assurance if Resolution Copper would default; however, some agencies like the Arizona Department of Environmental Quality (ADEQ) allow the use of corporate self-guarantee which would not be at all helpful in the event that Resolution Copper would abandon the project.

Under "Source of measure," RCM and certain agencies are listed, but how the responsibility is apportioned is mostly unclear. Some statements in the methods section amplify a few of these concerns, but this concern mostly remains unaddressed. Who is responsible for funding the proposed mitigation or monitoring measure is unclear. Federal, state or municipal/county government contributions depend on budgets and appropriations, and in a period of reduced government funding, the government contributions become vulnerable to reduction or elimination. That translates into a loss of effectiveness and responsibility for monitoring health and environment, oversight of Resolution Copper, initiation and supervision of mitigation and remediation.

Many of the measures outlined in Appendix J have no teeth, have no details, or are measures that already are (or should be) required. That makes much of this section pointless. In addition, most of the outlined measures have no timeline or deadlines. The write up for many measures admit that "implementation is not assured." What good is discussing a measure intended to mitigate or monitor environmental damage if there is no guarantee they would or could be implemented? For almost all of the monitoring measures, is monitoring being done for the sake of monitoring, or would the monitoring trigger mandatory corrective measures?

Measure RC-213 calls for a replacement climbing area aptly called "Inconceivables." Beside the obvious fact that any recreation area on public land is not "new," it is not reassuring that Resolution Copper is responsible for this measure. There are no details as to what this would entail. Would they just blade a road? How easy would it be to get to? Would it only be open to Resolution Copper supporters? Please provide maps. Is this "new" area of equal size and quality as what would be lost at Oak Flat. It is inconceivable that, if this place was as good as climbing is at Oak Flat, it would not already be used by climbers. If Resolution Copper truly wanted to create a "replacement" climbing area, they would need to donate some of their own private land to the public for this use.

Measure RC-215 calls for a replacement campground. There are no maps showing where that

"new" campground would be or how it could possibly compare with Oak Flat. Is it just a parking lot along a highway? Is there similar vegetation? Is it even on public land? Would it be as nice and rustic as Oak Flat or would it be a "modern" industrial campsite?

Measure FS-01 calls for Satellite monitoring of the TSF. How often? Would this be in place of on-the-ground monitoring? If the monitoring finds something wrong, what further measures would be taken? Is this a "look good" measure, or something that would require meaningful action if the monitoring finds something wrong?

Measure GP-26 calls for the improvement of the resiliency of the TSF. This seems like Resolution Copper expecting a gold star for simply obeying the law. One would think that no agency would approve a TSF without it already being as resilient as possible. This seems to be nothing more than an attempt to make it appear that USFS and Resolution Copper are going above and beyond the rules.

Measure FS-227 is for conducting a FMEA before the FEIS is released. This should have been done for the DEIS and, if it is complete before the FEIS is released, how will the public have a chance to comment on the FMEA. A FMEA is only viable if it is done in the light of day and not written in secret and then put on a shelf to rot. Is this a mitigation measure or a monitoring measure? Should it not be a basic safety measure necessary as a baseline for all analysis? All of these comments are directly applicable for measures FS-228 and FS-229.

Measure FS-229 is something that needs to be done in a new or supplemental DEIS. The homeowners and ranchers living along Dripping Springs Road have the right to know that, if the preferred alternative is chosen and a dam failure occurs, whether there would be a viable plan to save their lives or whether they are left twisting in the wind. This measure must be done in a new or supplemental DEIS with complete transparency and with the full input and sign off of folks whose lives are directly in danger from this project. It is simply inconceivable that Resolution Copper, the perpetrator of the danger to local residents, is helping to write this plan, but not the folks at risk.

A new or supplemental DEIS must be written analyzing all mitigation and monitoring measures with full opportunity for public comment on the revised plans before any decisions are made.

Inadequate Analysis of the "No Action" Alternative

At the outset, the DEIS is based on a fundamental flaw regarding the USFS's authority over

Resolution Copper's proposed use of lands that will remain in federal ownership. The DEIS mistakenly believes that approval of the proposed uses on the remaining federal lands is linked with approval of the land exchange. Regarding the No-Action Alternative, the DEIS states that **"this alternative cannot be selected by the Forest Service."** DEIS at 66 (emphasis added). This is because, according to the USFS:

> **The no action alternative includes the following:**
>
> - The final GPO would not be approved, thus, none of the activities in the final GPO would be implemented, and the mineral deposit would not be developed;
>
> - **The land exchange would not take place**;
>
> - Certain ongoing activities on Resolution Copper private land, such as reclamation of the historic Magma Mine, exploration, monitoring of historic mining facilities such as tailings under existing State programs and permits, maintenance of existing shaft infrastructure, including dewatering, and water treatment and piping of treated water along the MARRCO corridor to farmers for beneficial use, would continue regardless of GPO approval;
>
> - Ongoing trends not related to the proposed project would continue, such as population growth, ongoing impacts on air quality from dust and vehicle emissions, human-caused fires from recreation, ranching, and a corresponding increase in use of public lands; and
>
> - No agency land and resource management plans would be amended for this project.

DEIS at 66 (emphasis added). Thus, under the agency's view, the No-Action Alternative cannot be selected because Congress mandated the approval of the land exchange. But that erroneously links the review/approval/denial of the proposed uses on the remaining federal lands with the congressionally-mandated approval of the exchange. Nothing in the NDAA, or any other federal law, requires the USFS (or any other agency such as the Corps) to approve anything beyond the land exchange.[5]

[5] As discussed above, the USFS is also under the mistaken belief that it must approve the GPO under the Part 228 regulations.

The DEIS may be correct that denial of the proposed uses would mean that "the mineral deposit would not be developed." Id. But that is not determinative of the scope of the agency's review of the project on the remaining federal lands and does not mean that the agency cannot select that Alternative, because denying those proposed uses is independent of the required approval of the land exchange.

A proper No Action Alternative, then, should be focused on the company's proposed uses of federal land (and its related impacts to private and state lands) as if all of the proposed uses on the remaining (non-exchanged) federal lands are denied by the USFS/Corps. Indeed, as detailed above, when the USFS reviews these proposed uses under the proper regulatory structure, the proposed uses cannot be approved, due to irreparable and devastating impacts resulting from approval of the uses.

Although the agency and Resolution Copper may argue that the company would not propose the exchange if the agency denied the proposed uses on the remaining federal lands, that presupposes that the USFS will approve all the requested uses. Yet, as detailed herein, nothing in the NDAA or any other law requires the agency to approve these uses. Overall, the agency cannot base its view of the No Action Alternative on an incorrect view of the law, or on any presumption that it must approve the proposed uses.

A legitimate and proper No Action Alternative must, then, consider the conditions that will exist if the agencies deny the proposed uses. For example, because Resolution Copper would have no need to continue to pump/dewater groundwater if it was denied its proposed uses (even after the exchange was done), because it would not have the support facilities necessary to mine the ore body, the baseline and related conditions that would then exist must be considered as the true No Action Alternative condition.

For example, the USFS incorrectly believes that the dewatering will continue (DEIS at 66) even if the proposed uses were not approved. *See also* DEIS at 317 ("Under the no action alternative, which includes continued dewatering pumping of the deep groundwater system….") That does not make sense. The fact that Resolution Copper would obtain the ore body and surrounding lands via the exchange does not mean that it would continue groundwater pumping when it could not conduct the proposed uses on the remaining federal lands.

"No Action" Alternative Improper Baseline Conditions

In Section 2.2.3 the DEIS discusses the No Action Alternative, or Alternative 1. The DEIS says:

> *"However, note that certain activities are currently taking place on Resolution Copper private property, such as reclamation of the historic Magma Mine; exploration; monitoring of historic mining facilities such as tailings under existing State programs and permits; maintenance of existing shaft infrastructure, including dewatering; and water treatment and piping of treated water along the MARRCO corridor to farmers for beneficial use. These activities are therefore assumed to occur in the no action alternative."*

That statement cannot be supported by the past history of Rio Tinto and BHP, the owners of Resolution Copper. History shows that when the mining industry abandons a project, they simply walk away and neglect many of the programs that the DEIS insists will be continued. In fact, when the Magma Mine operations (which were owned by BHP at the time) closed in 1996, BHP simply turned off the dewatering pumps in shaft #9. There is no reason to believe that if Alternative 1 is chosen or for some other reason Resolution Copper is denied permits to mine, or if Resolution Copper, for whatever reason decides not to move forward, that reclamation of the historic Magma Mine; exploration; monitoring of historic mining facilities such as tailings under existing State programs and permits; maintenance of existing shaft infrastructure, including dewatering; and water treatment and piping of treated water along the MARRCO corridor to farmers for beneficial use, would continue. A true "no action" alternative would not consider speculative ongoing activities by a company whose owners have a pattern of doing exactly the opposite.

As Alternative 1 is used to set the baseline conditions from which the DEIS examines all other alternatives, because Alternative 1 makes unreasonable assumptions about activities not likely to take place, the entire DEIS is tainted by this major underlying flaw.

This is not an abstract argument. Because the DEIS uses a flawed baseline for all other alternatives throughout the DEIS, the impacts for all other alternatives are incorrect.

For example, the DEIS's conclusion that dewatering would continue under baseline conditions skews the water balance conclusions. By including continued dewatering of the deep GW aquifer in No Action Alternative groundwater model predictive long-term simulations, and then subtracting drawdowns from LOM and post-closure simulations, RCM consultants have

effectively biased the magnitude and extent of mine impacts on GDEs towards the low side, or the opposite of conservatively high impacts (see page 3, paragraph 4, Garrett and Newell, 2018). At a minimum, predicted drawdowns should have been calculated from pre-mining conditions, as these are the levels to which shallow ALT aquifer groundwater levels will eventually recover to. This is known without even using the highly uncertain groundwater modeling results.

Improper Dismissal of "No Action" Alternative

As noted above, the analysis of the required "no action" alternative in the DEIS is totally inadequate. It is predicated on the premise that the no action alternative requires no real analysis, but simply repeated statements to the effect that nothing will happen were the no action alternative to be selected. Not only does this "wax museum" representation fail to recognize on-going, changing, and projected patterns of use within the project vicinity, it totally fails to acknowledge the larger context within which the proposed project would occur. The requirement to analyze the effects of the no action alternative is not satisfied by an oft-reiterated version of the statement that "nothing will happen." The requirement for the no action alternative exists as a mechanism for comparing the environmental and related social and economic effects of the affected environment in the absence of the proposed action as compared to all of the proposed action alternatives. "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," *Federal Register* Vol. 46, No. 55, March 1981, Question 3, "No Action Alternative." Just as the impacts of the four alternatives are analyzed over the 20-plus years of the project life, so the "no-action" alternative must be analyzed over 20-plus years. Furthermore, the period *after* mine closure needs to be carefully and fully analyzed, particularly because the mine represents an irreversible commitment of resources.

Unfortunately, in this DEIS, there is no acknowledgement of the current, on-going and project/planned changes in the overall built and natural environment. Instead, the substance of all commentary of this alternative is characterized as "none," "not applicable," "no impact," "no change," and similar phrases. The DEIS totally ignores the ecological changes that would occur, the impacts of climate change, projected patterns of visitation and use, including grazing and recreation, on the site of the proposed Resolution Copper mine.

Moreover, the DEIS fails to recognize that substantial change will continue to occur on the balance of the Tonto National Forest as well as other public lands and private lands surrounding the project area. Consistent with local government plans and policies, significant increases in population and population distribution will occur throughout the area. Changes in the land use patterns will also occur, including, but not limited to, residential uses, commercial uses,

employment centers, ranching, recreation, as well as conservation. Moreover, patterns in resource use will also change, most notably the use of increasingly scarce water resources. In effect, then, the "No Project Alternative" does not consist of a baseline suspending all change in Arizona for the duration of the projected operation of the proposed project as interpreted in the DEIS; rather, the baseline for evaluating impacts is the dynamic and changing world surrounding the proposed project. And, to realistically project conditions in the affected area without the proposed mine requires the USFS to evaluate the aggregate of local government plans, policies, population projections, capital improvement programs, etc., as well as plans for other relevant Federal, State, and local agencies.

The analysis of the "No Action" Alternative must also address the fact that changes would be occurring incrementally over the period of mine operation. Many of the impacts would be at their most severe or greatest magnitude in the final years of mine operation. For example, growth in traffic and water use would likely be at their highest levels due to the combination of normally occurring growth combined with the proposed project. Thus the baseline for evaluating impacts in the DEIS should be the aggregate state of the environment from the initiation of operation of the proposed project through to the completion of reclamation.

The "No Action" Alternative should properly consist of the aggregate baseline conditions and reasonably foreseeable conditions as if the proposed uses on the remaining federal lands were denied.

Unlawful Restrictions On Public Participation

In addition to the inadequate deliveries of public notice, the restrictions placed on the submission options for public comments raises serious concerns about the adequacy of public participation under this process and of potential violations of procedural due process.[6] USFS regulations at 36 C.F.R. § 219.4 state:

> When developing opportunities for public participation, the responsible official

[6] During the scoping period in 2016, an email address was provided for submitting comments. However, an email address is not provided for commenting on the DEIS, further restricting the available methods for public participation, contrary to the requirements contemplated at 36 C.F.R. § 219.4. TNF's decision to refuse to provide an email address for comments eliminates the opportunity to comment *via* one of the most commonly available communication methods in the contemporary era. Moreover, we are concerned that individuals who previously commented using the then existing USFS email address may find out too late that this option is no longer available or they may submit comments to this email address and, absent a bounce-back, may never know that their comments were not received by TNF, further violating 36 C.F.R. §219.4.

> shall take into account the discrete and diverse roles, jurisdictions, responsibilities, and skills of interested and affected parties; **the accessibility of the process**, opportunities, and information; and the cost, time, and available staffing. The responsible official should be proactive and use contemporary tools, such as the Internet, to engage the public, and should share information in an open way with interested parties. (emphasis added).

Here, the requirements set for in 36 C.F.R. § 218.8(b) for filing prohibits the incorporation of documents by reference, "except for the following list of items[7] that may be referenced by including date, page, and section of the cited document, along with a description of its content and applicability to the objection. **All other documents must be included with the objection**." (emphasis added). This requirement, when combined with the arbitrarily small file size (20 MB) accepted by the online portal provided to upload and submit comments, effectively bars the electronic submission of comments due to the extensive nature of all documents that must be included and, consequently large file sizes that exceed 20 MB. Because electronic submission is the most convenient submission method, these requirements make the public participation process less accessible, which violates USFS's regulations at 36 C.F.R. § 219.4.

Additionally, these submission requirements have the greatest impact on less technically sophisticated public participants who may be unaware that their comments may not be considered due to failure to comply with technical USFS regulations. These participants will often fall into the categories that the USFS regulations specifically direct the agency to engage, such as "[y]outh, low-income, and minority populations," and "private landowners whose lands are in, adjacent to, or otherwise affected by, or whose actions may impact, future management actions in the plan area." 36 C.F.R. § 219.4(a)(1). In light of these serious deficiencies in the public participation process, the DEIS comment period should be extended to 180 days, the restrictions on comment submission corrected, and additional public meetings should be held in the Phoenix and Tucson metro areas.

Public Health and Safety

[7] This list consists of (1) All or any part of a Federal law or regulation; (2) Forest Service directives and land management plans; (3) Documents referenced by the Forest Service in the proposed project EA or EIS that is subject to objection, and (4) Comments previously provided to the Forest Service by the objector during public involvement opportunities for the proposed project where written comments were requested by the responsible official. 36 C.F.R. § 218.8(b).

Safety Concerns

The DEIS Report:

- Actually and specifically states that "the mine and associated activities are expected to increase risks to public health and safety from the presence of a large tailings storage facility on the landscape, and the transport of concentrate and tailings by pipeline. These risks are unavoidable."

- Notes other serious to very serious tailings dam failures, including Brumadinho (2019), Córrego do Feijão (2019), and Fundao (2015) in Brazil and Mount Polley (2014) in British Columbia, so these risks acknowledged in the DEIS are very real. Moreover, ALTs 2-6 propose a much larger mining project than the above Brazilian and B.C. mines, increasing the level of proposed risk to life and property.

- Admits that "Aside from catastrophic failures, tailings storage facilities can represent other long-term risks to public health and safety; groundwater contamination from seepage, erosion of materials into downstream waters, and windblown dust. While these facilities gradually drain over time, becoming less susceptible to failure, the potential risk can last for many decades. One study (Strachan & Van, 2018) identified that roughly 80% of tailings facilities failures occur in active facilities, but 20% occur in closed facilities."

- Contradicts itself in stating in one place (§ES 3.7, bullet # 5) that no storm water run-off that contacts the tailings facilities would be released; however, there is no evidence to support this claim, which apparently assumes 100% mitigation effectiveness. Then almost immediately contradicts itself saying that the mitigation is 99.5% at best.

- States that "the proposed project may adversely impact individuals" (§ES 3.8); this statement apparently is in reference to the "normal" seepage that will occur from the tailings storage facilities. However, if there is a containment failure, sensitive wild-life species and habitats, especially those connected with the Gila River will be devastated.

- Reiterates under "Public Health & Safety," Bullet#2, that for ALTs 2-6: "consequences of a catastrophic failure and the downstream flow of tailings would include possible loss of life and limb, destruction of property, displacement of large downstream populations, destruction of the Arizona economy, contamination of soils and water, and risk to water supplies, and key water infrastructure like the CAP Canal." The highest downstream

population would exceed 600,000 (§ES 3.10). (Also, in §ES 3.7 the DEIS says there is no potential for this.)

- Says in §1.75 "Issue 5" that "Construction and ongoing operation of the mine may have a variety of adverse effects on public health and safety … These concerns are focused principally on risks caused by breach or other failings of the tailings facility and embankment, emissions and other negative effects on air quality, possible seepage from or other contamination related to the tailings facility fouling local groundwater supplies; the potential for hazardous materials/chemical spills."

- Notes under "Issue 6: Water Resources" that "The tailings storage facility also presents risks to the watershed through the potential for contaminants from metals or chemicals in tailing seepage to escape controls and enter groundwater and/or downstream surface waters" (§1.76).

- Is vague under "Tailings Storage Facility and Tailings Pipeline Corridor" in the description of pipelines and safety protocol (Ch. 2).

- Is vague and minimally discussed under "MARRCO Corridor" when referring to the interaction of the copper concentrate slurry pipeline and currently existing water pipelines and infrastructure (Ch. 2).

- Gives an example of pipeline arrangements, obviously generic at this time, but is there data on where these types of devices, especially the bridges, are needed? Planners/developers need to provide more specificity regarding pipeline terrain interaction and location/implementation (Figure 2.2.2-11).

- Under "Tailings Facility/Liner" The PAG cell would incorporate an engineered low-permeability layer … the engineered low-permeability layer could contain one or more of the following 5+designs or materials. If the wrong materials are used, it could have an adverse effect on the ability to control seepage.

- States: "The sludge containing concentrated metals and salts from evaporation would likely require clean-up and handling as a solid or hazardous waste." How is this going to be done, how much would it cost, and what are the potential environmental safety aspects or implications? (§ "Tailings Facility – Closure and Reclamation" Para. 2).

- Notes, primarily for ALT 6, but is also applicable to ALTs 2, 3, and 4: Surface water diversions would be large due to the steep surrounding terrain and the need to surround the tailings facility on the northern, eastern, and western sides with extensive storm water diversion structures. Can the safety and effectiveness of this "extensive storm water diversion" be determined in any reliable way with regards to uncommon/severe storm, flash-flood type water run-off, etc.? (Table 2.2.8-1, "Auxiliary Facilities").

- Notes that for groundwater and surface water quality for ALTs 2, 3, 4, and 5 seepage control effectiveness was listed in the very high 99-plus percent level, but for ALT 6, (the "preferred" Alternate) seepage control is only good up to 90% - which is highly problematic as this is the lowest percentage referring to public health risk so far in the report. (§3.7.2 , Chapter 2, "Water Resources")

- States the results of the impact analysis for ALT 2 & 3 are quite literally devastating; ALT 4, 5, and 6 are pointed out to have much smaller impacts, but they have impacts nonetheless. "Consequences of a concentrate or tailings pipeline failure would include soil and water contamination, and destruction of vegetation in any water bodies crossed."

- States that "the Forest Service in the process of developing a set of mitigation measures…" What are the mitigation measures and when will they be finalized (Chapter 3, 3.1, Introduction, para. 24)?

- Notes that "There are several areas of uncertainty and some areas of sparse or low confidence data…" (Ch 3, 3.2.2.2, para. 5, bullet#4). Where are these uncertain data detailed?

- States "Alternative 6 does not involve any federal land. Activities and resource impact occurring on these lands would not be regulated under either Forest Service or BLM regulations, though Resolution Copper would potentially employ some of the same environmental protection measures and mitigation" [emphasis added] (Ch 3, 3.2.3 "Affected Environment" & 3.2.2.1, "Relevant Laws, Regulations, Policies, and Plans" para. 4). Exactly what environmental protection measures and mitigation efforts would be employed?

- States that "The regulatory framework under the State of Arizona requires financial assurance for long-term closure activities is the same as described for Alternative 2. However, Alternative 6 differs from the other alternatives because the tailings facility

would not be located on lands managed by the Forest Service (as in Alternatives 2, 3, & 4) or BLM (Alternative 5). For Alternative 6, the Federal financial assurance mechanisms would not be applicable" (§ 3.3.4.7, "Alternative 6-Skunk Camp," penultimate paragraph). So who or what agency will pay for these potential long-term closure activities, and what assurance would be in place for these costs?

- Notes under "Unavoidable Adverse Effects" that "…these include the complete loss during operations of soil productivity, vegetation, and functioning ecosystems within the area of disturbance, and eventual recovery after reclamation (though not likely to the level of desired conditions or potentially over extremely time frames)" (§3.3.4.9, "Mitigation Effectiveness" Last subsection). The DEIS admits this problem in the best of circumstances with regard to the proposed mine (for ALTs 2-6).

- Notes under "Irreversible and Irretrievable Commitment of Resources" that the effects on the soil of Alternative 6 are irreversible. The area of the crater and of the tailings storage facility would be a forever-loss" (§3.3.4.10, "Other Required Disclosures"). The DEIS admits this problem in the best of circumstances with regard to the proposed mine.

- Addresses, "Interpretation of Background 'Ambient' Noise Measurements." Are the Skunk Camp tailings facilities under the military VR/IR routes and/or military operating areas? If yes, there is the potential for high-speed aircraft sonic disturbances. (§3.4.3.3, "Existing Conditions…").

- States: "The exposure of the mined rock to water and oxygen, inside the mine as well as in stockpiles prior to processing, can create depressed pH levels and high concentrations of dissolved metals, sulfate, and dissolved solids … Seepage from the tailings has the potential to enter underlying aquifers and impact ground water quality. In addition, contact of surface runoff with mined ore, tailings, or processing areas has the potential to impact surface water quality." (3.7.2.1, "Introduction"). Once again, an admitted adverse impact of the proposed mine.

- Notes: "All tailings storage facilities – including filtered tailings – lose water to the environment in the form of seepage that drains by gravity over time. This seepage is the primary source of potential water contamination …" (3.7.2.2, "Geochemistry Modeling Process").

- Presents TABLE 3.7.2.2, "Modeled Block-Cave Sump Water Chemistry": Eight (8)

elements are listed that are higher than the allowable amounts, and they are Antimony, Beryllium (toxic), Cadmium (toxic), Chromium Cr(VI) Hexavalent CR (toxic & carcinogen), Lead (toxic), Nickel, Selenium Salts (toxic in large amounts), and Thallium (highly toxic – historically used as rat poison).

- Once again, the DEIS acknowledges adverse impacts. Tailings seepage models for all alternatives acknowledge the seepage will occur and the mitigation controls are designed to preclude groundwater contamination concentrations to be less than allowed by Arizona aquifer/surface water quality standards.

- Notes that ALT 6 modeling estimates indicate that the engineered seepage controls can recover 90% of total seepage. This is the lowest percentage of ALTS 2-6. "Sulfate and total dissolved solids are significant constituents in tailings seepage and can alter the potential use of downstream water resources, but do not have numeric standards. Over time, sulfates concentrations in groundwater closest to the tailings storage facility are expected to rise slightly above the 250mg/L secondary standard, to 385 mg/L" (Under "Risk of Seepage Impacting Groundwater or Surface Water Quality").

- Notes that the closure timing is estimated at 20 years: "The sludge of concentrated metals and salts from evaporation would likely eventually require clean-up and handling as solid or hazardous waste" (Under "Ramifications"). There is required long-term financial assurance for closure and post-closure activities for ALTs 2-5; however, for ALT 6 the federal financial mechanisms would not be applicable. Similar to the question above, who or what agency will pay for these potential long-term closure activities, and what assurance would be in place for these costs to be covered?

- States: "The potential for TENORM problems to occur (based on analysis of 5,987 samples of copper ore from 137 exploration boreholes, etc.) the authors state that this does not suggest a strong presence of radioactive materials above typical concentrations"(Under "Technologically Enhanced Naturally Occurring Radioactive Materials). However, the authors go on to state that a small percentage (2-6%) of the samples exhibited concentrations above "thresholds of concern."

- States under the Introduction to the "Tailings and Pipeline Safety" section of "Public Health and Safety," that "Tailings storage facilities represent a long-term source of risk to public health and safety that extends well beyond the operational life of the mine. Catastrophic failures are one type of risk." The DEIS here again admits to these adverse

impacts of the proposed RCM.

- "Aside from catastrophic failures, tailings storage facilities can represent other long-term risks to public health and safety, groundwater contamination from seepage, erosion of materials into downstream waters, and windblown dust. While these facilities gradually drain over time, becoming less susceptible to failure, the potential risk can last for many decades. One study (Strachan & Van, 2018) identified that roughly 80% of tailings facilities failures occur in active facilities, but 20% occur in closed facilities."

- States: "The concentrate in tailings pipelines are also susceptible to failure. Failures of these types of pipelines are not generally tracked. However, the petroleum industry is the only source of published studies on frequency of pipeline failures. Their research translates to roughly 0.03 failures per year per 1,000 miles of pipeline, so for a 30-mile tailings pipeline, the risk of failure in any given year would be about 0.1%."

- Admits there are substantial limitations to the Rico Empirical Method approach to breech analysis (simulations of failures). For example, the largest facility in the data set was 74 million cubic meters, compared with 1,000 million cubic meters (upon build-out) for the TSF. Therefore, the extrapolation goes well beyond the bounds of the original data set: This represents an uncertainty because larger facilities may or may not act like smaller ones. Specific embankment construction methods are also not factored into the empirical equations of the 35 facilities included in the estimates. None used centerline construction matching ALT 6. Therefore, the empirical data set is not representative of the specific design proposed for ALT 6.

- Discusses various BLM/USFS regulations as well as a FEMA- developed national dam safety program, which includes standards applicable to structures constructed on Federal land. This includes tailings embankments" (Under "Federal Requirements for Tailings Facility Design"). Does this actually apply to ALT 6 – since Resolution Copper's TSF would not be on federal land?

- Points out in TABLE 3.10.1-3 that, for ALTS 2, 3 & 4, there is an estimated population of 602,879 downstream (within 50 miles). For ALT 5, there are 31,831 people downstream. For ALT 6 the hypothetical flow path is assumed to follow Dripping Spring Wash to the Gila River toward Winkelman, Hayden and Kearny. ALT 6 (the preferred alternative) facts: nearest downstream residence is four (4) miles, estimated population within 50 miles is 3,159. The Gila River, between Dripping Spring Wash and Ashearst-Hayden

Dam is generally perennial. This reach of the Gila River includes critical habitat for the endangered Southwestern Willow Flycatcher and proposed critical habitat for the threatened Western Yellow-Billed Cuckoo, and Northern Mexican Garter Snake, and is habitat for a number of native species, including amphibians, reptiles, and bats.

- Notes: A number of important transportation or water structures are downstream of these proposed tailings facilities in all ALTs 2-6. Whitlow Ranch Dam that is on Queen Creek, immediately downstream of ALT's 2 & 3; built in 1960 to reduce the risk of flood damage to farmland and developed areas, that include Chandler, Gilbert, Queen Creek, Florence Junction, as well as the Phoenix-Mesa Gateway Airport, which are highly populated areas. This dam was evaluated in 2009 and rated inadequate by U.S.A.C.E. due to foundation seepage and piping. Capacity of the dam is about 86 million cubic meters (Under "Infrastructure").

- States: "A number of important transportation or water structures are downstream of these proposed tailings facilities in all ALTs 2-6. Whitlow Ranch Dam that is on Queen Creek, immediately downstream of ALT's 2 & 3; built in 1960 to reduce the risk of flood damage to farmland and developed areas, that include Chandler, Gilbert, Queen Creek, Florence Junction, as well as the Phoenix-Mesa Gateway Airport, which are highly populated areas. This dam was evaluated in 2009 and rated inadequate by USACE due to foundation seepage and piping. Capacity of the dam is about 86 million cubic meters." (Under "Infrastructure"). The ability of this dam to retain a tailings release from ALTs 2 & 3 is dependent on the size of the failure.

- Discusses "The Applicant-Committed Environmental Protection Measures" failure modes but preventative and responsive actions if failures develop are simplistic and vague.

- Notes in TABLE 3.10.1-6 two recent actual tailings facility failures, Mount Polley and Fundao, released 23.6 and 45.0 million cubic meters of tailings, respectively. Downstream distance traveled by these releases were 4.4 miles for Mount Polley and 398 miles for Fundao, both accidents were considered to range from serious to very serious. Note here that under ALTs 2 & 3, the Whitlow Ranch Dam is downstream with a capacity of 86 million cubic meters. Estimates of a failure for ALTs 2 & 3 range from 136 to 436 million cubic meters and a downstream distance of 85 to 901 miles. ALTs 5 & 6 have similar failure values. these numbers are considerably larger than the numbers for the failures at Polley and Fundao ("Empirical Estimates of a Hypothetical Failure").

- Points out that ALTs 2 & 3 are upstream of substantial populations, Phoenix metro area with a population of 600,000+. The location would offer little evacuation time in the event of tailings facility failure and could thus result in disastrous loss of life and property (Under "Potential Risk to Life and Property").

- For ALTs 5 & 6 locations are upstream of populations in Pinal County, putting about 3,000 people and property at risk. However, ALT 6 also represents a risk to water supply for residents, wildlife, and vegetation in the area, and eventually downstream towards larger populations and their water supplies.

- The DEIS must better address employee safety. The DEIS says absolutely nothing about methods that will be used to prevent the occurrence of air blasts. Air blasts are well known as a hazard in block caving. The air blast and associated fatalities that occurred at the Northparkes Mine in Australia in November 1999 led to a number of lessons learned, recommendations, and procedures to help prevent air blast. Precautions, such as air gap monitoring and control, that must be followed to help prevent air blast, are well known and documented, for example in the "Cave Mining Handbook". There is no apparent reason for the TNF to have completely ignored the subject of air blast in the DEIS. Considering the size of the proposed mine, air blast prevention must be a major consideration. A new or supplemental DEIS must include air blast effects as a possible environmental impact, and that mandatory procedures to help prevent air blast must be specified in the DEIS as a mitigation.

- The new DEIS should also address what measures will be taken to ensure the safety of miners.

All existing mines in the country have resulted in numerous public health impacts and hazards.

<u>Safety Issues Missing From the DEIS</u>

(1) Transportation issues—traffic accidents and fatalities

The DEIS is completely silent in projecting any increase in traffic accidents or fatalities due to increased traffic generated by the proposed project. This is unacceptable. The Rosemont Copper DEIS, which the US EPA panned as the "worst DEIS they have ever reviewed" and was also largely written by SWCA, the same consultant for this DEIS, at least studies transportation risks. The Rosemont DEIS (for a much smaller proposal with

much less of a spatial footprint say that traffic accidents) would increase from an average of 30 per year, with one fatality every three years, to 61 to 107 accidents per year with fatalities between one and two times per year. The rates would likely be higher for this proposed project due to more highways, a much larger footprint and more mountain roads. These risks are also unacceptable.

The DEIS lacks any plan to mitigate the adverse effects from increased traffic. Car pools are proposed to reduce passenger commuter traffic, but these are often not successful. The engineering of SR 77, 177, and Highway 60 near Oak Flat is inadequate and dangerous for the heavy volume of large truck traffic proposed. There are no simple or quick fixes to remedy these existing situations, all of which contribute to the likelihood of serious accidents. Adequate mitigation would require a total reconstruction of certain highways to appropriately mitigate the dangers of the proposed mining operation.

(2) Transportation issues—other road hazards

Copper concentrate, when dribbled out, becomes a regulated hazardous waste. This will result in release/disposal in violation of both Superfund and hazardous waste management law. There is a potential for spillage of copper concentrate from railroad cars departing from the loadout facility. The DEIS is silent in addressing spillage of copper concentrate once it leaves the load out facility. Regardless, this issue needs to be identified and investigated, as well as mitigation measures required.

(3) Air Pollutants and Disease Organisms

Coccidioidomycosis (Valley Fever) is an environmentally-mediated systemic infection caused by the inhalation of airborne arthroconidia from *Coccidioides immitis*, a soil dwelling fungus found in the southwestern United States, parts of Mexico and Central and South America. Valley Fever is not transmitted person to person. When soils containing the fungus are disturbed and dust is raised, spores may be inhaled along with the dust. Certain activities such as agriculture and construction, two large industries in Arizona, cast aloft large amounts of dust. Non-human events that act to disturb the soil include wind storms and earthquakes.

A rough chain of events can be construed where the soil serves as the initial habitat of the fungus, human or other dust-disturbing events send dust into the atmosphere, the winds distribute the now airborne spores where they can then be inhaled by people or other animals. Dr. John Galgiani at the University of Arizona Valley Fever Center at the

Tucson VA Hospital indicates that the number of cases of Valley Fever is increasing. The Center for Disease Control has *C. immitis* on the dangerous list as a potential bio-hazard for terrorism.

(4) Public Health and General Air Pollution Problems

The DEIS improperly denies the existence of a public health and safety problem with respect to air pollution. The DEIS has relied on faulty modeling, lack of data, improper analysis methods and lack of knowledge of fundamental sciences relating to air pollution problems to public health and safety and has restricted the bounds of analysis for this issue to exclude population groups at risk from the adverse effects of air pollutant discharges and toxic substance exposure.

(5) Public Health and Risks of Exposure to Lead and Arsenic as Toxic and Hazardous Air Pollutants

Lead and arsenic are the two major toxic and hazardous materials associated with the mine source materials that are released to the landscape from mining activities. These toxic elements are particularly dangerous when children, pregnant women and nursing mothers, and the elderly receive acute and chronic exposure because they are neurotoxins and affect brain development, cognition and intelligence. Further, airborne arsenic is a human carcinogen and affects cardiac function. But, the DEIS describes no risk assessment studies or chronic exposure studies for these substances which will appear in emissions from mining processes.

(6) Public Health and Risks of Exposure to Other Toxic and Hazardous Air Pollutants

Other toxic and hazardous air pollutants which require exposure assessments and risk assessments are: chromium, nickel and cadmium which are also human carcinogens; fluorine because of the danger of fluorosis in humans and wildlife; selenium because it is a teratogen; manganese because it is a neurotoxin; radioactive elements because of their special hazard and danger. Because of the poor quality of data on thallium and antimony, it is not clear if a risk assessment can be performed for these elements which are known to cause adverse cardiac responses.

(7) Public Health, the Interactive Effects of Multiple Air Pollutants, and Risk

Assessments

The DEIS omits any consideration of the interactive effects of multiple pollutants, a cumulative effect over and above any basic effects of the toxic pollutants on plant, animal and human exposures. When multiple toxic substances are present, their interactions need to be addressed because the overall impact may exceed the impacts of the individual toxic substances appropriately weighted for their relative presence. A mixture of chemicals in which every chemical is below some "threshold" does not mean the mixture has no health effects, especially in the very young. Interactive effects mean that less than threshold amounts of certain chemicals will cause health problems and that means a reassessment of the limits on toxic and hazardous pollutant emissions. This requires a need to lower the stated thresholds of emission of air pollutants of 10 tons/year of a single toxic substance and 25 tons/year of all toxic substances combined. In many cases, these interactive toxic effects are enhanced by ozone and NOx. All risk analysis developed under the DEIS or any Supplemental DEIS need to utilize newer risk models utilizing the issue of toxicogenomics and enzyme polymorphism.

(8) Public Health Problems of Air Pollution Are Not Exclusively Related to Human Exposure to NOx

The DEIS improperly limits attention to air pollution problems to human exposure to NOx only because EPA has insisted that this issue must be addressed. There are, however, other air pollutants besides NOx and hazardous and toxic pollutants of lead and arsenic mentioned in a previous item of this section. These include chromium, nickel, cadmium, and radioactive elements (thorium, uranium and radium), which are carcinogenic and likely to be released to the landscape. Further, the public health implications of sulfate, ozone, and carbon monoxide are not considered.

(9) Public Health and Ultra-fine Particulate Matter

The DEIS does not consider public health problems associated with the ultrafine PM(0.1-2.5). This size fraction even if not complexed with toxic metals, induces inflammation and predisposes for related diseases (National Health and Environmental Effects Research Laboratory). This particular size fraction is a significant portion of the fine particulate matter size distribution data.

(10) Public Health and Endocrine Disruptors

The hazardous substances lists provided in the DEIS mention several chemicals which are known as "endocrine disruptors." These chemicals interfere and adversely affect the growth, metabolism, neurological and sexual development of children, and affect immunological functions. These chemicals can manifest their effects *in utero* with a developing fetus, during infant development through transmission in mother's milk or contamination in food or water, childhood growth and development at critical stages where gene expression causes functional changes in neurological and sexual development. The DEIS has no discussion of these impacts.

(11) Public Health and Environmental Justice

A considerable portion of the land area in the various bounds of analysis includes ancestral lands or Traditional Cultural Property (TCP) of Native American populations. It also includes Hispanic communities, especially in the town of Superior. Their health status is generally less favorable than the health status of residents of surrounding urban and suburban areas. The reserve populations include children and elderly among the residents. The DEIS acknowledges the environmental justice issues, but does little to indicate that anything will be required to remediate adverse effects which the DEIS recognizes as long lasting, irreparable in many instances, culturally and economically destructive, and a public health issue.

(12) Public Health and Special Consideration of Erionite, Asbestos, and Asbestiform Minerals

Erionite is a zeolite, not an asbestos mineral, but it occurs as a fibrous or wooly aggregate (thus is called "asbestos-like"). It is a common alteration product of siliceous tuffs, and as a hydrothermal deposition product. There are known localities in Arizona which have this mineral in its geological makeup. Its fibers have recently been shown to be carcinogenic and cause mesothelioma, the form of cancer most associated with asbestos. Several government agencies, including National Institute of Occupational Safety and Health (NIOSH) and Center for Disease Control (CDC) have called for special measures to prevent erionite exposure, but the DEIS makes no reference to regulations on asbestos and asbestiform minerals in the Clean Air Act requirements, but also no record of erionite or asbestiform minerals appears in the list of minerals from the Resolution Copper geochemical background documents. This does not mean that erionite or asbestiform minerals are not present, only that the background studies have not reported on them. The DEIS should provide data and information from a basic petrographic or crystallographic

search for erionite in some of their "tailings" composites. It is the kind of mineral that will not be routinely "found" unless you are specifically looking for it.

(13) Public Health and Water Pollutants

Many of the previous comments about public health and air pollutants apply to public health issues and water pollutants. The waters involved include drinking water and potable water supplies, water for bathing and contact sports. These can be either surface water supplies, groundwater supplies or both. The public health requirements on these water supplies may differ, but all of the substances mentioned as air pollutants exert their adverse effects also when they are in water supplies. Thus, arsenic, chromium, nickel, cadmium, radioactive materials, and asbestos and asbestiform minerals are also carcinogens or neurotoxins when in water supplies. Lead is still a neurotoxin, fluoride still produces fluorosis, selenium is still a teratogen. Further, epidemiological evidence indicates that selenium supplementation may increase risk for glaucoma and ocular hypertension. In dealing with risk assessments for these materials, there will be a need to consider all sources, both atmospheric and aquatic, in the exposure assessments. While the DEIS considers surface water and groundwater requirements for various chemicals, there is nothing in the DEIS requiring risk assessments for these substances to assess the public health risks. There is nothing in the DEIS to assess the cumulative effects of these chemicals.

Climate Change

Climate Change, A Climate Crisis

The Tonto National Forest should have thoroughly analyzed the impacts of the proposed project relative to climate change. The Intergovernmental Panel on Climate Change's (IPCC) assessment demonstrates that climate change – in particular as a result of anthropogenic drivers contributing to climate change – is a pressing issue that must be addressed by the world's communities (IPCC, 2007). Much focus is on mitigating and adapting to climate change by reducing greenhouse gas emissions. The IPCC assessed the "current scientific understanding of impacts of climate change on natural, managed and human systems, the capacity of these systems to adapt and their vulnerability" (IPCC, 2007) In its most recent special report, the IPCC outlined how we are already experiencing the impacts of climate change, "seeing the consequences of 1°C of global warming through more extreme weather, rising sea levels and diminishing Arctic sea ice, among other changes (IPCC, 2018). It went on to say that we can avoid some of the worst impacts of this climate crisis by acting now to limit the warming to 1.5ºC (IPCC, 2018).

The nation's public lands, and especially the national forests, play a critical role in providing habitat and protection for hundreds of fish and wildlife species. The vast majority of the public has repeatedly made clear that it places a high value on the use of National Forest System lands for fish and wildlife protection. With a growing and sprawling population, resulting in the continued fragmentation of private lands, along with the unprecedented uncertainty created by the current climate crisis, the Forest Service must address the issues of climate change relative to this proposed project.

When compared to the twentieth-century average, the western United States has experienced an increase in average temperature during a recent five-year period that was 70 percent greater than the world as a whole (Saunders, et al., 2008). Of special concern is that the increase in temperatures occurs more at higher elevations than lower elevations, affecting snow resources which supply much of the western United States' fresh water supply (Hotter and Drier, Saunders, et al., 2008). The IPCC projects that warming of the western climate will continue, making it imperative the Tonto National Forest consider the impacts of climate change on each proposed action, including travel management.

While providing brief discussion of climate change and offering a rationale for not providing an assessment of the contribution from and effects of greenhouse gases and other emissions contributing to climate change as the result of the proposed mine activities, the DEIS ignores any assessment of the effect of climate change on the numerous natural resources that would also be affected by the proposed Resolution Copper mine. This is particularly disturbing given that recent warming in the southwest is the most rapid in the Nation and significantly more than global averages in some areas. The average temperature in the southwest is projected to rise by 2.5 to 5.5 degrees degrees Fahrenheit by 2050. The DEIS entirely fails to analyze the effects of climate change on the proposed project. USFS guidance on how to consider climate change in project- level NEPA analysis and documentation includes the effects of agency action on global climate change and the effects of climate change on the project.

The DEIS needs to analyze the effects of climate change on the project for all alternatives. This is a reasonably foreseeable issue that should be analyzed in an integral way and included in the DEIS when assessing potential impacts to Soils, Surface Water Quality, Surface Water Quantity, Ground Water Quantity, Ground Water Quality, and Biological Resources.

Scientists are well aware that the southwest has experienced periods of unusually severe drought (e.g. a five decade mega drought) and findings suggest that similar severe drought conditions should be anticipated in an even warmer and drier future (IPCC, 2018). Until the climate dynamics of such mega droughts are fully understood, plans involving water management should be designed to accommodate a 50-year independent of the climate change impacts (e.g.,

temperature increase and snow decrease) that will only make the average water availability less, and the drought more severe. The DEIS should analyze the potential for 50-year mega drought in its consideration of groundwater quantity and quality and surface water quantity and quality.

In Arizona, winter precipitation is already becoming more variable with a trend toward both more frequent extremely dry and extremely wet winters (Karl, Melillo, & Peterson, 2009). On the global and national scale, precipitation patterns are shifting with more rain falling in heavy downpours that increase the risk of flooding. Rapid landscape transition such as that which will result from the proposed Preferred Alternative and the Proposed Action, will reduce flood-buffering capacity of the landscape and exacerbate the risk of damaging flooding. The effects of climate change will not play out on pristine systems but will interact with existing stressors on the landscape and will generally exacerbate impacts to natural resources and reduce the effectiveness of mitigation and reclamation that is designed without taking climate change impacts into consideration.

Decadal-scale Pacific Ocean circulation persistence can result in long-term drought, which can drastically reduce water supplies as demonstrated in the extremely dry conditions between 1999 and 2005 and during the 1950s. The Southeastern Planning Area and the Active Management Area as defined by the Arizona Water Atlas (ADWR) experienced a total departure from normal of -27.6 inches and -35.1 inches, respectively, for the time period 1940-1960. While the current drought may reflect precipitation conditions similar to those of the 1950s, temperatures during the last decade are almost 2 degrees higher. This warming trend will affect the severity of drought.

The USFS recognizes that forest management and watershed function depend on productive, porous soils. Ongoing and projected climate changes compound the effects of other factors on soil resources and increase the need for watershed treatments to restore degraded soils and stabilize sites at increased risk of erosion, loss of porosity, and loss of soil organic matter. The DEIS needs to consider the ongoing and projected climate changes in their analysis of impacts to soils.

A revised or supplemental DEIS must analyze how these changes will affect surface water and groundwater, habitat, and dust—indeed, the entire ecosystem in which these proposed mining operations would take place.

Greenhouse Gas (GHG) Emissions

In December 2014 the CEQ released “Revised Draft Guidance for Greenhouse Gas Emissions

and Climate Change Impacts" that describes how Federal departments and agencies should consider the effects of greenhouse gas emissions and climate change in their NEPA reviews. The guidance recommends a reference point of 25,000 metric tons of CO2-equivalent emissions on an annual basis, below which a quantitative analysis of GHG emissions is not recommended.

The DEIS (DEIS, page 279) calculated that total greenhouse gas emissions would amount to 13,328 CO_2 equivalent tonnes/year, but only calculate emissions from fuel used for vehicles, process combustion sources, and employee traffic and deliveries. Just the transportation by rail of concentrate over a distance of 500 miles, by itself, could result in an annual carbon dioxide footprint comparable to the 25,000 metric ton threshold. The GPO also states that the mine will produce ore at an average rate of 132,000 tons per day with a maximum 165,000 tons per day. The electrical energy (kWh) required just to lift the mass of this ore thousands of feet to the surface corresponds to tens of thousands of metric tons of equivalent CO_2 per year, even without considering conveyor efficiency, etc.

The quantitative analysis of the GHG emissions in accordance with the White House Council on Environmental Quality ("CEQ") guidelines must account for emissions from all sources attributable to the proposed mine, including mobile and stationary engines burning hydrocarbons within or going to and from the mine facilities, hydrocarbon fueled generators providing electricity to the mine, hydrocarbon fueled transportation of copper concentrates to remote smelting facilities, and loss of CO2 sequestration capacity due to destruction of vegetation.

RCM's main source of power would be a grid intertie to Salt River Project ("SRP") power. RCM's demand is likely to be between 260 MW and 1900 MW, and given that SRP power is roughly 85% powered by coal and natural gas, carbon emissions to power RCM will be extremely high. Carbon emissions from both power generation and the operation of all fuel-operated mining machinery should have been calculated both annually and over the life of mine in the DEIS. These comments do not intend to go into detail about the scientific consensus as to why climate change is an enormous threat to humans, wildlife, and the economy, especially in desert climates facing water scarcity issues. It is, however, worth reiterating the numerous efforts of the federal government to combat climate change, such as the Clean Power Plan, the Bureau of Land Management proposed methane emissions reductions rule, the EPA methane emissions reduction rule, the Renewable Fuels Standard, renewable energy tax credits, and the vehicle gas mileage standards. Since the TNF is a federal agency, it has an obligation to align its priorities in the NEPA process to that of its sister agencies that are going to great lengths to reduce greenhouse gas emissions. It should also follow CEQ's guidance regarding how to consider climate change impacts in all NEPA processes.

The DEIS should have included alternatives for RCM's proposed power supply designed to reduce emissions. Preferably, an alternative would include RCM's own renewable power generation, and hybrid heavy machinery (many mines already use hybrid equipment) to run from these renewable sources. Solar thermal power generation is already being successfully deployed in similar desert environments to provide reliable, baseload power using molten salt as an energy storage medium. Solar thermal operations utilizing dry cooling achieve major water savings over wet cooling, and should be considered for all new facilities. An SRP intertie could serve as a backup option to provide conventional energy only when RCM's own power systems fail to do so. An alternative such as this will be an important step to showcase that a new mine does not by definition lead to increased carbon emissions.

A new or supplemental DEIS should be prepared to consider the downstream carbon footprint of the mine as well, including the following:

- Transportation (by all methods across the entire chain of custody from assembling of raw materials for equipment and mine supplies to the removal of wastes)

- Smelting and final processing.

- Pumping and movement of water from original sources (ie., the Colorado River) to last use at the mine.

- Production of electricity.

- Use of fossil fuels beyond transportation.

Water Quantity

What is the projected water consumption of the Resolution Copper Mine?

According to Rio Tinto, the Resolution Copper Mine will consume 15,700 acre-feet per year of water at full operation with a possible maximum of 20,000 acre-feet per year (Resolution Copper Mining, 2014a). This range of a maximum of 16-20,000 acre-feet per year of water consumption has been repeated at numerous community forums hosted by Rio Tinto (Resolution Copper, 2018b). Since water is recycled throughout a mining operation, water consumption can be much

less than water use. Water consumption refers to water that must be replaced by withdrawals from surface water or groundwater resources. Water consumption is also called the "blue water footprint" and includes water lost by evaporation, water that is incorporated into the product (such as the copper and molybdenum concentrates), and water that is not returned to the same catchment area from which it was withdrawn (Northey and Haque, 2013). Since Rio Tinto has already provided its own projected water consumption, the second objective is equivalent to asking whether the prediction by Rio Tinto is correct.

Hydraulic Impacts of the Proposed Resolution Copper Mine, Arizona

Professional Engineer and hydrogeologist, Dr. Bob Prucha, conducted a study of the hydrologic impacts of the proposed Resolution Copper Mine (see Appendix Prucha's 2019 report in the Appendix) notes that groundwater dependent ecosystems (GDEs) evaluations in Garrett 2018d are suspect. Upper Devils Canyon streams may be base flow discharge from TAL. Well within 10' contour. Not likely perched hydrogeo included in GW model – hence distancing by workgroup from relying on any SW-GW flow predictions.

The DEIS doesn't appear to consider broader impacted area (impacted areas up to for example, 1-ft drawdown vs. 10-ft) – as predicted in model, despite uncertainty band around this. More GDEs would have shown up as impacted, needing mitigation. Instead only those delineated by uncertain predicted 10-ft drawdown used (at 200 years) to define potentially impacted GDEs.

Evaluating drawdowns in shallow aquifer at 200 years, or 148 years post-closure, severely limits the number/magnitude of impacted GDEs because the groundwater model still hasn't fully recovered by this point. With a future fractured and highly permeable pathway that develops between the shallow Apache Leap Aquifer (ALT) and DEEP aquifer zone (in Resolution Graben), relatively rapid drainage of ALT would dewater GDEs over the short-term, as it fills voids in the deep aquifer. But then, ALT water levels will eventually return to pre-mining conditions. Choosing 200 years limits the understanding of time-varying impacts extent/magnitude.

By including continued dewatering of the deep GW aquifer in No Action alternative groundwater model predictive long-term simulations, and then subtracting drawdowns from LOM and post-closure simulations, Resolution Copper Mine (RCM) consultants have effectively biased the magnitude and extent of mine impacts on GDEs towards the low side, or the opposite of conservatively high impacts (see page 3, paragraph 4, Garrett and Newell, 2018). At a minimum, predicted drawdowns should have been calculated from pre-mining conditions, as

these are the levels to which shallow ALT aquifer groundwater levels will eventually recover to. This is known without even using the highly uncertain groundwater modeling results.

Water quality of the 'perched' upper Devils Canyon drainage doesn't appear to confirm it is disconnected to shallow ALT aquifer, which has likely dropped simply due to the substantial and long-term historical pumping, compounded by the more current 2009-present shaft 9/10 dewatering. The assessment of which GDEs to include, or discard from further analysis (i.e., discarded if perched, vs. connected to impacted ALT or Deep aquifers) appears to be based on relatively recent hydrologic data (i.e., collected after significant unrecovered historical drawdowns, 1910-1996) and superimposed re-drawdown of levels post-2009 (i.e., shaft 9/10 dewatering). No analysis of 1910 to 1996 dewatering/recovery is presented in the DEIS, or its supporting documents. Knowing how much drawdown has already occurred in the GDE locations/segments would have likely significantly increased the number of GDEs potentially impacted.

A key question is what additional GDEs, or even those omitted because the Groundwater Modeling Workgroup decided they didn't exhibit "persistent presence of water, year-to-year and season-to-season" (stated page 296, paragraph 3 in the DEIS), would have been valid locations had effects of past/current pumping been removed (recovered)? GDEs should have been defined based on pre-mining groundwater conditions, where the long-term pumping influence at Magma Mine, and RCM pumping since 2009 don't bias identification of persistent discharge at springs/along streams towards the low side. Because it is unclear how the estimated pre-mining groundwater levels were determined without calibration data, the DEIS should have conservatively identified all GDEs, within uncertain range of flow conditions.

DC13.5 SW flow assumed disconnected from ALT aquifer – but unconvincing evidence. West-East Cross Section A-A' (Figure 2.3 in WSP, 2019) shows Inferred Tal Water Table at Devil's Canyon at the bottom of the streambed, in the dismissed GDE segment from DC10.9 to DC 15, contradicting assumptions made that this stream segment (albeit ephemeral many years) is due to perched groundwater conditions (see page 28, paragraph 2 in Montgomery and Associates, 2017). Given the likelihood that flow in this segment, well within the 10' groundwater level drawdown zone impacted by mining, is connected to the Tal aquifer, it should have been included as an important GDE in the DEIS.

Furthermore, Prucha's report notes issues with overall approach to impact evaluation as presented by the DEIS. Understanding the current hydrologic flow system and predicted changes due to mining rely heavily on modeling that involves successfully completing various sequential steps to produce reliable results agencies can use to make informed decisions. Problems with any

of these steps translate into subsequent steps that reduce accuracy and reliability of results. Moreover, there are issues with the overall methodology used to evaluate impacts. A general 'industry-standard' approach to modeling hydrologic impacts is lacking. A general approach used to develop predictions via use of numerical models was never presented, though many guidance documents are readily available online as noted by BGC, 2018d2 in Section 2.2 (Description of Best Practices). The most useful, current and relevant to assessing mining impacts is provided by Wels, 2012[8], which shows a standard modeling process on Figure 1. Clearly defined questions related to potential impacts and modeling objectives should have been presented, particularly how groundwater impacts affect surface flows, and vice-versa. These were not evaluated in this DEIS or supporting documents. Implications of the lack of a clear overall approach to hydrologic impact evaluations include the following four issues.

One, a major flaw in modeling conducted in this DEIS is that groundwater modeling was done in apparent isolation from surface water modeling, yet surface water clearly recharges groundwater (losing segments), and groundwater clearly discharges to surface streams as baseflow, or via springs. In other words, surface water recharge to groundwater (losing stretches) was not included in the groundwater modeling as a boundary condition, and vice versa. Including this 2-way flow is essential to realistically and accurately assessing mining impacts on surrounding GDEs (and surface water ecosystems).

Two, a formal code(s) selection process that demonstrated tools selected for the analyses adequately answer key questions/meet objectives wasn't performed. These issues are addressed in more detail in Section 2.4 below.

Three, once models were created, the important feedback loops shown on Figure 1 from model calibration to conceptualization and data collection doesn't appear to have been considered. In other words, obvious data-gaps identified during modeling weren't addressed.

Four, a formal predictive uncertainty analysis wasn't conducted, and partly confused with a predictive sensitivity analysis (see Wels, 2012, Proposed Groundwater Modeling Process).

Discussion of characterization and conceptualization of both surface water and groundwater

[8] Use of Modflow to explicitly model the effect of faults is inappropriate. Codes like FEFLOW permit actual simulation of flow along faults as planar features. Modflow-Surfact required specifying model cells (with variable dimensions unrelated to actual fault planes/zones in the field). Hydrogeologic characterization of flows along and/or across faults is largely missing – and therefore highly uncertain.

flows, and flow interactions between them over the entire mine footprint is confusing, poorly presented and missing important details. For example:

a) The complex hydrogeologic system, especially around the proposed mine area exhibits numerous offsetting faults and multiple tilted hydrogeologic units, and is illustrated in only a single West-East cross-sections (Figure 2.2) groundwater modeling report (WSP, 2019). Yet, critical conceptual details are missing, fundamental to defining an appropriate conceptual flow model (or multiple conceptual models, given subsurface complexity) of the entire potentially-impacted system. For example:

b) Perched zones are hypothesized in various supporting documents, and used to explain how many GDEs are disconnected from mine-impacted groundwater drawdowns. But no data, characterization of the lateral/vertical extents, or conceptualization of such features or associated flows are presented in the DEIS, or supporting documents. This represents a key error in conceptual modeling (see Section 4.6, Wels et al, 20121). The groundwater flow model further appears to have omitted these perched zones (i.e., in upper Devils Canyon, above segment DC10.5), which should have shown lower recharge to deeper aquifer zones (see WSP, 2019, Figure 3.6), but don't appear to have been incorporated into the flow model (see Appendix B HGU Material Property Values, WSP, 2019).

c) Geothermal influence not included in the conceptual flow model, but may be important to evaluating long-term post-closure flow conditions within the subsidence area (i.e., density- driven flows, and water quality impacts).

d) The well-established industry practice (as defined in the flow chart on Figure 2 by Kolm and Van der Heijde, 1996) of going from raw data (i.e., borehole/well data) to characterization, for example of interpolated groundwater surface elevations for perched, shallow and deep aquifer units, over the mine-impacted area (including all TSF alternatives, West Plant, Superior, Queens Creek, MARRCO corridor etc), to conceptualization of flows (both vertical and lateral) within aquifer units, along faults, discharge to surface, flows between surface water-groundwater, recharge from precipitation and runoff etc., is largely absent.

e) Description and illustration of the future conceptual model around the mine, or Alternative #6 TSF area (i.e., baseline conditions) were never provided. Hydrogeologic characterization associated with Alt 6 TSF is largely missing, in Dripping Springs Wash – i.e., they state "It is not known at this time whether

these faults act as preferential flowpaths, or low permeability boundaries for groundwater flow" (Klohn Crippen Berger Ltd. 2018).

f) Given the high degree of complexity in the subsurface over the mine footprint, a realistic range of alternative conceptual models should have been considered in the modeling to account for substantial uncertainty in virtually all model input. Conceptual model uncertainty typically accounts for most uncertainty in subsequent numerical model predictions. Neuman and Weiranga, 2003 describe in detail how to incorporate alternative conceptual models into formal uncertainty analyses. Typically, conceptual model uncertainty dominates overall predictive uncertainty and as such should have been more fully assessed in the DEIS modeling evaluations.

Several, independent hydrologic modeling efforts were conducted in the DEIS, including the following:

1. 3D Groundwater Modeling – Modflow-surfact mine-area evaluations (WSP USA 2019)
2. Hydrologic (Surface water) model – AWBM Monthly Hydrologic Model (BGC Engineering USA Inc. 2018c)
3. ADWR's Salt River Valley (SRV) Groundwater Flow Model – Modflow. (Klohn Crippen Berger Ltd. 2019c)
4. 2D Conceptual TSF Seepage modeling – SEEP/W

<u>No formal code selection was conducted.</u>

A formal code selection process should have been conducted to identify appropriate codes that are able to simulate all required processes needed to fully assess mine impacts on surrounding hydrology, and more importantly, to define required calibration targets for specific EIS impact assessments (i.e,. required predictive accuracy) (Technical Guide to Ground-Water Model Selection at Sites). Section 5 in Wels, 2012 provides details on conducting a formal groundwater model selection, even including a flow chart.

The MODFLOW-Surfact groundwater modeling tool used by WSP, 2019 to assess mining impacts at GDEs within the entire mine footprint fails to model important physical processes (i.e., overland surface runoff processes, distributed recharge and evapotranspiration dynamics, stream hydrodynamics, and stream-aquifer dynamics etc.) necessary to simulate physically realistic and defensible mine impacts on surrounding GDEs. Much more robust modeling tools

are readily available, but weren't considered because a formal, industry standard code selection process wasn't conducted, where all modeling objectives/needs are carefully defined and evaluated against capabilities of available codes.

Fully integrated hydrologic/hydraulic codes should have been considered for more robust and physically realistic impact evaluation. These codes don't suffer major shortcomings such as: 1) attempting to run one model in isolation (i.e., the groundwater flow model), then attempting to couple non-dynamic results to a separate spreadsheet tool, when the flows between groundwater and surface water is complex, dynamic and spatially variable, and 2) they simulate all relevant physical flow processes and don't require unrealistic and highly uncertain boundary conditions

Many options are commercially-available and have been applied to mine water balance projects, worldwide for many years (AquaResource Inc. 2011).

1. Use of Modflow to explicitly model the effect of faults is inappropriate. Codes like FEFLOW permit actual simulation of flow along faults as planar features. Modflow-Surfact required specifying model cells (with variable dimensions unrelated to actual fault planes/zones in the field). Hydrogeologic characterization of flows along and/or across faults is largely missing – and therefore highly uncertain.

2. The variable saturation, finite element modeling code, FEFLOW, developed by DHI-WASY would have allowed a much higher resolution near critical streams, while decreasing resolution in area of less interest. This would have met stated objectives.

3. Conceptualization should have included heat transfer, due to geothermal waters encountered during construction of shaft 10, which drive density-dependent flows. FEFLOW includes the ability to simulate heat flow, and also has the ability to directly simulate 3-dimensional geochemical modeling based on PHREEQC, similar to its use in the USGS PHAST code.

4. Fully integrated, or coupled, physically-based, fully-distributed hydrologic (and hydraulic) codes have been available for decades and would have allowed RCM consultants to directly simulate the complicated, baseline and mine-impacted coupled surface water-groundwater dynamic flow system response in a robust, realistic way.

The authors attempted to estimate spatial distributions of recharge, which is a complex spatially distributed, and dynamic process, using an undocumented method. However, fully integrated codes like the USGS GSFLOW code, DHI's code MIKESHE/MIKE11 or even Aquanty's Hydrogeosphere code actually simulate important processes like dynamic, spatially-distributed recharge, surface runoff and channelized hydrodynamics, which are dynamically coupled to subsurface flow (i.e., coupled to a modflow equivalent code). The MIKESHE code was used to simulate hourly impacts of climate change and stream temperature changes associated with Pebble Mine impacts in southeastern Alaska (Wobus, et al., 2015).

5. Simulate ET and Recharge processes more realistically:
    - ET boundary condition – Instead of using the original MODFLOW EVT package which treats ET loss as a linear function of hydraulic head (not very physically realistic), consider using MODFLOW Riparian ET package (available for MODFLOW-2005) http://pubs.usgs.gov/tm/tm6a39/pdf/tm6a39.pdf, or even the ETS package (http://pubs.er.usgs.gov/publication/ofr00466).

    - Recharge boundary condition – See the following publication on the Basin Characterization Method (BCM) currently used by the USGS in a number of southwestern basins. (http://pubs.usgs.gov/pp/pp1703/b/pp1703b.pdf) or (http://pubs.usgs.gov/sir/2007/5099/).

Also, according to Prucha's report, the model set-up assumptions in the DEIS are flawed. A number of issues were identified with the setup of the groundwater flow and TSF seepage flow models that severely limit confidence in a realistic range of mine impacts on the surrounding hydrologic system, including water quality impacts. There are seepage model set-up issues in the DEIS modeling of Alternative 6 Tailings Storage Facility (Klohn Crippen Berger Ltd. 2019c), which are problematic for the following six reasons.

1. Data required to conduct realistic seepage modeling are inadequate, and introduce significant uncertainty in comparing different TSF alternatives, especially related to estimating valid and defensible impacts of each proposed TSF on the surrounding baseline hydrologic and water quality conditions. In effect, baseline conditions and characterization were not evaluated, but should have been in this DEIS to provide adequate comparison of alternatives.

2. Only 2D simulations using the SEEP/W code were performed, when the TSF and underlying hydrogeologic system clearly exhibits 3-dimensional features which would influence groundwater-seepage flows and interaction.

3. The model is not based on actual site data and 3-dimensional characterization of subsurface and surface hydrologic system. Instead, modeling is based on a simplified 2-d 'conceptual' configuration which doesn't account for important features such as variable thickness of alluvium (i.e., likely thickest along actual drainages, but thinner at TSF perimeter, away from drainage thalweg). The DEIS should assess likely impacts in this area, using actual data to constrain the 3-d hydrogeology, and local groundwater and surface water conditions. A detailed and complete 3-dimensional conceptual flow model is not presented which shows how the proposed TSF interacts with the natural groundwater and surface water flow system. Centering the TSF over Dripping Springs Wash is where groundwater flow would be expected to be upwards.

4. A no flow boundary condition is placed at the surface water divide to the north, but subsurface data is missing in this area to confirm this also coincides with a groundwater divide.

5. Effects of faults on groundwater-seepage flows is not assessed in the area, despite the relatively high density of faults clearly evident in exposed rocks to the west, showing notable offsets and likely influential in controlling local groundwater flows below unconsolidated alluvium.

6. No effort was made to assess impacts of stream routing/diversions around the TSF, and effects of streambed infiltration on shallow groundwater-seepage flows, and associated fate/transport of impaired waters downstream.

Also, Prucha's report found four issues (described below) with the groundwater flow model set-up in the DEIS (WSP USA. 2019). The model extent and boundary are inappropriate. Just based on reported results using the 10- foot contours, it's clear predictions of mine drawdowns are impacted by the model boundary condition. Had a 1-foot drawdown contour been reported in the modeling, boundary effects would have likely been far more extensive. It would likely show a much greater degree of boundary impact on the model. This boundary should have been extended outward in all directions to:

1. Avoid influencing internal calculations. This is standard industry practice (Reilly & Harbaugh, 2004) .

2. Simulate flow conditions for at least preferred Alternative 6 TSF, and downgradient impacts to Gila River, so that: fate and transport modeling of seepage from the TSF could have been properly assessed in Dripping Springs Wash,

3. 2D seepage modeling could have used realistic/calibrated groundwater boundary conditions as boundary conditions on simulations estimating seepage through the TSF (Klohn Crippen Berger Ltd. 2019c).

4. Permit estimating impacts down to at least 1' drawdown, which likely extend much further out than estimated maximum extent shown in the DEIS (see Figure 3.7.1-3).

Prucha's report also notes inappropriate stream-aquifer setup/assumptions in the DEIS for the proposed RCM.

Use of MODFLOW drain package to simulate stream discharge is inappropriate for several reasons:

1. It only permits removal of groundwater from the model, but no streambed recharge in losing river reaches. This is a major flaw in the model setup and non-standard. Many other high profile recent mining DEIS modeling efforts (i.e., Pebble Mine, Rosemont Mine) have utilized the much more robust MODFLOW stream routing packages (STR1, STR2), which actually dynamically route baseflow discharge from upper reaches to lower reaches, which permits downstream recharge in areas where underlying aquifer heads are lower than the dynamically calculated stream stage. Not accounting for streambed recharge results in either under- simulation of heads in critical GDE areas, or incorrect adjustment of other parameters (i.e., reduction in hydraulic conductivity in stream areas) to compensate for lack of focused, higher streambed recharge.

2. Drain 'hydraulic resistance' or drain conductance was set 'sufficiently high' (see page 23, paragraph 5, WSP, 2019) so they would not exhibit resistance to flow. Even if it were acceptable to use one-way flow drain discharge to simulate river discharge, the standard modeling approach is to define drain conductance values as a primary calibration parameter. The modelers here have effectively removed a key parameter value from the calibration process and specifying high conductance prior to calibration is not valid and should be based on actual field-based measurements and careful calibration (but using a river package, and not a 'drain' package).

3. No attempt appears to have been made to couple the MODFLOW drain discharge

distribution with surface water modeling (BGC, 2018), so that predicted impacts due to mining on surface water flows could be better simulated, despite simulating at a monthly time period.

Also noted as problematic in the deis are inappropriate seepage setup/assumptions. Springs and seeps do not appear to have been simulated as discharge points in the Modflow model. It would have been appropriate, and is typical, to use the Modflow Drain package to simulate discharge at these areas. Not simulating discharge in these areas would cause the model to overestimate heads otherwise controlled by discharge to seeps/springs.

Areal Recharge Specification Inappropriate:

1. books have been written on the subject – it is complex, but critical to acceptable calibration (Healy and Scanlon, 201014). The USGS15 has developed a commonly used method called the Basin Characterization Method (BCM) to estimate recharge based on many known factors.

2. Factors that Schlumberger indicates control recharge (slope and geologic 'infiltration multipliers) are only some of the factors actually determining recharge at any given cell. No references to this estimation of recharge are provided, yet this is a critical model input, typically strongly correlated with hydraulic conductivity, and influencing calibration.

3. Recharge zonation into upper and lower zones, and 'enhanced recharge' zones along Queen Creek and Devils Canyon (see paragraph 1, page 25, WSP, 2019) is arbitrary and unjustified, and has significant effects on calibration. WSP, 2019 states "These zones were conceptualized to concentrate runoff that would lead to higher infiltration rates, which were set at 4% and 8% for the lower and higher elevation areas, respectively. As runoff is concentrated in these areas, water is stored in surface soils longer, providing more time for infiltration and hence a higher recharge rate." This statement is physically incorrect, as streambed recharge occurs only along streams, as indicated in Simmers, 198816. Moreover, the aerial recharge specified in the model (Figure 3.6, WSP, 2019) incorrectly assigns high recharge within a nearly ½ mile wide zone around each of these key mine-impacted drainages, which causes too much recharge in these areas, and in turn reduces mine impacts. If the model had been calibrated against surface flows (both discharge and recharge), along with a proper number of wells along each of these drainages, recharge in these areas would have been much better constrained. This is a major problem in the DEIS, which focuses on assessing mine-impacts to these very

drainages.

Another problem Prucha's report identified was that the actual evapotranspiration (AET) from groundwater is not simulated. Calculation of AET is in fact, a critical water balance component in most hydrologic models, and a complicated function of complex climate inputs (generally accounted for in more robust estimates of PET, like the standard ASCE or FAO Penman-Monteith equation17), soil properties (i.e., soil types, layering, moisture contents, unsaturated zone hydraulic properties), precipitation, groundwater depths with time, and vegetation properties (i.e., leaf area index, root depth density with depth, crop coefficients, types, saturation, residual and field and wilting point moistures, canopy properties etc). In single-process codes like MODFLOW, AET is typically simulated either using the standard EVT package, which calculates AET on a cell- by-cell basis, as a function of groundwater depth, maximum evapotranspiration rates, and plant root depths, or by specifying net-recharge, where AET is calculated on a cell by cell basis, and then removed from applied recharge. Importantly, assessing sub-daily impacts at specific locations in the model is strongly influenced by correct calculation of AET. In riparian zones, groundwater loss to AET and baseflow discharge compete against each other, as a function of groundwater depth. Consequently, without directly simulating AET in all cells, groundwater models likely overestimate baseflow loss, and incorrectly parameterize stream- aquifer conductance values. Omitting this critical process (a conceptual error, especially in semi-arid climates) prevents estimation of mine impacts on phreatophyte-dependent riparian vegetation. This is a major oversight in the DEIS evaluation of impacts at GDEs.

Another problem Prucha's report identified was that modeling of groundwater fate/transport from the mine was not considered. WSP 2019, Resolution Copper Groundwater Flow Model Report groundwater model sensitivity analysis provided a range of expected drawdowns, despite not being produced by a robust predictive uncertainty analysis, or by adjusting more realistic changes to key model inputs (i.e., distributed parameter and combinations of parameters). The Block Cave Geochemical modeling (Eary, 2018) apparently did not evaluate or discuss predictive uncertainty, which could be quite high due to the high number of input parameters (beyond groundwater flow model), and high uncertainty in inputs/assumptions.

Yet another problem Prucha's report noted was that the subsidence was not evaluated – Salt River Valley ADWR Model. No effort was made to estimate subsidence in the important Phoenix AMA area, though drawdowns are estimated and subsidence potential acknowledged. Garrett 2018 states on page 9, paragraph 2:

Long-term drawdown from Desert Wellfield pumping of 10 to 30 feet is modeled

> to occur in the nearby known subsidence areas. Any groundwater pumping within a groundwater basin with known subsidence has the potential to contribute to that subsidence, including the pumping from the Desert Wellfield.
>
> Further detailed analysis is not feasible beyond noting the potential for any pumping to contribute to drawdown and subsidence. Subsidence effects are a basin-wide phenomenon, and analytical tools do not exist to isolate the impact from one individual pumping source on subsidence."

The Modflow Subsidence package (Höffmann, Leake, Galloway, & Wilson, 2003) could easily have been used to assess the likely impacts of MARRCO pumping on subsidence.

Another problem identified in the DEIS by Prucha was that the evaluation of future drawdown at the surrounding wells was not conducted. About 285 wells (ADWR database) would be impacted within the 10' drawdown (at 200 years), and more than 400 wells would probably be impacted by drawdowns of at least 1 foot. This is easily done with a properly calibrated model and predictive uncertainty analysis. Newell and Garrett 2018 state, page 10, paragraph 3 "In lieu of analyzing individual wells, typical wells in key communities were analyzed using the groundwater flow model, including wells near Top-of-the-World (using well HRES-06 as a proxy), wells within the town of Superior (using well DHRES-16 as a proxy), and wells near Boyce Thompson Arboretum (using the Gallery well as a proxy)." Proxies give a misleading sense of impacts to surrounding wells because drawdown is spatially complex. The DEIS should have evaluated a range of maximum drawdowns (given uncertainty in predictions) in all wells, regardless of the amount.

A number of model calibrations problems in the DEIS were identified in Prucha's report that show the model calibrations to be unreliable. First, the calibration approach was flawed and non-unique. Calibrating groundwater flow models to only hydraulic heads, which are spatially biased with higher density near the proposed mine, and sparse further from the mine is well known to produce non-unique solutions (Castro & Goblet, 2003). The non-unique solution is typical of groundwater models where recharge and hydraulic conductivity values are highly correlated (Jvrkama & Sykes, 2006). Doherty and Hunt (2010) indicate that non-unique solutions can be addressed by adding other types of calibration data (i.e., surface water discharge, water quality data etc). Representing seasonally dynamic gaining/losing surface water flows as 'drain' cells in the groundwater model, fails to account for stream recharge in losing reaches. This in turn forces incorrect adjustments of hydraulic parameter values to compensate, and further degrades calibration and therefore reliability of the groundwater model for predictions.

A second calibration problem is that adequate calibration data was lacking in the DEIS. The main focus of the DEIS is to estimate potential changes to the surface/subsurface hydrologic system, or GDEs affected by mine drawdown and changes to surface flows. Despite this objective, virtually no observation data for either surface water, or groundwater is available at, or near GDEs to constrain calibration in these critical areas. This is a major flaw in the overall model calibration approach and should have been addressed in the DEIS. Other major mine modeling efforts (i.e., see Rosemont mine, O'Brien, 2010) attempt to reproduce spatial distribution and magnitudes of observed baseflow, but the spatial distribution and long-term (i.e., multiple years) of surface water flow (or stage) data appears inadequate to assess even flow along the entire extent of the three main drainages potentially affected by the mine dewatering/TSF (Queen Creek, Mineral Creek and Devils Canyon).

A third problem in the DEIS identified by Prucha with regard to calibration regards pre-mining conditions and periods from 1910 to 1996 that were uncalibrated. The approach to determining pre-mining initial 3-dimensional heads (1910) for 39 model layers was never presented in the WSP, 2019 modeling report, but the DEIS really should have required detailed description of these conditions and how they were derived, and associated errors. They are critical to assessing the nature of long-term post-closure groundwater recovery, rather than attempting to assess recovery relative to the start of RCM pumping in 2009, which already induces a substantial drawdown response, superimposed on the partially-recovered heads from 1910 to 1996 pumping. This is essential information in conservatively assessing mine impacts on GDEs.

From 1910 to 1996, the model appears uncalibrated (no reporting on this in DEIS, or WSP, 2019 report) even the historical pumping locations are largely unknown (KEAY, 2010) which likely introduces substantial error into the calibration, and further uncertainty in predictions, as the heads by start of RCM pumping in 2009 were no-where-near recovered to pre-mining conditions.

A fourth calibration in the DEIS is that the TSF seepage modeling is unreliable. Review of the seepage modeling (Design for Alternative 6) associated with TSF alternatives (particularly #6) shows this modeling was never calibrated, because it was based on an idealized, conceptual 2-d profile, rather than using actual field-derived hydrogeologic data. It is understood that the authors of this study (at preferred alternative #6) believe conceptual modeling of this complex, but critical mine component is adequate for assessing different alternatives. But numerous assumptions were made about the subsurface and boundary conditions which would affect leakage estimates, including the implicit assumption that groundwater flows beneath the proposed TSF (for all possible future climate conditions and meteorological conditions) would never interact with internal seepage calculations, which are not conservative. The TSF and surrounding hydrogeologic system is a 3-dimensional flow system, where groundwater flows

concentration beneath the central surface drainage. No surface water or groundwater data, or hydrogeologic data support the notion groundwater wouldn't interact with the calculated seepage. If it did, this becomes critically important in subsequent evaluations of water quality impacts both during mining, and post-closure – and comparison of alternatives. Ultimately, estimates of seepage rates during mining and post-closure are not calibrated, and therefore unreliable.

A final problem noted by Prucha with calibration modeling in the DEIS is that the presentation of calibration results is incomplete and/or misleading. Model performance and reliability based on model-wide calibration statistics of only head data gives a misleading and unreliable sense the model is adequately calibrated for intended purpose of evaluating impacts at GDEs. For the high degree of hydrogeologic complexity of the subsurface system, including multiple offset faults, perched, shallow and deep aquifer units and historically complex dewatering in the area, the number, locations and depths of calibration targets is inadequate, particularly in key target GDE areas, the main focus of the groundwater modeling evaluation. For example, Table 3.6 in the WSP, 2019 report indicates Residual Mean in the Apache Leap Tuff is -14 ft, indicating on average, the model overestimates heads in this shallow aquifer. Yet, closer inspection of transient well hydrographs included in Appendix C of WSP, 2019 closer to surface drainages (i.e., DHRES-08, DHRES-10, DHRES-11, DHRES-12, DHRES-17 and DHRES-18) indicates simulated differences more than 100 to more than 600+ feet.

1. Spatial Bias in Calibration:The WSP, 2019 report shows calibration 'Scatter Plots' (see Figures 3.9 and 3.10), but never show spatial bias and residuals at specific wells by aquifer unit. This is essential for assessing calibration error (residuals) at specific GDE locations, generally along streams.

2. Hydraulic Tests: Calibration to 2 aquifer hydraulic tests appear to reproduce drawdowns in several wells, and even anisotropic drawdown trend, but the mine dewatering will continue for several decades, and these hydraulic tests have limited value:

3. Tests are far too small. A stress on the aquifer to confirm parameterization, assumed boundary conditions for most of the GDEs.

4. These tests already confirm aquifer response in spatially-biased high density of mine wells.

5. These tests don't confirm influence of all faults included in the model. It would have been far more instructive to conduct tests, monitoring hydraulic response on both sides of

important bounding faults (or faults that act as preferential conduits of groundwater flow.

Another problem identified by Prucha is that the DEIS makes many misleading or incomplete predictions with no supporting documents. The first is that the predicted change from the proper "Baseline Conditions" is biased. Historical Magma Mine pumping occurred from 1910 to 1998. RCM pumping started in 2009 (WSP, 2019). WSP states (page 4, paragraph 6) "Water levels had recovered to approximately 2,200 ft amsl by the time dewatering was resumed on March 17, 2009". This clearly indicates the groundwater levels in the vicinity had not fully recovered, and therefore do NOT represent a proper baseline, or pre-mining condition. Pre-mining Furthermore, it is likely streamflows (and springs) in the area that would have been impacted by historical Magma Mine pumping, and which would have recovered had RCM not restarted pumping in 2009, would have increased the number of baseline GDEs in the area (i.e., Devil's Canyon stream from DC10.9 to DC15). Pre-mining (baseline) heads for the Tal shallow aquifer are presented in WSP 2019, but no discussion of associated interaction of groundwaters with surface waters during this period is presented. The DEIS should have evaluated the proposed RCM mine dewatering and post-closure crater subsidence related to this condition, as the Magma mine dewatering would presumably have recovered to near these levels.

The second problem is that the predicted flow through the fractured crater in the DEIS is limited because of model instability. Page 38, paragraph 1 WSP 2019 indicates that hydraulic conductivities within the fractured crater were limited to only 100 ft/day due to instabilities in the model, if assigned higher values. The fracturing likely produces much higher conductivity values than 100 ft/day, which would enhance vertical drainage from the overlying shallow Tal aquifer due to block caving. The DEIS should require detailed assessment of hydraulic response (or recovery for post-closure) to better assess impacts of this important post-closure condition. It is possible the recovery of water levels post- closure would have been much quicker, leading to better estimates of drawdown and GDE impacts (instead of limiting impacts to 148 years after closure, and 10' drawdown contours).

The third problem with predictions in the DEIS is that the evaluation effect of geothermal water on post-closure flows and water quality were not conducted. No evaluation was presented in the DEIS or associated documents to evaluate geothermally influenced circulation within the post-closure fracture zone, which would act to circulate deep warmer waters with shallow, cooler inflow from ALT aquifer waters, driven by density variations (i.e., warmer waters rise, inducing vertical mixing). Geothermal waters were encountered in Shaft 10 (E & MJ, 2014, Sinking America's Deepest Shaft), which surprised RCM and consultants. Often, geothermal waters are found in permeable fault zones, or where faults intersect each other (Prucha, Benson, & Witherspoon, 1987). Because multiple faults are present in the mine area, the DEIS should have

required more characterization, conceptualization and use of an appropriate code capable of simulating heat transport and associated effects of density-driven circulation to better estimate long-term post-closure conditions, and water quality impacts. It's unclear why RCM didn't consider potential to develop the geothermal water source to offset energy requirements.

A fourth problem with predictions in the DEIS is that clear disclosure of full hydraulic impacts is missing. Montgomery & Associates, 2017, Page ES-6, states "However, the Magma Mine workings do extend west of the fault, providing the potential for hydraulic impacts to extend beyond the fault." A clear description and explanation of the final 3-d mine closure configuration is never presented. It is apparent that WSP failed to account for the change in land surface in their modeling (~800 to 1100 feet). This is a critical oversight in the DEIS, because had a proper future-condition conceptual model been developed showing the 800 to 1000 ft drop in land-surface, it would have required a similar change in the calibrated model. Simulating long-term (steady state to avoid uncertainty associated with the time it takes for system to recover to pre-mining conditions) post- closure conditions would very likely have shown development of a pitlake (see Section 2.7.7). This is a major impact to the system which the DEIS failed to address.

A fifth problem with predictions is the inappropriate predictions of post-closure impacts in the DEIS. WSP, 2019, Page 4, Paragraph 4 states "As water level recovery within the block cave is slow, some areas show additional drawdown continuing to propagate outward after 200 years as steady state equilibrium conditions have not yet been re-established." Prediction of post-closure hydrologic conditions at an arbitrarily chosen 200 years (or 148 years after closure) is very misleading and incorrectly conveys what will really occur at final steady state conditions. The modeling report suggests even at 148 years post-closure, drawdown is still occurring, due to slow/low recharge, though the flawed calibration/non-unique solution produce model results so uncertain SW discharge is not relied on. Clearly the 200 years should not have been arbitrarily used to assess long-term final impact w/uncertain model. These biases estimated drawdown impacts at GDEs towards the low side (not conservatively high as suggested in the WSP study. By comparison, the modeling conducted for the Rosemont DEIS demonstrated Steady State conditions were achieved at streams of interest (at 1000 years out). This continued drawdown by itself should have alerted modeling group to insist on simulating much longer, or steady state post-closure.

A sixth problem with predictions in the DEIS is the use of a 10-foot drawdown contour is misleading or biased (or both). At least a simulated long-term 1-foot drawdown contour should have been used in the identification of GDEs. GDEs, or private wells experiencing even a 1' drawdown could have significant negative impacts. A simulated 1-foot drawdown contour (or

lower) was never shown in the DEIS, but probably shows significant effects of model boundary effects, implying the model extent should have been expanded to avoid any influence over internal calculations as is standard modeling practice. Using the 10-foot drawdown contour to define impacts is highly biased, and likely removes many GDEs from further evaluation of impacts/mitigation. The explanation that drawdowns less than 10-feet are imprecise in the DEIS (see page 301) is flawed. Groundwater models are precise, but suffer from accuracy issues. The accuracy at 1-foot drawdown is the same as 10-feet. A predictive uncertainty analysis would effectively provide a means of adding a +/- around drawdown contours.

A seventh problem with predictions in the DEIS is the assessment of potential pitlake developments/impacs is flawed. Pitlake Development. WSP 2019 states on Page 1, Paragraph 2 that 'the potential for a pit lake will be assessed'. Yet the modeling study failed to present any further details on the potential for a pitlake to develop, and to then characterize and evaluate the impacts of the pitlake on surrounding flows and water quality. Page 376-377 in the DEIS do describe the 'Potential for Subsidence Lake Development', explored by the Groundwater Modeling Workgroup, but the DEIS states on page 377 "Ultimately the Forest Service determined that the presence of a subsidence lake was speculative and not reasonably foreseeable, and as such it would therefore be inappropriate to analyze in the EIS" Table 3.7.2-7 provides an overview of predicted water levels after 1000 years and the DEIS concludes "groundwater levels are still at least 200 feet below the bottom of the subsidence crater".

However, there are two key reasons why it is likely a pit lake would form post- closure:

1. The flow model is highly uncertain, and non-unique due to calibration to only groundwater head data, and not other common calibration datasets (i.e, surface discharge, water quality etc) that would reduce non-uniqueness. As a result, estimated water level recovery at 1000 years is highly uncertain, and levels would likely recover much quicker.

More importantly, conceptually, it is easy to argue that the groundwater levels will eventually recover to pre-mining levels (steady state), and at least to currently monitored levels, known to be influenced by Shaft 9/10 pumping since 2009. In fact, these recovered levels, at wells DHRES-01 and DHRES-02 within the crater, exceed 3650 ft, MSL for various screened zones (see observed levels in WSP 2019 report, Appendix C for different well screen zones). According to DEIS Figure 3.7.2-4, these recovered levels would be more than 650 feet above the 1100 ft subsidence crater land surface, and more than 350 feet above the 800 ft land surface elevations (3000 ft, and 3300 ft, respectively).

2. WSP, 2019 failed to include the change in the ground surface due to the crater in the

future condition groundwater modeling. Conservatively, they should have dropped the surface 1100 ft, and let the groundwater model simulate eventual development of the subsidence crater, which would, like the Rosemont mine DEIS modeling that also showed long-term development of a pitlake, change the long-term, or eventual groundwater flow regime. More importantly, with continued evaporation, the pitlake waters would likely also significantly change predicted long-term water quality predictions and risks in the area of this pitlake.

3. Figure 1 from Meza-Cuadra, 2018 was revised to reflect conceptually what the WSP, 2019 groundwater model should have simulated (change in land surface), and the eventual development of a pitlake as groundwater levels recover. WSP should have included this type of Future Processes Conceptual Model, which is industry standard (see Potential Errors in Conceptual Modeling, Section 4.6 in Wels, 2012[9]). Rosemont DEIS groundwater modeling of the development of a pitlake was developed using Modflow-Surfact coupled to a dynamic systems model using the GoldSim code (Roemer, et al., 2018).

Given the strong evidence to suggest formation of a pit lake, the Forest Service should have included in the DEIS the long term impacts associated with this strong possibility. In any arid environment where evaporation exceeds precipitation, pit lakes become evaporative sinks, drawing water in from surrounding groundwater which causes a cone of depression, and resulting in permanent evaporative loss from the pitlake surface. Water that would otherwise be available for humans and the natural environment are permanently lost.

The DEIS failed to accomplish the following. A revised DEIS should: 1.) calculate the annual evaporative loss from the formation of a pit lake; 2.) determine which existing water rights holders would be affected by this loss; 3.) revise the long term groundwater modeling to include possible pit lake consumptive loss; 4.) As noted below, analyze pit lake water quality, as pit lakes tend to evapo-concentrate over time, leading to ever-worsening water quality 5.) analyze worsening pit lake water quality on adjacent groundwater over the long term.

9

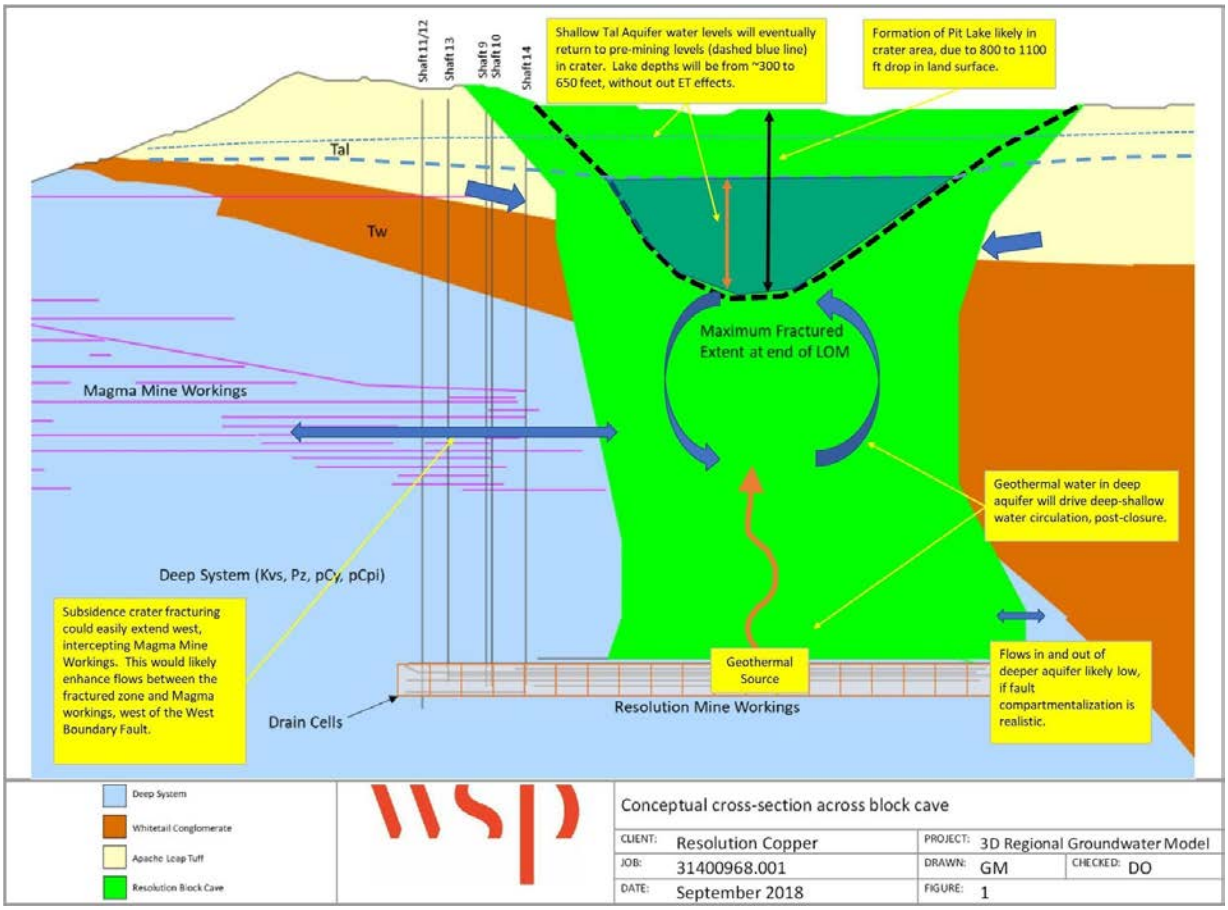

Figure 2: Prucha, "Modified Conceptual" West-East section through future fractured crater.

Modified conceptual West-East section through future fractured crater. Note it shows no adjustment to land surface. Recovered water levels and revised ground surface added.

Note it shows no adjustment to land-surface. Recovered water levels and revised ground-surface added

"Long-term Draw-Down" below shows a more likely long-term drawdown (at steady state, not arbitrary 148 years after closure) 4 km out from the arbitrarily chosen 10' drawdown, which should really have shown predicted drawdowns of <1', or something which would impact groundwater discharge areas (springs, baseflow in streams, riparian vegetation etc). The figure shows that additional SW areas would likely be affected by long-term drawdown than evaluated in the DEIS. The DEIS should have also assessed impacts within the following watersheds:

- North of Queen Creek, including Haunted Canyon, Upper Pinto Creek, and West Fork watersheds.

- Walnut Canyon to the south, which drains into the Gila River via Donnelly Wash.

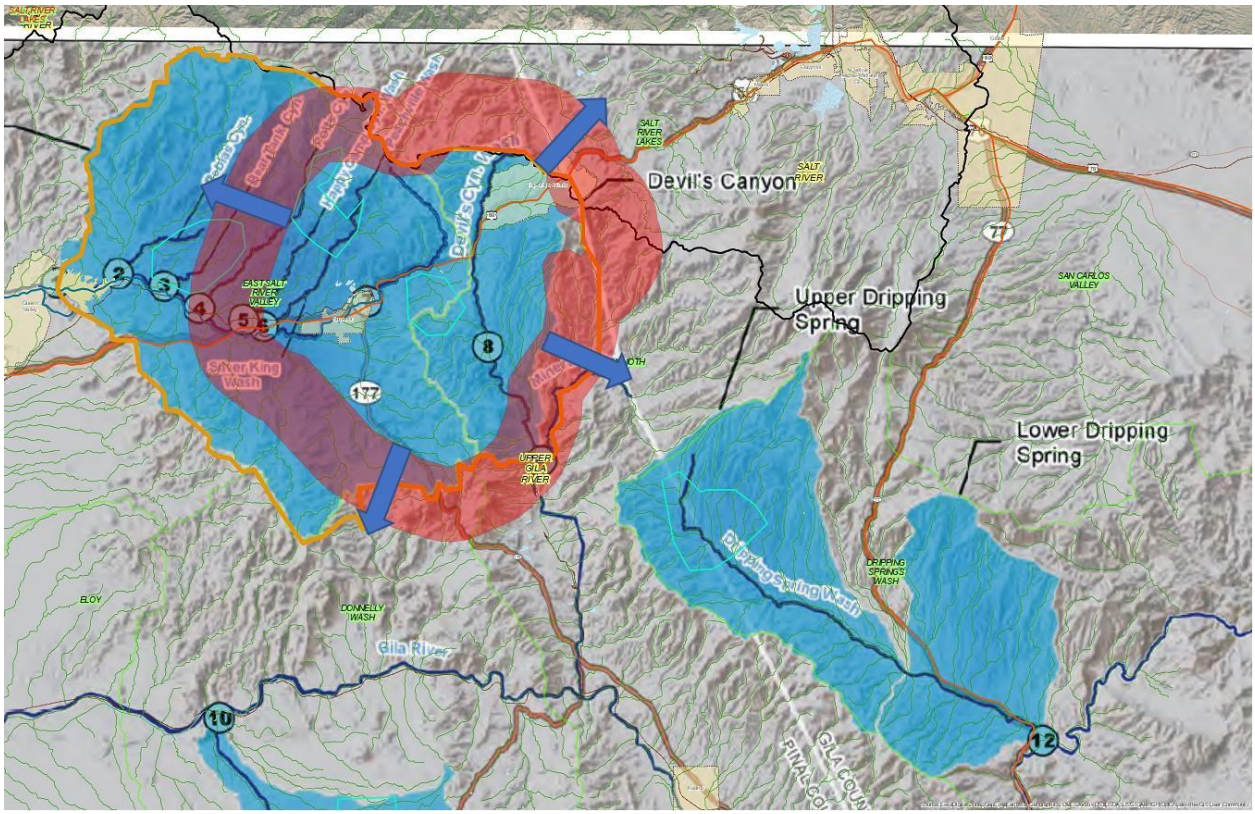

Figure 3: Prucha "Long-term Draw-Down": Long-term Drawdown (greater than 1 foot) likely extends several kilometers out in all directions (Red zone shows 4 km buffer around 10 foot maximum drawdown area in DEIS. Blue areas are SW Quantity Analysis Areas (from Figure 3.7.3-1 in DEIS).

The eighth problem with predictions in the DEIS is the missing predictive uncertainty evaluation. The Groundwater Modeling Workgroup appeared to acknowledge uncertainty in their modeling predictions of drawdown extent, but then failed to provide a range of predictions for all predictions. Other modeling efforts also appear to have failed to consider any type of predictive uncertainty, despite substantial calibration errors and high input uncertainty. The DEIS should have required a comprehensive approach to dealing with any modeling uncertainty in all model

predictions. All of the models developed and referenced in this DEIS (and supporting documents) have numerous assumptions and inputs, each of which translate into prediction uncertainty, but none address the substantial uncertainty in the predictions, let alone even identifying and tracking all sources of uncertainty.

Impacts of the proposed Desert Wellfield pumping wells near the proposed MARRCO corridor were evaluated by Bates et al, 2018 using ADWR's 2009 Salt River Valley (SRV) model (Freihoefer, et al., 2009). The ADWR SRV modeling effort never included a predictive uncertainty evaluation, nor did the predictive modeling by Bates et al, 2018. This would have been well warranted in the proposed pumping area, as data used to support the model construction are clearly absent in this area. As a result, predictions using this model, in this area, are expected to exhibit high uncertainty relative to other areas in their model domain, which had much greater data to justify model construction.

The evaluation of hydrologic model prediction uncertainty is critical, yet modelers confused sensitivity evaluation for standard/formal predictive uncertainty analysis. It is important to note that the non-uniqueness of the groundwater flow model calibration (remembering that it was only calibrated to heads and not discharge, water quality etc.) leads to many equally valid predictive solutions. Therefore, the assessment of the range of possible impacts of the mine on surrounding hydrology (and water quality) is inadequate and unreliable. It is misleading and incorrect to assume flawed or unreliable model simulated drawdowns above 10 feet are accurate, and those below are inaccurate. GDEs are very sensitive to groundwater levels – and even a 1-foot change will likely significantly change spring/river discharge or even presence. Gabora et al, 201435 appropriately used a Monte Carlo method to predict an entire range of simulated pit model inflows, while maintaining calibration.

The reliability of the model findings is implicitly tied to the accuracy of the model, which by default is uncertain, like all models. Model accuracy can be improved by collecting more data, increasing discretization and better reproducing observations, but in reality, this is impossible to achieve, given that models are simplifications of flow systems, and data will always be limited. As such, it is far more important for RCM consultants to acknowledge uncertain model predictions, and instead conduct a detailed and robust predictive uncertainty analysis which focuses not just on predicted groundwater inflow to the pit lake, but also on predicted response at all other mine components, at the same time. A sensitivity analysis (ASTM D5611, 2016) does not provide a range of possible predicted responses given ranges of uncertain model inputs like an uncertainty analysis, which constrains realizations to maintain calibration within acceptable targets (Doherty, 2010).

Modelers appear to have confused a predictive sensitivity analysis with a predictive uncertainty analysis. The distinction is very important, as a sensitivity analysis does not provide a true assessment of model uncertainty (see Neuman & Weiranga, 2003, Doherty et al, 2010)—typically perturbations cause the model to fall out of calibration, which make the results unreliable. Yet the authors report a range of output from simulations using an arbitrary adjustment of selective (i.e., cherry picked) parameters, to imply they've considered the full range of possible impacts at GDEs. Despite the modelers using the PEST code (described by code author Doherty, 2010) to help refine model calibration (see page 27, WSP, 2019), they failed to use the same code to conduct a predictive uncertainty analysis.

The failure of this DEIS to require formal uncertainty analyses for all of the modeling predicting impacts to the surrounding environment/GDEs is a major oversight. As Doherty et al, 2010 states "Central to any decision-making process is an assessment of risk. Such an assessment is impossible without some assessment of predictive uncertainty.", which clearly supports the need for some type of uncertainty analysis to qualify predictions.

Ultimately, model predictions of impacts on GDEs are considered highly uncertain, due to a combination of the high level of input uncertainty, high conceptual model uncertainty, uncertainty in calibration data, and notable model error. While it appears that the groundwater modeling workgroup has acknowledged that the results are uncertain, especially with distance from the mine operations, further evaluation of uncertainty was dismissed in favor of selective sensitivity evaluations (Meza-Cuadra et al, 2018). Conducting a simplified sensitivity evaluation and then claiming it represents model uncertainty is misleading and understates the value of conducting a formal uncertainty analysis (at GDEs). An uncertainty analysis, which maintains calibration constraints by adjusting individual/combinations of model inputs, defines a range of equally valid predictions to which the solution is most sensitive. Sensitivity analysis identify parameters that predictions are most sensitive to, but do not bracket a realistic range of equally possible solutions that meet objective function constraints (i.e., minimizing the difference between historical and simulated heads), and as such shouldn't be used in lieu of a constrained uncertainty analysis. Conducting a formal uncertainty analysis and providing a qualified range of potential impacts, provides a much better way to inform critical decisions related to mine permitting

The null space Monte Carlo Constrained Maximization/Minimization method (Doherty et al, 2010) can provide the very important result of conveying the range (maximum – minimum) of equally plausible predictions of impacts at GDEs. The current sensitivity analysis is a) too selective and doesn't consider combinations of sensitive parameters and b) isn't constrained to minimize objective function (i.e., reproducing historical conditions within some value).

The well-known parameter estimation code PEST can be used in conjunction with existing calibrated groundwater models to determine a full range of uncertainty in predicted effects on GDEs using the Null-Space Monte Carlo method (see Doherty et al, 2010). The choice of the target or threshold objective function level at which the model is deemed to be "calibrated" is often subjective (Though targets should be determined based on required accuracy in GDE areas of interest following, for example a baseline study of this flow system that defines minimum environmental flows or changes to the hydrologic/ecologic system, to avoid irreversible damage).

Doherty et al, 2010 states "The principle that underlies this methodology is illustrated in his figure 6 for a two-parameter system. In this figure, the shaded contour depicts a region of optimized parameters that correspond to the minimum of the objective function. The solid lines depict objective function contours; the value of each contour defines the objective function for which parameters become unlikely at a certain confidence level. Each contour thus defines the constraint to which parameters are subject as a prediction of interest is maximized or minimized in order to define its post-calibration variability at the same level of confidence. The dashed contour lines depict the dependence of a prediction on the two parameters. The constrained maximization/minimization process through which the post- calibration uncertainty of this prediction is explored attempts to find the two points marked by circles on the constraining objective function contour. These points define parameter sets for which the prediction of interest is as high or as low as it can be, while maintaining respect for the constraints imposed by the calibration process."

The DEIS has failed to recognize existing ground and surface water rights

The DEIS has failed to recognize the existing ground and surface water rights granted and purchased by the Queen Valley Golf Course and the Queen Valley Community dating back to 1916.

1916	Notice of location of water for agriculture purposes on Queen Creek.
1963	The Whitlow Dam was constructed along with the weir to permit uninterrupted flow of water to serve Queen Valley.
1983	Queen Valley Golf Course purchased water rights first granted in 1916 for $30,000.

1984 *Certificate of Grandfathered Groundwater Right* given to Queen Valley Golf Association by the county of Maricopa, State of Arizona Department of Water Resources.

1998 *Statement Of Claim To Use Public Waters Of The State Of Arizona* issued by the Arizona Department Of Water Resources Surface Water Rights. Attachment B states this water right was recognized by the federal government in 1963 when the Corps of Engineers constructed Whitlow Dam and constructed the weir to permit uninterrupted flow of water to serve Queen Valley.

2000 *Certificate Of Grandfathered Groundwater Right* issued by County of Maricopa, State Of Arizona Department Of Water Resources.

Documents verifying the above will be provided upon request from the Queen Valley Golf Association. The existence of the Queen Valley Golf Association is very dependent on the water rights that have been purchased and granted and they believe that Resolution Copper does not have legal entitlement to interfere with the Golf Courses senior water rights, which are vested property rights. These issues must be resolved before this project moves forward.

MARRCO corridor

The DEIS Fails to Analyze and Mitigate the Direct, Indirect, and Cumulative Impacts of Water Usage.

Our scoping comments submitted on July 18, 2016 included several concerns and questions regarding the substantial water demands and water sources of the Resolution Copper mine project. Most if not all of those have not been included in this DEIS and are still unanswered. The DEIS does not meaningfully consider the implication of Arizona law on the water consumption of the proposed Resolution Copper mine. Unlike other users of groundwater in Arizona (i.e. industrial, agricultural, and residential) mines are essentially unregulated water users. Groundwater extraction permits for mines are "must issue." As a result, they face no legal restrictions or limits on the amount of water they can pump from the aquifer. (A.R.S. § 45-514). While it is not the obligation of the TNF to assert a view one way or another on the suitability of Arizona law in this regard, it is TNF's obligation to consider potential impacts of the project that would arise from the implementation of this (and other) statutes. The net effect is that, notwithstanding the representations made today, Resolution Copper can pump as much water as

they want at any point in the future and as such, the DEIS must consider this in its evaluation of impacts.

Although the Arizona Department of Water Resources (ADWR) has been a cooperating agency in the NEPA process, the DEIS fails entirely to contemplate the actual availability of water resources - or the direct, indirect, and cumulative impacts from withdrawing such large volumes of water from the various undetermined sources (groundwater, surface water, banked water, etc.). In fact, the DEIS (p. 18 and elsewhere) states that the water sources "would be" (have not yet been) determined by ADWR. This determination should have been made and included in the DEIS for full analysis of its direct, indirect, and cumulative impacts, as well as mitigation.

The DEIS (p. 59) further states that "[r]egardless of the authority for obtaining the water, the water is pumped from the same wells." Given this assertion, a full analysis should also have been done in this DEIS to consider impacts of the mine's proposed water usage on Arizona's water supplies at the local, regional, and state level, regardless of what "paper" source is claimed for that water. Furthermore, given ADWR's status as a cooperating agency, the DEIS should have (but completely failed to) analyze the water management actions by that agency and how those may affect and be affected by this project, including the Management Plans required under the 1980 Groundwater Code which was enacted to "aggressively manage the state's finite groundwater resources."[10] Under the Groundwater Code, areas of the state with "heavy reliance on mined groundwater" were designated as Active Management Areas (AMAs), and for many AMAs including the Phoenix AMA, "the primary management goal is safe-yield by the year 2025."[11] The current mine infrastructure "lies almost entirely within the Phoenix AMA" (DEIS p. 312), and the desert wellfield is "within the East Salt River valley subbasin of the Phoenix AMA" (DEIS p. 18). Incredibly, no discussion or analysis is held anywhere in the DEIS on the relationship between the large amount of water proposed to be used by this project and the Phoenix AMA safe-yield goals. Additionally, discussion regarding the impacts of the project's immense water usage is radically insufficient and almost entirely absent. This is inconsistent with NEPA, which requires, at a base, a "reasonably thorough discussion of the significant aspects of probable environmental consequences." *Oregon Natural Resources Council v. Lowe,* 109 F.3d 521, 526 (9th Cir. 1997).

The DEIS (p. 335) states that "the amount of groundwater in storage in the East Salt River valley subbasin (above a depth of 1,000 feet) is estimated to be about 8.1 million acre-feet." The amount of water in storage (meaning in water storage facilities) is NOT the same thing as the

[10] ADEQ, Active Management Areas (last visited Nov. 4, 2019), https://new.azwater.gov/ama.
[11] *Supra* note 21.

amount of water which actually exists in the subbasin. Yet without analysis, the DEIS adopts and presents this 8.1 million acre-foot figure as the amount of water "estimated to be physically available in the aquifer." (DEIS p. 342). The DEIS never confirms where this estimate of how much water is physically available in the aquifer actually comes from, whether it has been independently verified, what the range of uncertainty is, or any of the discussions which would otherwise accompany verifications being done as a proper part of NEPA analysis. This is a major point of concern.

The DEIS further spends astonishingly little time analyzing the impacts of the Resolution Copper Mine water usage on regional water supplies. In fact, the DEIS (p. 342) sets up and immediately dismisses its obligation to consider cumulative impacts, stating that although "groundwater demand is substantial and growing," and that "the total demand on the groundwater resources in the East Salt River valley is substantial and could be greater than the estimated amount of physically available groundwater, that "it is not possible to quantify the cumulative water use in the area" due to "uncertainties." Despite documented instances of residential wells in Pinal County already beginning to dry up at certain depths,[12] no consideration is given to the steep costs to residential well owners in this region to deepen their drying wells to access water in lower depths, an impact which Resolution Copper water use would contribute to potentially directly but also indirectly and cumulatively. This impact should have been considered but was absent from this DEIS.

The DEIS is fundamentally flawed without these important discussions, since all of the proposed mine's activities, in one way or another, involve water. Additionally, analysis of water availability should have been conducted as though Resolution Copper's voluntarily stored water resources do not exist.

Impacts of activities in the desert wellfield (MARRCO corridor) including water pumping have not been fully considered under NEPA.

The DEIS (p. 19) states that the water pipeline corridor to the New Magma Irrigation and Drainage District (NMIDD) irrigation canal is authorized under an existing Special Use Permit, but the next sentence also states: "Future activity within the MARRCO corridor potentially could be covered under the final mining plan of operations, rather than a special use permit." Future activity in the MARRCO corridor includes at least the drilling of several dozen wells,

[12] *See* "Private Wells Running Dry in Pinal County" published October 24, 2019 by ABC15 News (last visited Nov. 4, 2019). https://www.abc15.com/news/region-central-southern-az/private-wells-running-dry-in-pinal-county

construction of major power line infrastructure, new pump stations, grading and sloping, access roads, and an additional 50-foot easement (DEIS, Appendix G, p. G-10), all of which are major connected actions as defined in 40 C.F.R. § 1508.25, and which should have been fully analyzed in this DEIS.

The DEIS fails to provide a full and fair discussion of the direct, indirect, or cumulative impacts of groundwater pumping in the MARRCO Corridor desert wellfield.

It is well-documented and researched that excessive, long-term extraction of groundwater can cause subsidence and fissures in the earth. These occurrences have been particularly concentrated in the East Salt River Valley subbasin, where over 500,000 AF of water would be pumped under the preferred Alternative 6. Regarding the East Salt River Valley subbasin, ADWR's Water Planning Atlas states: "Earth fissuring and subsidence have occurred in the ESRV sub-basin due to localized pumping. These occurrences are found near Apache Junction and in the vicinities of Queen Creek, North Scottsdale and Paradise Valley (Rascona, 2005)."[13] The University of Arizona's Water Resources Research Center states: "Within the Salt River Valley are various locations where subsidence is occurring."[14]

The DEIS (p. 334) contains no meaningful analysis of the potential subsidence from its large water uses, saying only that while groundwater pumping has already caused land subsidence in the wellfield area, a detailed analysis of land subsidence caused by withdrawals from this project is "not feasible" and that the impacts from one pumping source "cannot be predicted or quantified." This is not a full nor a fair discussion of the potential environmental impacts caused by the large volume of proposed pumping in this area as required by 40 C.F.R. § 1502.1. Nor does any part of this discussion cite to supporting evidence, as required by 40 C.F.R. § 1502.1 (requiring that statements "shall be supported by evidence that the agency has made the necessary environmental analyses.") Since subsidence due to water use is not analyzed in this DEIS, the direct, indirect, and cumulative impacts from that subsidence (such as the impacts of subsidence on the U.S. 60, S.R.79, and other nearby roadways, ground instability, impacts to

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[13] *See* ADWR Water Atlas, Active Management Area Hydrology – Groundwater Overview and Phoenix AMA (last visited Nov. 4, 2019), http://www.azwater.gov/AzDWR/StatewidePlanning/WaterAtlas/ActiveManagementAreas/PlanningAreaOverview/Hydrology.htm#eastsalt.

[14] Joe Gelt, *Land Subsidence, Earth Fissures Change Arizona's Landscape*, 6 Arroyo 2, Water Resources Research Center (Summer 1992), https://wrrc.arizona.edu/publications/arroyo-newsletter/land-subsidence-earth-fissures-change-arizonas-landscape.

wildlife, impacts to existing and planned infrastructure, etc.) are all absent from the DEIS. Drawdown contours are shown in Figure 3.7.1-2 (DEIS p. 298) which overlay nearby roadways and developed areas, but the impacts of these drawdowns on those features are never analyzed in the DEIS.

The DEIS (p. ES-24) states that desert wellfield pumping in the East Salt River Valley MARRCO corridor "would incrementally contribute to the lowering of groundwater levels and cumulatively reduce overall groundwater availability in the area" but the DEIS contains no meaningful analysis of impacts or plans for mitigation. As discussed further herein in these comments, Resolution Copper's water recharge and storage credits, which are "not required under Arizona water law" and a "voluntary measure" (DEIS p. 341) are non-binding by definition. They can be freely sold or exchanged at any time, and cannot and should not be relied on for mitigation. Yet the DEIS improperly relies on them (*see* DEIS p. 333, stating "[t]he applicant-committed environmental protection measures include remedying any impacts on water supply wells caused by drawdown from the project.")

The groundwater model for the MARRCO wellfield is deficient.

Although Resolution Copper purportedly intends to pump 540,000 acre-feet of water from groundwater resources (under the preferred Alternative 6, DEIS p. 99), the DEIS makes no attempt whatsoever to model or estimate groundwater resources and thus, makes no attempt to study the cumulative impacts. This is a glaring and quite unbelievable deficiency in the DEIS.

The DEIS (p. 303) states that the groundwater flow model to predict pumping impacts from the MARRCO corridor desert wellfield was built by Resolution Copper "from an existing, calibrated, regulatory model prepared by ADWR" and, since the original model had been used for planning purposes since the 1990s, the modified model "did not require as extensive a review as the models prepared specifically for the mine." This is absurd, modifications to the existing model are not described. The original model may be reliable, but a new model should have been subjected to the same thorough review in the DEIS.

Insufficient data is provided regarding the groundwater flow model on the MARRCO wellfield. The DEIS (p. 303) under the section titled "Model Used for Mine Water Supply Pumping Effects" indicates that Resolution Copper built a model from an existing ADWR model for this area. The DEIS states that a less extensive review was given to this model, yet doesn't give an explanation why, or what this lower-level review supposedly entailed. Resolution Copper has taken an ADWR model and modified it or updated it in some way and no discussion appears

anywhere in the DEIS about how this model was changed. Furthermore, ADWR has recently finalized a new groundwater model for this area, correcting errors and shortcomings in the older model. The model reflects a "major update" performed by ADWR in 2014, "structural modifications" made in order to "address differences found between the simulated thickness of the aquifer materials and the thickness described in numerous well drillers' logs."[15] According to the 2019 Pinal Model Technical Memorandum, "[c]hanges were also made in the East Salt River Valley (SRV) portion of the SRV model" based on significant structural modifications.[16]

The DEIS (p. 300) says that groundwater model results "could be reasonably assessed up to 200 years" but this statement is couched in multiple qualifiers with no explanation given for why only 200 years is the threshold. Additionally, although it is common scientific practice to do so, no range of uncertainty (such as ± 10-15 years, for example) accompanies this figure. This figure is relied upon as the basis for all quantitative results in the DEIS, but it is not a reliable figure. Furthermore, the vague expression of the estimated point of maximum groundwater drawdown or impact as "decades or even centuries" is a huge unusable range, and completely unreliable.

A map (or discussion) of the groundwater model area boundaries for the East Salt River Valley analysis area are never provided. The DEIS (p. 298) claims that figure 3.7.1-2 shows the groundwater model boundaries/analysis area of the East Salt River valley model. However, figure 3.7.1-2 (p. 298), below, shows only a zoomed-in, limited portion of this groundwater model area – making it impossible to know what the analysis area does or does not include.

[15] The Pinal Model was finalized in October 2019. http://infoshare.azwater.gov/docushare/dsweb/View/Collection-19686.

[16] ADWR, 2019 Pinal Model and 100-Year Assured Water Supply Projection Technical Memorandum (Oct. 11, 2019), http://infoshare.azwater.gov/docushare/dsweb/Get/Document-11793/2019_Pinal_Model_and_100-Year_AWS_Projection-Technical_Memorandum.pdf.

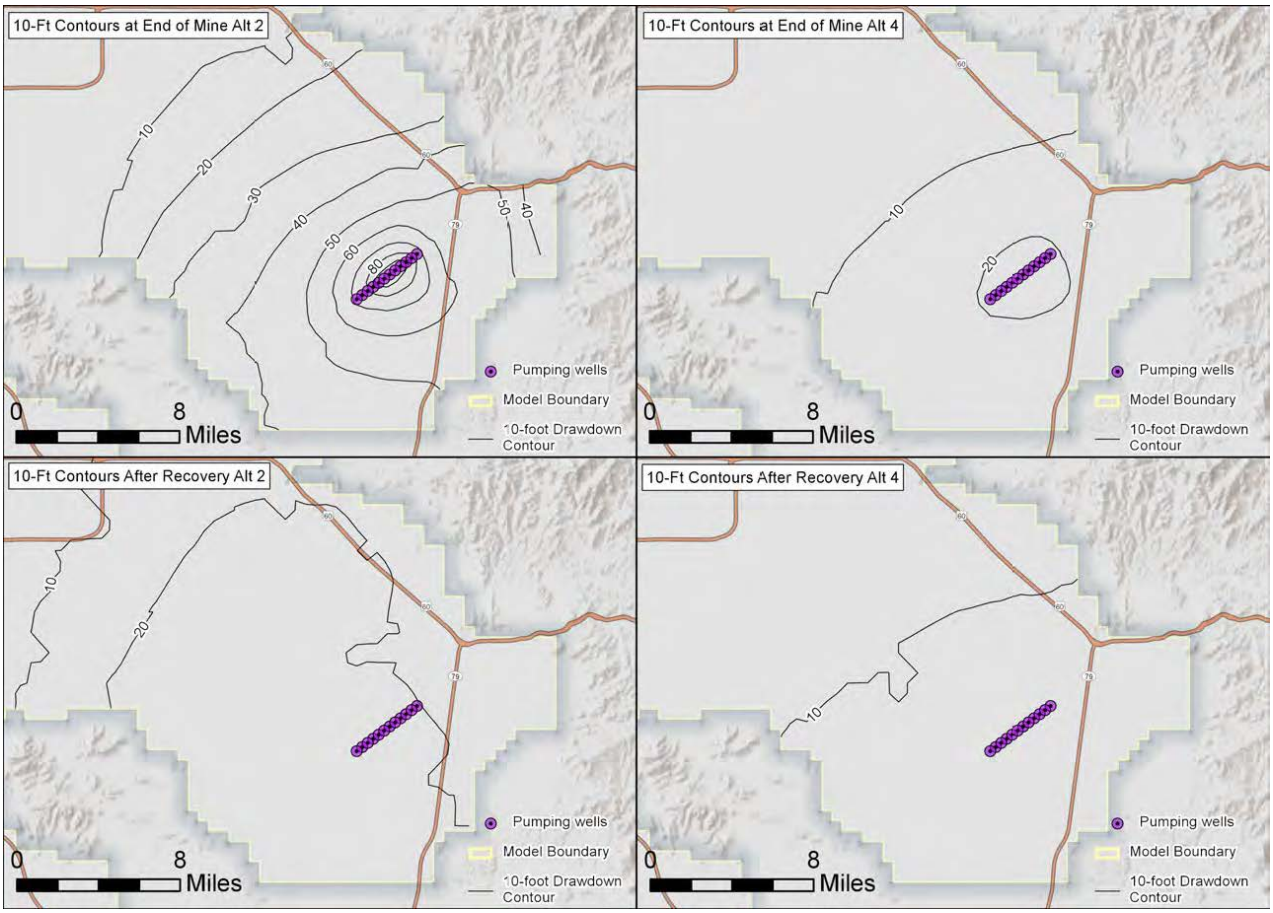


Figure 4: (Figure 3.7.1-2. from DEIS) Desert Wellfield modeling analysis area and maximum (Alternative 2, left) and minimum (Alternative 4, right) modeled pumping impacts.

The DEIS contains no meaningful discussion whatsoever about the accuracy of the groundwater model. The DEIS contains multiple assurances that the groundwater model is precise since it produces results with "many decimal points" (p. 301). The DEIS states that the Groundwater Modeling Workgroup only assessed the groundwater model results for precision. This is not a scientifically sufficient way to evaluate results – both accuracy and precision are required which are totally independent concepts and not to be used interchangeably (as is done in BGC Engineering USA Inc. 2018d). "Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA." 40 C.F.R. § 1500.1. This DEIS fails to meet this requirement.

As shown below, the analysis area of the water quality model omits critical segments of Queen Creek. Figure 3.7.2-1 shows what is included in the water model analysis area studied under this section (supposedly encompassing where groundwater or surface water quality changes could potentially occur under the project). The area studied is extremely insufficient for many reasons,

including that only about half of the length of Queen Creek between the block-cave zone and Whitlow Dam is included in the analysis area, despite Resolution Copper having an AZPDES permit No. AZ0020389 for nearly ten years to discharge mine wastewater into the unstudied portion of Queen Creek. The DEIS does not address why this study failed to include such a large portion of Queen Creek, but this is an extremely unscientific, glaring omission which fails to comply with the requirements of 40 C.F.R. § 1502.16 and the very first requirement on the list of requirements for an EIS at Section 102(2)(C) of NEPA (P.L. 91-190).

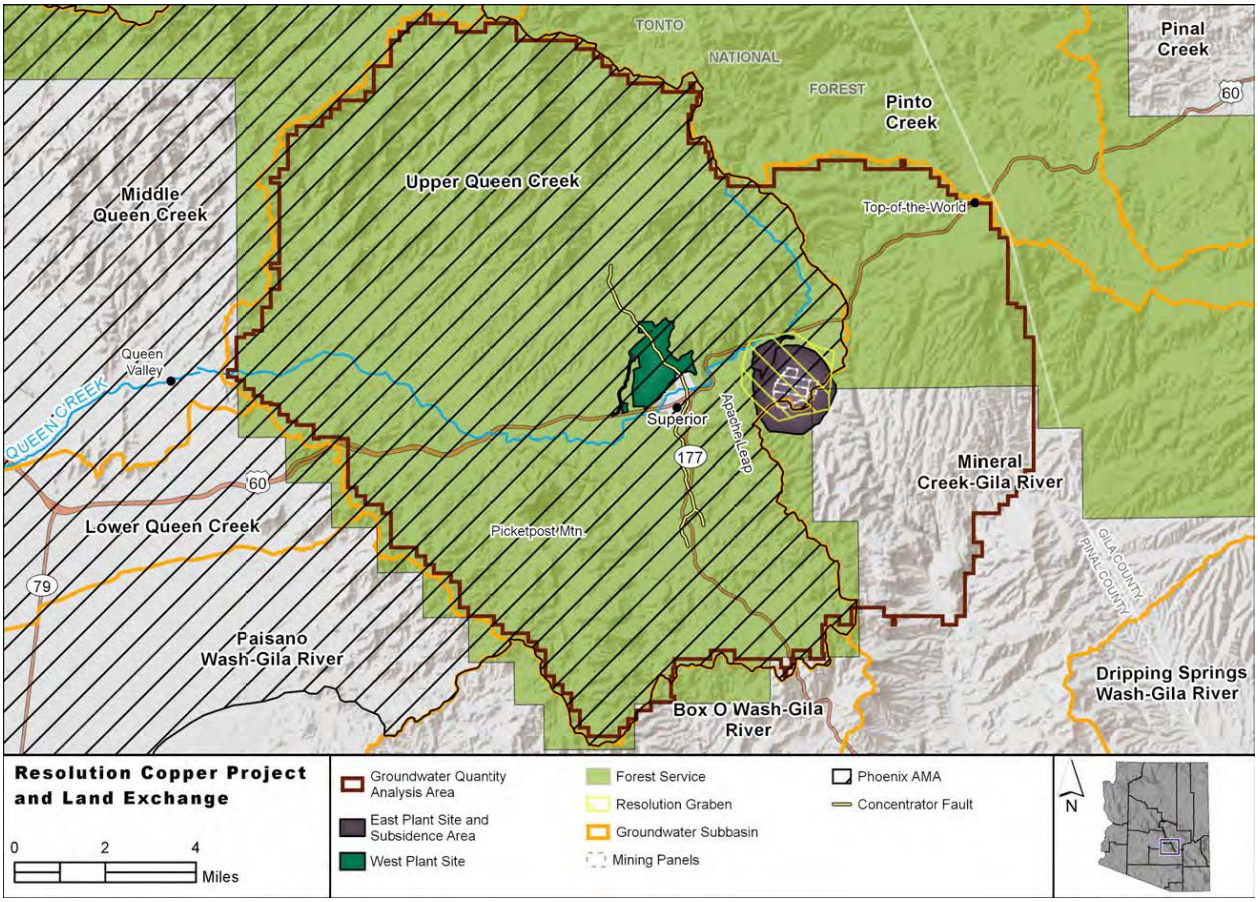


Figure 5: (Figure 3.7.1-1. from DEIS) Overview of groundwater modeling analysis area

Resolution Copper's water recharge and storage credits, which are "not required under Arizona water law" and a "voluntary measure" (DEIS p. 341) are not a requirement by definition and should not be relied upon at all in any part of the DEIS. Therefore, it is improper that they should be considered in any part of this water model. Yet the ADWR/Desert Wellfield Modeling Meeting minutes (cited as Garrett 2018a) contain the following statement: "Estimate that 10-30 feet of drawdown in the regional aquifer at Desert Wellfield has been avoided because of the long-term storage credits enabled by Resolution." Incorporation of any voluntarily acquired

recharge and storage credits (which can be resold at any time) into any water model for this project is highly problematic.

The DEIS fails to mention or consider the increased water pumping facilitated by the Drought Contingency Plan in the East Salt River valley as a reasonably foreseeable future action and as part of a cumulative effects analysis.

Under the Drought Contingency Plan (DCP), a widely known major federal action being implemented in Arizona via specific DCP approval legislation which includes converting water usage from surface to groundwater, impending Tier 2 shortage will result in 70,000 AF of water being extracted from the East Salt River Valley aquifer. The DEIS fails to consider or even mention this.

The DEIS does not state anywhere exactly how much water is already being pumped from groundwater resources in Pinal County, or how much more groundwater resources will be used over the next several years from this already-strained area under the actions facilitated under the DCP.

Despite the subject specifically being raised in scoping by and information provided to SWCA representative Charles Coyle on April 2, 2019, the DEIS does not meaningfully address the direct, indirect, and cumulative impacts to Arizona's water supplies and to Arizona's water users stemming from Resolution Copper's water usage related to past, present and reasonably foreseeable actions required for a cumulative impacts analysis. The contents of the April 2, 2019 email to SWCA are cited here below. Linked materials are incorporated into these comments.

> As part of the implementation of the Lower Basin Drought Contingency Plan in Arizona, water stakeholders, including the State of Arizona, the Central Arizona Project (CAP) cities and Tribes in the state, agreed to fund the development of groundwater infrastructure in Pinal County to supplant the loss of Colorado River water under DCP and during shortage on the Colorado River. The stakeholders agreed to help fund rehabilitation of existing wells and construction of new wells sufficient to provide 16,500 Acre-Feet of water in 2022 and 70,000 Acre-Feet of water in 2023 and thereafter. (See slide 10 of this presentation for a useful chart).
>
> In January, the Arizona legislature approved, and the Governor signed, a $9 Million appropriation from the state specifically for rehabilitation of existing wells and construction of new wells as part of the DCP approval legislation. In addition, CAP authorized the use of $5 Million of its revenues to be used for

> groundwater infrastructure. CAP also justified their appropriation as an investment in stored CAP water currently in Pinal County, with the expectation that the water will be called upon during shortage. This recovery of stored water should also be considered a Reasonably Foreseeable Activity.
>
> The Pinal County farmers currently expect to raise $25 Million, including the appropriations from the state and CAP, with the goal of seeking federal funding for an additional $25 Million through NRCS, USDA and possibly Reclamation. In the meantime, their supporters in the legislature continue to seek additional state funds to be used if the federal funding does not materialize (see video of the hearing, here)."

Analysis of reasonably foreseeable actions and reasonably foreseeable future actions (RFFAs) with potential to impact East Salt River Valley water supplies is virtually nonexistent from the cumulative impacts analysis in this DEIS. In addition to having been previously provided to TNF and SWCA, this information is widely and publicly available and should have been considered in this DEIS.

Regarding impacts to East Salt River Valley water supplies, the DEIS (p. 340-341) devotes one paltry paragraph to setting up a handful of vague actions and dismissing them all from consideration, stating that:

> Several reasonably foreseeable future actions were identified during the NEPA process but were determined too speculative to analyze for cumulative effects without detailed plans. These include potential housing developments in the town of Florence, and the ASLD's planned Superstition Vistas development area. A number of approved, assured water supplies were also identified in the East Salt River valley, and these describe future use of water in enough detail to be considered for cumulative effects. All of these potential future actions have the potential to be cumulative in combination with the impacts from the Desert Wellfield, resulting in greater drawdown than projected from the Resolution Copper Project.

Analysis of "Affected Environment" with regard to groundwater quantity in the East Salt River valley is a superficial three-paragraph overview which does not meaningfully discuss past and present actions in the region. The brief, non-analytical content does not meaningfully describe the affected environment at all. Considering the enormous quantity of project water which is

planned to be extracted from this region, the DEIS must be corrected to properly analyze existing environmental characteristics as well as impacts to this region.

WATER QUALITY

Review of Geochemical Issues of Resolution Copper's Draft Environmental Impact Statement, August 2019

(See Maest's report with the same title in the Appendix)

The primary mined materials that could adversely affect water quality are the mine tailings, development rock, and the rock remaining in the block cave zone, where the ore and development rock would be extracted according to the study done by geochemical and water resources expert, Dr. Ann Maest (see Maest's Review of Geochemical Issues of Resolution Copper's Draft Environmental Impact Statement, August 2019). Mine-influenced waters that could adversely affect streams, groundwater, and springs include contact stormwater, tailings seepage and supernatant water, and water in the block cave zone or that could enter the block cave zone and underground workings during or after mining.

The Forest Service's preferred alternative is Alternative 6: Skunk Camp North Tailings Corridor Option (DEIS, p. 30). All alternatives include separate management of potentially acid-generating (PAG) and non-PAG (NPAG) tailings (DEIS, p. 38 and 41). The PAG tailings would comprise 16% of the total tailings, while the NPAG tailings would be classified as NPAG. The DEIS describes scavenger tailings as being synonymous with NPAG tailings and pyrite and cleaner tailings being synonymous with PAG tailings (DEIS, p. 30 pdf 81).

The DEIS says it used "best practices" for geochemical characterization by using methods from INAP and those required by ADEQ (p. 372). However, two methods used will underestimate acid generation and contaminant leaching potential: the Sobek method (Sobek et al., 1978) and the synthetic precipitation leaching procedure (SPLP; US EPA, 1994). The original Sobek method (Sobek et al., 1978) could overestimate acid generation potential because it uses total sulfur rather than sulfide sulfur. However, for the Resolution Copper Project, only the sulfide sulfur was used (MWH Americas, Inc., 2013, p. 2-4). Use of the original Sobek method in this case is more likely to overestimate neutralization potential because of the pH endpoint (Maest et al., 2005). The Modified Sobek method is recommended over the original Sobek method by INAP (2009) and the Nevada Bureau of Land Management (2013). Because most of the test results for Resolution Copper showed that nearly all the mine rock samples, all the PAG tailings, and over half the "NPAG" tailings were potentially acid-generating (PAG; DEIS, p. 372 and

373), the use of the older Sobek method is not particularly concerning for the DEIS. However, it should not be used in the field to distinguish PAG and NPAG rocks for different placement and different mitigation approaches; instead, the Modified Sobek method should be used. No information is provided in the DEIS about methods used in the field to distinguish PAG and NPAG rock (read project description etc.). An important question is why the DEIS calls the "NPAG" tailings (scavenger tailings) NPAG when half are PAG or acid generating (DEIS, p. 373).

The SPLP test will underestimate the leaching potential of mined materials, especially in arid areas like southern Arizona, because it calls for a 20:1 solution:solid ratio (Maest et al., 2005). The meteoric water mobility procedure (MWMP) is recommended by the Bureau of Land Management for the State of Nevada, another arid state in the western US. The MWMP has a solution:solid ratio of 1:1 and should have been used by the proponents to evaluate the short-term contaminant leaching potential of mined materials. As noted in the DEIS (p. 381), a drawback of relying only on the SPLP test is that it is usually conducted on unweathered fresh core or lab-created tailings when in the field over time, these mined materials will weather. As especially sulfidic mine materials weather, secondary sulfate salts are formed that can release metal(oid)s, sulfate, and acidity rapidly during a storm event or as waters rise into mined areas; the effects of this rapid dissolution are rarely taken into account when predicting mine waste behavior (Maest and Nordstrom, 2017 and references contained therein).

Results from the SPLP tests for NPAG and PAG tailings are presented in Table 3.7.2-9 of the DEIS. The concentrations predicted for PAG tailings runoff should be higher than those for NPAG tailings, but they are not, as shown in table 3.7.2-9. This is an indication that either the SPLP tests include too much dilution or that the SPLP results in the table are not taken from PAG and NPAG samples. For example, predicted concentrations of antimony, beryllium, cadmium, chromium, copper, iron, mercury, silver, thallium, and zinc in the table are identical, and oddly, sulfate and total dissolved solids concentrations are higher in the NPAG than in the PAG sample. The report from Verburg and Harvey (2008) is cited as the source for the SPLP results in the table. Upon reviewing the report, no sample identified as 7/7A 7C is included in the report, and the report is not about SPLP results – it is about humidity cell test (HCTs – much longer-term leach tests) results for six tailings samples. This discrepancy needs to be corrected. The inclusion of SPLP results in the DEIS (see Table 3.7.2-9) is confusing because it implies that the results were used to calculate stormwater runoff concentrations. However, it appears that SPLP results were not used for tailings runoff water quality predictions (Eary, 2018g) and barrel and early HCT results were instead used.

A more important issue is the lack of geochemical testing for the lone proposed mitigation

measure for PAG tailings. The PAG tailings (that is, the pyritic or cleaner tailings) would be subaqueously deposited because "this limits oxygen from interacting with the concentration of sulfides in the PAG tailings, minimizing and preventing water quality problems (acid rock drainage)" and the NPAG tailings would "eventually encapsulate the PAG tailings." (DEIS, p. 41). However, no testing was done to determine if depositing the PAG tailings under water would minimize or prevent the formation of acidic drainage. Because submerging PAG tailings is the only mitigation measure proposed for minimizing acid drainage at the source, saturated column tests on tailings should be conducted. The testing will require months to a year or more to complete and evaluate.

Saturated column (SC) testing on core from the proposed block cave area was conducted. The tests were designed to mimic what would happen when the block-cave zone refloods after mining (DEIS, p. 372). The saturated column tests used spent material from the humidity cell tests (HCTs) from 14 samples for a total of 12 weeks. The number of pore volumes of water flushed through the column tests was estimated to represent thousands of years of waters moving through the block cave area after mining ceases (MWH Americas, 2013, p. 3-4). The spent HCT material was presumably used to ensure the samples were weathered before testing began to better simulate actual field conditions after mining. The results for pH, total acidity, sulfate, and copper are shown in Table "Summary of Leachate Chemistry" for the last week of HCT testing and the first and last week of SC testing. In the report with the results (MWH Americas, Inc., 2013), the results for copper were not presented in the main body of the report but were buried in two appendices.

The results in Table "Summary of Leachate Chemistry" show that all tests with acidic HCT endpoints had even lower pH and higher acidity values for week 1 of SC testing, indicating that the salts that remained on the spent HCT material contained latent acidity. For the samples with neutral pH HCT endpoints, little change in pH or acidity resulted in the SC tests. All SC tests had higher sulfate concentrations at the end of the first week of SC testing regardless of pH values, indicating that elevated sulfate concentrations would be released into groundwater when the block cave area experiences rising water levels during closure/post-closure and salts on the surfaces of the block caved material are dissolved. Similarly, all tests, regardless of pH, had higher copper concentrations at the end of the first week 1 of SC testing, showing that rising groundwater would also greatly increase copper concentrations in the block cave area. Only two of the eight SC tests that were acidic had copper concentrations below detection at end of the test; the other six had decreasing concentrations over time, but values were still well above aquatic life criteria for copper. This result suggests that movement of block cave groundwater toward streams could adversely affect groundwater-dependent ecosystems. The results show that once the block cave area is inundated with rising groundwater, a flush of acid, copper, and sulfate

will occur because of the dissolution of acidic metal-sulfate secondary salts. This flush of contaminants would contaminant groundwater in the block cave zone and could also affect groundwater-dependent ecosystems and the subsidence lake that would likely form above the collapsed ground surface, as discussed in the following section.

Table 1. Summary of leachate chemistry (pH, acidity, sulfate, copper) for the final week of humidity cell testing (HCT), first week of saturated column testing, and final week of saturated column testing. Tests with acidic pH values at end of HCTs are highlighted in pink.

SCT ID	HCT Final Week	SCT Week 1	SCT Week 12	HCT Final Week	SCT Week 1	SCT Week 12	HCT Final Week	SCT Week 1	SCT Week 12	HCT Final Week	SCT Week 1	SCT Week 12
	pH			Total Acidity			Sulfate			Copper		
	(s.u.)			(mg/L as $CaCO_3$)			(mg/L)			(mg/L)		
SC2	7.05	7.18	6.77	<5	<5	<5	615	1470	1020	<0.05	0.04	0.04
SC11	3.74	3.09	3.64	137	5183	66	158	6750	77	99.7	3060	2.07
SC12	4.92	4.58	5.06	329	2190	71	376	3310	85	267	2010	49.7
SC14	5.77	5.03	5.56	65	411	15	807	1750	1580	24.2	192	0.49
SC21	3.63	3.08	4.46	108	1544	9	105	1530	<10	13	539	0.29
SC28	3.76	2.94	4.61	237	7280	27	225	11000	20	34.1	2480	<0.05
SC34	7.10	7.44	7.55	<5	<5	<5	33	299	<10	0.01	0.12	<0.05
SC38	8.58	7.95	8.02	<5	<5	<5	<10	10	<10	<0.05	0.04	<0.05
SC39	8.78	8.34	8.86	<5	<5	<5	<10	151	<10	0.01	0.1	<0.05
SC44	2.7	2.43	3.80	482	2180	60	567	2790	63	17.3	223	1.02
SC49	4.57	3.17	4.09	49	14980	40	50	17400	34	364[a]	9350	0.13
SC50	4.21	3.81	4.72	345	1750	33	496	2660	49	230	670	<0.05
SC52	7.32	7.57	7.79	<5	<5	<5	77	1340	10	0.39[a]	3.54	0.01
SC54	6.30	6.37	7.53	10	28	<5	603	1600	1350	3.42	13.7	0.11

Source: MWH Americas, Inc., 2013; Geochemical Characterization Data Summary Report; and Appendices F and H of the Report; SCT Saturated Column Test; a then converted to shoebox.

The proposed mining is expected to result in an enormous collapsed and fractured area predicted to be 7,000 feet deep with an overlying crater that will develop starting in year 6 of mining (DEIS, p. ES-3, p. 26). The crater is expected to be between 800 to 1,115 ft deep and approximately 1.8 miles wide at the surface of Oak Flat (DEIS, p. ES-3). The collapsed and cratered area will likely result in flow reductions in Devil's Canyon and Queen Creek and the loss of seeps and springs in the Superior area (DEIS, p. 26). The two competing geochemistry models presented in the DEIS have radically different water quality predictions for groundwater quality in the block cave zone, as shown in Table 1. Once explanation for the discrepancy is that chemical weathering of wall rock and mineralized fractured rock in the collapsed block-cave zone is assumed in the Eary (2018f) model to not supply any chemical load to the sump water (DEIS, p. 350). However, the results presented MWH Americas (2013) and interpreted in the section Block Cave Groundwater After Mining Ceases in this memo completely contradict that assumption and show that acidity, copper, and sulfate can be released from oxidized mineralized rock in the block cave zone when water levels rise.

Table 2. Modeled block-cave sump water chemistry for selected constituents compared to water quality standards (pink shading indicates predicted concentrations exceed one or more water quality standard or criterion).

Constituent	Eary Block-Cave Geochemistry Model* Predicted Concentrations (mg/L)	Hatch Block-Cave Geochemistry Model** Predicted Concentrations (mg/L)	Arizona Aquifer Water Quality Standard (mg/L)	Safe Drinking Water Act[1] or Clean Water Act[2] Standard (mg/L)
pH (s.u.)	8.58	5.05	–	6.5 - 8.5[A2]
TDS	1,528	NR	–	500[A2]
SO4	934	2,247	–	250[A2]
F	2.3	NR	4	4[A1]
N	0.8	NR	–	10[A4]
Sb	0.0047	0.035	0.006	0.006[A1]
As	0.0227	0.013	0.05	0.01[A1]
Be	0.0003	0.036	0.004	0.004[A1]
Cd	0.0008	0.19	0.005	0.005[A1]
Cr	0.0027	0.241	0.1	0.1[A1]
Co	0.0063	2.72	–	–
Cu	0.0158	141	–	1.3[A3] / 0.009[B1]
Pb	0.005	0.088	0.05	0.015[A3] / 0.0032[B1]
Mn	0	14.2	–	0.3[A5]
Hg	NR	0.018	0.002	0.002[A1]
Ni	0.0076	2.5	0.01	0.052[B1]
Se	0.0051	0.5	0.05	0.05[A1] / 0.0015[B]
Tl	0.0043	0.009	0.002	0.002[A1]

*Source: DEIS, Table 3.7.2-1; NR not reported; *Eary, 2018f; **Hatch, 2016.*

A Safe Drinking Water Act (US EPA, 2018): maximum contaminant level (MCL; A1), Secondary MCL (A2), A3 Action Level requiring treatment, A4 MCL for Nitrate+Nitrite (as N), A5 Lifetime Health Advisory.

B Clean Water Act Freshwater chronic criterion (US EPA, 2016, 2019): B1 hardness-based metals calculated at 100 mg/L hardness as CaCO3.

The DEIS admits that after closure, the reflooded block-cave zone could have poor water quality; however, it concludes that a lake in the subsidence crater is not anticipated, and no other exposure pathways exist for this water (DEIS p. ES-24, pdf 31). The ad hoc "Groundwater Modeling Workgroup" provided input to the Forest Service, which concluded that "the presence of a subsidence lake was speculative and not reasonably foreseeable, and as such it would therefore be inappropriate to analyze in the EIS" (DEIS, p. 376). The types of participants in the Groundwater Modeling Workgroup is described in the DEIS (p. 296), but their qualifications are not. The potential to form a subsidence lake in the crater is rejected in the DEIS but is discussed in detail in Prucha's Review of Hydrologic Impacts of the DEIS (see Appendix). The DEIS concludes that "it is not possible to predict the details necessary to conduct even a rudimentary

analysis of effects" (DEIS, p. 378) and does not make a prediction of the lake's water quality. Prediction of the lake water quality is no more uncertain than all the other predictions made in the EIS and in some ways less complicated because all potential inputs and evaporation rates have already been estimated or can be estimated (see DEIS, Table 3.7.2-8). The range of potential concentrations in block cave groundwater could be used to estimate the range of concentrations in the subsidence lake and compared to water quality standards. The causes for the large discrepancy between block cave groundwater quality end members should also be better described in the DEIS. One possible cause is that Eary (2018f, p. 16) used the last three weeks of HCT results to estimate rates. Using results from the last weeks of testing will generally underestimate rates, assuming the tests were conducted for long enough to reach "steady state" conditions. Instead, a range of rates should be used, including maximum rates associated with maximum increase in iron and sulfate and maximum pH decreases (Maest and Nordstrom, 2017). Also, figures showing the HCT results are not presented in the DEIS or in any associated report that I could find. Examining the changes in concentrations in the tests visually is an important aid in understanding reactions occurring in the tests that will also occur in the field.

The formation and quality of a subsidence lake should be re-evaluated in a revised DEIS, including the cumulative effects section because of the potential to pull water from the Magma Mine workings into the block cave zone, as described in Prucha's Review of Hydrologic Impacts of the DEIS (see Appendix). The potential impact to birds and groundwater-dependent ecosystems should also be evaluated.

The results in Table 3.7.2-9 for estimated runoff water quality from PAG and NPAG tailings (Eary, 2018g) show that PAG tailings runoff is predicted to exceed surface water standards for Gila River, Queen Creek, or ephemeral tributaries for arsenic, beryllium, cadmium, chromium, copper, fluoride, iron, lead, manganese, nickel, selenium, silver, thallium, zinc, and pH (low pH) often by several orders of magnitude. Runoff water quality for NPAG tailings is predicted to exceed standards for copper, nickel, selenium, and pH (also low) by smaller factors, but still by more than 500 times, indicating that; The DEIS states that stormwater contacting tailings would not be released or discharged to the environment at any time (p. 381). This belief is based on stormwater controls used for the tailings impoundments as part of the project. Even with reasonable mitigation measures, unexpected releases of stormwater can and will occur due to failures in design or construction of the mitigation measures, human error, storm events, and other causes. Climate change is causing more extreme storm events, and the design and operation of mine facilities must take this into account. Table 3 describes stormwater releases from large copper mines in Arizona, when they occurred, their effects, and the causes, when known. The report (Gestring, 2019) also includes releases of mine contaminants and tailings from dam

failures, process facilities and other sources that are not included in Table 3. The mine contaminants associated with the releases in Table 3 included acidity, tailings, and metals such as copper and zinc. The stormwater releases adversely affected streams, soils, and groundwater and were caused by operator error, mechanical failures, and storm events. The DEIS should include all reasonably foreseeable effects, and Table 3 demonstrates that stormwater releases do occur with some regularity and should be fully evaluated as part of the potential environmental effects of the project.

Table 3. Stormwater releases from copper mines in Arizona

Mine Site, State Costs (if known)	**Description of Release**	**Environmental Effects and Cause (if known)**
Morenci Mine, Arizona 2011	Release of acidic solution directly into Lower Chase Creek from a stormwater pipe. The material travelled more than two miles, in violation of the mine's discharge permit.	*Effects*: Pollutants in the discharge exceeded surface water quality standards for copper, zinc and pH in Lower Chase Creek. *Cause*: Operator error: process solution pipeline connected to stormwater pipeline.
Pinto Valley Mine, Arizona 2007 and 2010	2007: A release of 45,000 gallons of impounded stormwater and tailings seepage water washed out a section of the secondary containment,	2007: *Effects*: Stormwater flowed directly into a tributary of Pinto Creek. *Cause*: a flange separation in a tailings line.

	which allowed it to escape. 2010: 5,362 tons of tailings spilled onto soil and into Pinto Creek, including 214 pounds of arsenic and 11 pounds of lead.	2010: *Effects*: 500 cubic yards of tailings were released into Pinto Creek, a tributary of Roosevelt Lake. *Cause*: storm event
Mission Mine Complex, Arizona 2002 and 2011	2002: discharge of primarily copper-laden stormwater runoff and process water to ephemeral tributaries of the Santa Cruz River near Tucson. 2011: release of tailings to a dry wash involving 811 cubic yards of tailings containing 145 pounds of lead sulfide.	2002: *Effects*: Violation of permit for copper, lead, TSS since October 2003; elevated concentrations of sulfate and TDS in aquifer and adjacent to the tailings impoundments; discharge to ephemeral streams tributary to the Santa Cruz River from mine outfalls. *Cause*: not stated 2011: *Effects*: It travelled underneath the Interstate and

		onto private property. *Cause*: backup of a tailings line
Silver Bell Mine, Arizona Multiple years: 1981, 1993, 2006	Tailings impoundment overflow to wash; 100,000 gallons of stormwater containing sulfuric acid and heavy metals escaped from a storage pit	*Effects*: Spills into dry washes and soils that threatened underlying groundwater; exceedance of aquatic life criteria in streams; extinction or loss of native fishes *Causes*: Leaks, storm events.
Source: Gestring, 2019. Note: Only stormwater spills are included in this table; multiple spills of process water from Arizona mines are also noted in the report.		

The conclusions of Maest's report can be summarized as follows:

1. The tailings are proposed to be separated into potentially acid-generating (PAG) and non-PAG (NPAG) components as part of the mine plan. Two flotation fractions would be produced: pyrite or cleaner tailings, which have been designated as PAG, and the scavenger tailings, designated as NPAG, from which pyrite has been removed. However, according to the geochemical testing results, over half the "NPAG" tailings are PAG and will likely generate acid mine drainage. The contradiction is not explained in the DEIS. This finding indicates that well over half the tailings are likely to generate acid.

2. The PAG and "NPAG" tailings are proposed to be managed differently in the same impoundment. The pyrite/PAG tailings (16% of total) would be submerged under water to minimize or prevent the generation of acid. But the scavenger/"NPAG" tailings (84% of total) would not be submerged. The finding above indicates that and a much larger percentage of the total tailings, upwards of 60%, would need to be managed as PAG and

submerged under water. No plans exist in the DEIS for this eventuality that has already been confirmed by the geochemical testing. Currently, the mine plan calls for a 42-inch pipe for NPAG and a 2-inch pipe for PAG tailings (DEIS, p. 38). Managing substantially more PAG tailings will also require a larger PAG pipeline and more extraction of fresh water, neither of which has been included as a contingency in the DEIS. Because more water would be needed to keep the larger volume of PAG tailings submerged, less "excess" or recycled water would be able to be returned to the mine for makeup water, resulting in the need to extract more fresh water, which consists of dewatering water, CAP water, and well field water along the MARRCO corridor (see DEIS, p. ES-6).

3. Submerging PAG tailings under water is the primary mitigation measure proposed to prevent or minimize acid mine drainage. No tests were conducted to determine if submerging the PAG (or for that matter, the "NPAG") tailings under water will accomplish this goal. Submerged column tests on both tailings types need to be conducted and will take months to years to complete.

4. Saturated column tests were conducted on rocks from the block cave zone to simulate water quality expected under low-oxygen conditions after groundwater levels rebound after mining. The number of pore volumes of water flushed through the column tests was estimated to represent thousands of years of waters moving through the block cave area after mining ceases. The test results show that samples that were already acidic remained acidic even when submerged under low-oxygen conditions. All tests showed a flush of copper and sulfate, regardless of whether they were acidic, during the first week of testing, indicating that copper-sulfate salts were dissolving rapidly. The results show that once the block cave area is inundated with rising groundwater, a flush of acid, copper, and sulfate will occur because of the dissolution of acidic metal-sulfate secondary salts. This flush of contaminants would contaminate groundwater in the block cave zone and could also affect groundwater-dependent ecosystems and the subsidence lake that would likely form above the collapsed ground surface.

5. Subsidence lake: The two competing geochemistry models presented in the DEIS have radically different water quality predictions for groundwater quality in the block cave zone. One model predicts good water quality and the other predicts exceedances of many mine contaminants by up to two or more orders or magnitude. The model predicting good water quality assumes that chemical weathering of wall rock and mineralized fractured rock in the block cave area will not supply any chemical load to the sump water. However, the results from the saturated column tests show that acidity, copper, and sulfate will be released in a flush when water levels rebound after mining. This water

would heavily influence water quality in a subsidence crater lake, yet the DEIS assumes it will not form and that water quality of the lake could not be predicted. A revised DEIS should re-evaluate these assumptions and provide a range of possible water qualities for the subsidence lake and its potential cumulative and ecological effects.

6. Predicted stormwater quality: Stormwater quality from PAG and NPAG tailings is predicted to exceed surface water standards for pH (acidic) and many metals and metalloids for PAG tailings runoff – often by several orders of magnitude. Runoff water quality for NPAG tailings is predicted to exceed standards for a smaller list of mine-related contaminants by smaller factors, but still by up to more than 500 times. The DEIS assumes that mitigation measures for stormwater will work perfectly and stormwater contacting tailings would not be released or discharged to the environment at any time. This unrealistic assumption is not supported by available information for Arizona copper mines. A revised DEIS should evaluate potential spills as part of a reasonably foreseeable scenario at the project.

7. The Resolution Copper Project has not resolved the high degree of uncertainty associated with the water quality of submerged tailings; the management of all PAG wastes; the block cave groundwater quality during operation, closure, and post-closure; stormwater quality and effects; or water quality in the subsidence lake, which is likely to form. Because of these uncertainties and the potential effects of poor water quality on Arizona groundwater, surface water, springs, and groundwater-dependent ecosystems – and the need to extract more fresh water – a revised DEIS should be completed before a Final EIS is considered.

Cultural and Historic Resources

1. The DEIS fails to adequately address scoping comments previously submitted to USFS and fails to disclose essential baseline information about cultural resources.

On July 18, 2016, the Arizona Mining Reform Coalition, San Carlos Apache Tribe and the Inter Tribal Association of Arizona provided USFS with detailed scoping comments for the Resolution Copper Mine and Land Exchange DEIS (see pp. 78–88 of Arizona Mining Reform Coalition scoping comments; pp. 4-13 of San Carlos Apache Tribe scoping comments and pp. 19-20 of the Inter Tribal Association of Arizona scoping comments). Because **the DEIS fails to address the great majority of those scoping comments and questions**, these comments on the DEIS formally incorporate by reference the multiple pages of the scoping comments presented

by the Arizona Mining Reform Coalition, San Carlos Apache Tribe and the Inter Tribal Association of Arizona. These comments list and summarize a few areas of concern, but USFS is respectfully advised to review and attend to *the full original scoping comments*. Please note that those scoping comments were presented so as to not require or encourage USFS disclosure of sensitive information. We are at a loss to explain why the DEIS fails to acknowledge and address our prior questions and concerns.

In particular, the DEIS fails to disclose and provide the rationales for at least five fundamental aspects of cultural resource impact assessment.

First and most generally, the DEIS fails to disclose the basic descriptive information about cultural resources necessary to allow the public to understand and assist in assessing cultural resource impacts. The DEIS acknowledges that hundreds of archaeological, historical, and cultural sites will be damaged or destroyed by the proposed action. The amount of proposed damage and destruction is startling: although the DEIS affirms that cultural resource inventories are still adding to these tallies, 721 archaeological sites and three historical structures have been recorded within the direct impacts analysis area, of which 523 are recommended or determined eligible for listing on the National Register of Historic Places. The DEIS also notes that 568 sites are located in the indirect impacts analysis area, and that at least 265 of these are listed in or eligible for listing in the National Register. The DEIS goes on to quantify the project's effects on cultural resources depending on Tailings Storage Facility (TSF) alternative. Alternative 6 would impact at least 193 more sites than Alternatives 2, 3, 4, or 5.

The DEIS tells the public almost nothing about cultural resources impacts beyond these simple numbers. Section 3.12.3.2 is where the full description of the identified cultural resources should occur, but that necessary discussion does not occur in 3.12.3.2 or elsewhere in the DEIS. Instead, 3.12.3.2 provides only a simplistic "boilerplate" cultural history overview of the Superior region and a few references to common archaeological site types. Most of the remainder of Chapter 3.12 returns to numerical abstractions: counts of cultural resource sites that would be affected under various scenarios and alternatives. Little is provided about the sites themselves. For example, Section 3.12.4.3 says that "Under Alternative 2, 132 cultural resources would be impacted: 101 NRHP-eligible and 31 undetermined archaeological sites" (NRHP is the National Register of Historic Places). A reader wanting to know anything about these 132 resources—about how or when or how much they may be impacted by the proposed action—has no further information available: no tabular summary, no graphics, no data appendices, no review of the various values and meanings behind the numbers. Cultural resources are discussed almost entirely in quantitative terms, as items noted on a checklist rather than places of special spiritual, educational, scientific, historical, and cultural value that merit and require, pursuant to NEPA and

the National Historic Preservation Act (NHPA), individual and specific recognition, description, assessment, and analysis.

In the DEIS failure to describe and analyze cultural resources and impacts except quantitatively, the DEIS fails to provide the public with even basic means by which to understand the nature, extent, values, and distributions of the project area's cultural resources. Without such contextual and resource-specific information, there is little basis for evaluating their significance, their integrity, or how their impacts and losses might be minimized or mitigated. The DEIS neglects its mandate to disclose and assess cultural resource impacts because it fails to provide information about each identified cultural resource, the values it contains, the extent to which it will be impacted—directly, indirectly, or cumulatively; wholly or partially—and the types of impact avoidance or mitigation treatments available to be applied. It is understood that USFS must and should withhold sensitive information from public documents, but this should not be used as an excuse to avoid disclosing the nature, values, and generalized locations of the cultural resources that would be impacted and lost as a result of the proposed action. Nothing in law or policy prevents USFS from offering such discussions. Indeed, NEPA requires it.

These comments incorporate the November 4, 2019 letter from the Arizona Mining Reform Coalition to the Tonto National Forest Supervisor identifying the specific, NHPA-based requirements for public involvement that must be met for Federal undertakings, like the action proposed in the DEIS, when NEPA is used in lieu of NHPA to solicit and manage public involvement in the NHPA Section 106 process.

Second, the DEIS fails to describe the cultural resource identification efforts and to establish the adequacy and reliability of those efforts. Here, too, the DEIS fails to address essential questions: Did all project supervisory personnel and field directors meet or exceed Secretary of the Interior's standards for education and experience required to perform archaeological identification, evaluation, registration, and treatment activities? Was there a written project manual or other source of guidance provided for field personnel in order to ensure consistent techniques, sound judgments, and accurate results? In what manner were sites evaluated to contain, not contain, or have the potential to contain buried cultural materials, especially human graves? Were field personnel trained and tested on their ability to recognize the subtle but unique attributes of Apache and Yavapai sites? How, specifically, were Tribal Monitors used in identification, evaluation, registration, and treatment planning efforts? In its failures to address these questions the DEIS disables and hampers not only USFS mandates to assess and disclose impacts but the essential public and technical reviews and inputs required pursuant to NEPA and related authorities.

Third, the DEIS fails to provide the standards and criteria used to identify and define cultural resources. The DEIS fails to address essential questions: Were cultural resource

identification and documentation standards consistently applied across all land jurisdictions? Did the standards change during the time the studies were being conducted? What specifications were used to differentiate between low-density artifact scatters that were recorded as sites, and broadly-distributed artifacts that were recorded as isolated occurrences? In its failures to address these questions the DEIS disables and hampers not only USFS mandates to assess and disclose impacts but the essential public and technical reviews and inputs required pursuant to NEPA, NHPA, and related authorities.

Fourth, the DEIS fails to describe or provide the necessary rationale for the specific way or ways USFS has applied National Register criteria to determine historic property eligibility. Here, too, the DEIS fails to address essential questions: What measures were taken to ensure the consistent application of the National Register criteria and integrity considerations throughout the duration and spatial extent of the project? What if any criteria other than National Register Criterion D was used to evaluate cultural resource sites that pre-date Euro-American occupation of the project area? What factors distinguish "eligible" archaeological sites and other cultural resource sites from those of "indeterminate" eligibility requiring further investigations, such as archaeological testing? Are the 21 pre-Apache archaeological sites in the NRHP-listed Chi'chil Bildagoteel Historic District considered eligible on their own merits, even though they are not associated with the stated period of Apache significance (post-A.D. 1300)? If so, why? If not, why not? In its failures to address these questions the DEIS disables and hampers not only USFS mandates to assess and disclose impacts but the essential public and technical reviews and inputs required pursuant to NEPA, NHPA, and related authorities.

Fifth, the DEIS fails to describe or provide the necessary rationale for the specific way or ways USFS is planning to avoid and mitigate significant impacts to cultural resources, including archaeological and historical period historic properties. Here, too, the DEIS fails to address essential questions: When and by what mechanisms will the historic contexts, research designs, research questions, and mitigation plans be made available for peer review by professional archaeologists and historians and the resulting comments be taken into consideration? Will professional and peer reviewers be able to visit selected archaeological and historical sites before, during, and after mitigation? Will mitigation standards be applied in a consistent manner throughout all parts of the project area, regardless of land jurisdiction? In its failures to address these questions the DEIS disables and hampers not only USFS mandates to assess and disclose impacts but the essential public and technical reviews and inputs required pursuant to NEPA, NHPA, and related authorities.

2. The DEIS fails to adequately address cultural resource issues because the (NHPA) Section 106 compliance process remains substantially incomplete.

USFS has neither comported with nor satisfied the pertinent regulatory standard for consultation: "the process of seeking, discussing, and considering the views of other participants, and, where feasible, seeking agreement with them regarding matters arising in the section 106 process" (36 CFR 800.16(f)). USFS has not satisfied this regulatory definition for consultation and has unnecessarily confounded the Section 106 process for the proposed mine and land exchange by excluding tribes from communications with the Arizona State Historic Preservation Officer and other signatory parties and vice versa. This unauthorized exclusion has created confusion and suspicion on the part of tribes, and other parties. Despite various requests from tribes, clear recommendations and suggestions in the project scoping comments submitted by the San Carlos Apache Tribe on July 18, 2016, and admonishment from the Arizona SHPO (September 19, 2019 letter to Tonto supervisor, attached as **CR-EX-01 (Appendix R**), USFS has failed to consult with all consulting parties regarding key steps in the Section 106 process to comply with NHPA. The parties have not been consulted on the area of potential effects, which USFS has done effectively unilaterally and in ways not always sensitive to historical and environmental contexts. USFS has failed to perform the public and government-to-government tribal consultations essential to the Section 106 steps and determinations, especially the consultations required (1) per 36 CFR 800.4(b) to make a "reasonable and good faith effort to carry out appropriate identification efforts" to find and document historic properties; (2) per 36 CFR 800.4(c) to evaluate the significance and determine the eligibility of identified historic properties; (3) per 36 CFR 800.5 to assess the adverse effects of the proposed mine and land exchange on historic properties; and (4) per 36 CFR 800.6 to resolve adverse effects, which USFS is attempting to do, despite requests not to, via the execution of a premature and flawed PA (see comments that follow here; see also **CR-EX-01, 02, 03 (Appendix R),** and the November 4, 2019 letter from the Arizona Mining Reform Coalition to the Tonto National Forest Supervisor identifying the specific, NHPA-based requirements for public involvement).

3. The DEIS includes a flawed and outdated Programmatic Agreement (PA) prepared to enable USFS compliance with NHPA.

The DEIS inclusion as Appendix O of an inferior and superseded version (5) of the PA indicates USFS failure to coordinate NHPA compliance with NEPA compliance. Version 6 of the PA has been available since before DEIS release. Both Version 5 and Version 6 remain unacceptable because they are dependent and contingent on the completion of step-by-step NHPA Section 106 consultations with tribes and other parties that have not occurred, as discussed above and in the

July 10, 2019 and September 30, 2019 letters to USFS from the San Carlos Apache Tribe (attached as **CR-EX-02** and **CR-EX-03**, respectively **(Appendix R**)). The failure to prepare, and to release in the DEIS, a full and adequate PA disables and discounts essential public, technical, and tribal participation in the NHPA and NEPA processes. It also contributes bias and confusion to those compliance processes by conveying false and misleading impressions of coordination and adequacy of stakeholder consultations and other essential procedures. In fact, two of the required signatories of the PA, the Arizona SHPO and the Advisory Council on Historic Preservation are expressing concerns about Version 6 of the PA. PA execution is not likely until December 2019 at the earliest.

4. The DEIS fails to include avoidance and mitigation plans for cultural resources.

According to Section 3.12.4.9 (DEIS p. 638), impacts to cultural resources will be addressed through a "robust mitigation plan" that "would be contained in the FEIS, required by the ROD, and ultimately included in the GPO approved by the Forest Service. Public comment on the EIS, and in particular Appendix J, will inform the final suite of mitigations." The DEIS further states that "Adverse impacts on resources that may not be historic properties under Section 106 would be avoided, minimized, or mitigated through steps outlined in the FEIS and ROD" (DEIS p. 661). These DEIS assertions amount to admissions that tribes, the public, and concerned technical experts will not have the opportunity to understand and analyze the cultural resource mitigation plans until the FEIS is released.

Instead of following customary practice in NEPA and NHPA compliance, and instead of following the detailed recommendations in the 2015 Ethnographic and Ethnohistoric Study (see **CR-EX-05 (Appendix R**)) USFS has delayed and deferred essential consultations and planning processes. USFS has known for at least 15 years that the Oak Flat area contains exceptionally rich and diverse cultural resources and that many of these resources hold great significance to tribes and to tribal members and citizens (US Department of Agriculture Tonto National Forest, 2015). USFS could and should have prioritized consultations with tribes, peer experts in cultural resources, and other parties to enable prompt, respectful, and culturally and scientifically appropriate and credible actions to give due consideration to cultural resources as part of mining project planning and design. DEIS Appendix J could and should have included detailed plans, specifications, and standards for avoiding and mitigating both historic properties and other cultural resources. Yet, for reasons not disclosed in the DEIS, Appendix J provides only two measures for addressing "Cultural/Historical Resources and Tribal Values" (p. J-22): historic property treatment plans (HPTPs). Neither of the HPTPs are available for public or professional-technical review; both appear to promise the exact same treatment for two different sets of cultural resources, namely additional damage through excavation and the restrictive and

potentially unnecessary treatment of cultural resources almost exclusively as archaeological sites. The fact that the DEIS exclusively references historic property treatment plans indicates USFS failure to assess impacts upon and create mitigation options for cultural resources other than historic properties (see **CR-EX-04 (Appendix R**for Zuni Tribe affirmation of similar concerns).

The DEIS fails to disclose the reasons for these otherwise apparently needless delays in essential planning and consultation processes and fails to provide and analyze basic information concerning the nature, distribution, and significance of cultural resources. In these ways the DEIS fails to enable or guide public, tribal, and technical comments about cultural resource impact mitigation. In effect, the DEIS requires the public, technical experts, and the affected tribes to wait until the FEIS to learn how significant impacts to cultural resources will be addressed, if at all. This is unacceptable as well as inconsistent with multiple laws and policies, as discussed in the more detailed cultural resource comments below.

5. The DEIS fails to sufficiently document or analyze cultural resources and significant impacts to cultural resources important in Hispanic and Anglo history and culture, especially the histories and cultures of industrial mining and livestock raising.

The failure of the DEIS to include a complete, useful, and up-to-date programmatic agreement is symptomatic of and is exacerbated by incomplete and selective public engagement in the identification of historic properties and other cultural resources threatened by the proposed mine and land exchange. The almost exclusive DEIS focus on Native American cultural resources is antithetical to public involvement and recommended NHPA-NEPA practice. This flaw further indicates incomplete NEPA–NHPA coordination and incomplete and flawed cultural resource identification and assessment. The DEIS offers no evidence or record of non-tribal public involvement or consultations regarding non-tribal cultural resources. Perhaps because of the failure to learn from local historians and community representatives, the DEIS arbitrarily ignores cultural resources important in Hispanic, Anglo, and industrial mining and livestock raising histories and cultures. Examples of these resources include residential and commercial buildings and historic structures and features in and around Superior. Both the DEIS and the Programmatic Agreement for Compliance with the National Historic Preservation Act on the Resolution Copper Project (DEIS Appendix O, “PA”) fail to consider adequately the historic built environment, and the DEIS (3.12.4, p. 629) mentions only “several houses and a hotel”. Additionally, the DEIS also ignores trails as cultural resources, including the Stoneman Grade.

The DEIS further ignores an extensive stone fence system and a likely pre-20th century trail in the middle reaches of Gaan Canyon (apparently not recorded during cultural resource surveys).

Nothing in Federal law allows or enables USFS to discount or disregard either cultural resources or cultural resource values or issues important in non-Native American culture and history.

6. The DEIS fails to describe and provide a useful historical framework for documenting and assessing the human environment, as needed to analyze likely and potential impacts and to devise impact mitigations.

The DEIS failure to document and analyze the non-Native portion of the cultural resource spectrum makes sense in light of the overall DEIS failure to describe, disclose, and apply the "historic contexts" and research questions essential to the correct, consistent, and meaningful identification, evaluation, registration, and mitigation of cultural resources across the vast and complex area being prepared to host the proposed mine. The DEIS notes (3.12.3.2, p. 625) that, "summaries of the cultural history of the area can be found in many reference reports (see, for example, Lindeman and Whitney (2005) and Buckles (2009)" [there may be citation errors here, see Lindeman and Whitney (2003), Buckles (2008)]. This is a flawed and distracting attempt to incorporate by reference two technical reports, neither of which are publicly available because both contain restricted information on cultural resource site locations. More to the point, both of the reports cited in the DEIS are more than a decade old and are based on information, research designs, and historic contexts that could and should have been updated by the intervening decade of cultural resource investigations. The DEIS fails to provide or to incorporate by reference detailed, up-to-date, context-specific description of the affected human environment in general and cultural resource in particular. The culture history simplistically summarized in DEIS section 3.12.3.2 is only one part or dimension of understanding the development and valuation of the affected environment.

In this sense, the DEIS fails to address essential questions: Were historic contexts developed during the Class I survey (in advance of the archaeological field studies) to help interpret and evaluate sites as they were encountered in the field? Did such historic contexts incorporate the idea of "whole landscape," or full-spectrum, archaeology, where the entire landscape serves as the analytical unit rather than spatially-segregated, bounded or point-plotted subunits of the landscape? Did the thematic or historic context statements and research design questions address the potential importance of Oak Flat as a crossroads for travel, trade, communication, and integrative social and ceremonial activities? Did the thematic or historic context statements and research design questions address the potential importance of the region as a case study in the "ethnic cleansing" of Yavapai and Apache families by U.S. Army troops and vigilantes to open the area for mining? In its failures to address these questions the DEIS disables and hampers not

only USFS mandates to assess and disclose impacts but the essential public and technical reviews and inputs required pursuant to NEPA and related authorities.

Instead of doing as tribes and colleagues have asked, and instead of carefully and respectfully describing the social environment to be impacted by the proposed mining activities, this DEIS gives the public and tribes only a facile abstract of regional cultural history (see 3.12.3.2), a 2-page summary that silences the lives of dozens of generations of people who lived upon, thrived, and benefitted from the project area. Where, in the DEIS or NHPA documentation, is the context-sensitive assessment and analysis of cultural resources and their manifest and manifold contributions to the human environment? Where, in the DEIS or other documentation and analysis of the current human environment, is the identification of the most consequential factors and dynamics that have shaped the region slated for impacts from the proposed mine? Where, in particular, are the historic context statements required to add dimension to the recitation of tallies of various types and numbers of cultural resource categories?

The DEIS fails to disclose and assess elements of the human environment subject to irrevocable alteration, even erasure, by the proposed mine. USFS is obligated to document, develop, and employ historic contexts that might include the following contexts, and / or other themes or contexts for understanding the affected area: **Cultural overlaps**—how, when, where, under what conditions and for what reasons did different groups of Native Americans and newcomer Euro-Americans occupy, use, share, and resist use and sharing of the area proposed for alteration by mining activities? **Movement**—For what reasons, by what means, and through use of what general routes did people travel to and through the impact area? **Spiritual and religious significance**—Who, when, where, and with what results have so many different people found spiritual inspiration and offered devotion in and through the area proposed for alteration by mining activities? **Native American displacement**—What compelled the United States to support and enable the interests and demands of non-Arizonans to the detriment of Native Arizonans in a manner that would today be recognized, internationally, as a crime against humanity? Why has this tragic episode, though well documented in authoritative works by respected scholars (especially Kuhn, 2014 and Welch, 2017; see **CR-EX-07 (Appendix R)**), been ignored, apparently deliberately, in the DEIS and historic context statements? **Mining and grazing**— What geological, technological, and local and global political and historical developments and dynamics led to regional domination by the mining and livestock industries?

7. The DEIS fails to describe and assess the cultural, spiritual, communal, educational, and other non-scientific/archaeological values of cultural resource; this failure ignores and discounts manifest connections among cultural resources and the people and communities who rely upon these resources for identity, vitality, connectivity, strength, and health.

Cultural resource issues and concerns are explicitly recognized in the National Defense Authorization Act (NDAA) and numerous other laws and policies. Section 3003(c)(3)(A), requires USFS to "engage government-to-government consultation with affected Indian Tribes concerning issues of concern." Further, Section 3003(c)(3)(B) requires USFS to then

> "consult with Resolution Copper and seek to find mutually acceptable measures to address the concerns of the affected Indian tribes; and minimize adverse effects on the affected Indian tribes resulting from mining and related activities." Section (c)(9)(C) specifically requires the DEIS to "(i.) assess the effects of the mining and related activities on the Federal land conveyed to Resolution Copper under this section on the cultural and archeological resources that may be located on the Federal land; and (ii.) identify measures that may be taken, to the extent practicable, to minimize potential adverse impacts on those resources, if any."

Our scoping comments and other documents demonstrate that USFS could and should have incorporated abundant information and guidance regarding cultural resources, cultural resource values, and culturally appropriate methods for evaluating the significance of cultural resources to minimize adverse impacts on cultural and archaeological resources and the values embedded therein (see, for example **CR-EX-02, 03, 04 (Appendix R**)). Tribes cooperated extensively with the Ethnographic and Ethnohistoric Study of the Superior Area, Arizona (Hopkins et al. 2015, see an executive summary of the study, attached here as **CR-EX-05 (Appendix R**)). From 2013 to 2015, 94 duly designated representatives from 10 tribes helped compile new and existing information on traditional and historical occupation and use of the impact area. The study identified over 400 historic properties considered eligible for the National Register because of their importance in tribal culture and religion—ancestral living, gathering, and hunting areas, trails, petroglyphs, landforms, water sources, and places of religious and spiritual importance and observance. The report also identified and outlined the significance of 46 springs and numerous plants, minerals, and animals in the impact area. The 94 tribal representatives agreed that the proposed mine constitutes a disrespectful, consumptive, extractive, harmful, and irrevocable commitment of cultural resources and public lands that tribal communities rely upon for health, well-being, and spiritual and cultural orientation and vitality. The 2015 report recommended USFS steps to further assess resource significances and to plan ways to minimize those adverse impacts.

Recommendations from the 2015 Study were incorporated into the San Carlos Apache July 18, 2016 scoping comments: "Meaningful and sustained consultation and collaborative research into all of the values associated with all of the cultural resources is required to achieve even basic compliance with applicable law and policy." The 2015 study report, the 2016 scoping comments, and many subsequent communications to USFS have affirmed mandates for USFS to assure that the full range of mitigative measures and alternatives are considered to avoid and reduce impacts to cultural resources and attendant harms to tribes and their members and citizens.

Instead of providing what the tribes have requested and continue to request, what the public needs and deserves to participate in the NEPA and NHPA processes, and what the Ethnohistoric Study (Hopkins et al. 2015) authoritatively recommends, the DEIS and PA discount and almost ignore those values through a single-minded focus on excavation as mitigation. No meaningful analysis has been directed to spiritual, familial, communal, educational, ecological, and associative values embedded in cultural resources. No useful, creative, or incisive treatments are being prescribed to avoid or reduce the numerous and profound harms and impacts to cultural resources and the communities of people who care about them. In sum, despite many explicit legal and professional requirements to do otherwise, and the many available sources of information and guidance on how, when, and with whom to work, the DEIS ignores and discounts the non-archaeological values of the cultural resources.

8. The DEIS fails—in the sections on Public Health and Safety (3.10), on Cultural Resources (3.12), on Tribal Values (3.14), and elsewhere—to provide a meaningful assessment of the direct, indirect, and cumulative harms of the proposed action on tribes in general and the descendants of the Yavapai and Pinal and Aravaipa Apaches in particular.

Chapter 3 outlines various adverse impacts to many values and resources without giving meaningful attention to the living people and communities that have already begun to experience significant impacts from the proposed action and will suffer for many generations. Instead of following the many mandates for government-to-government consultations and the recommendations of the 2015 Ethnohistoric Study, the DEIS incorporates an untested use of Tribal Monitors as unauthorized tribal surrogates to represent tribal interests and preferences in relation to the identification and analysis of Tribal Values. Despite sustained expressions of concern by tribal government officials (see **CR-EX-02, 03, 04 (Appendix R**)), USFS has uncritically adopted methods for historic property identification commonly used to obtain compliance with NHPA Section 106. This USFS adoption simply replaces archaeologists with Tribal Monitors and unilaterally imposes that approach in an attempt to address Tribal Values. Stubborn USFS insistence on the use of Tribal Monitors confines Tribal Values to material things

and ignores and discounts the impacts of the proposed action and all action alternatives on spiritual and communal health and other Tribal Values.

USFS is well aware of the harmful impacts of industrial land alteration and mining on tribes and their members. In a special assertion of tribal solidarity, and as the outcome from a collective visit to Oak Flat, on June 20, 2007, the duly elected executives of the Camp Verde Yavapai Apache, Hopi, Hualapai, San Carlos Apache, Tonto Apache, and White Mountain Apache tribes formed a Tribal Coalition to inform President Bush:

> "The Tribal Coalition cannot, on any basis, support a legislative land exchange which would allow for the destruction of these culturally significant and environmentally important lands, especially where the devastating impacts to be conducted on, around, and underneath Oak Flat and Apache Leap will continue forever, leaving future generations to suffer from the legacy…. These impacts, coupled with the cumulative environmental effects of other significant mining activities in the region, must not be lightly cast aside…." (**CR-EX-06 (Appendix R**))

More recently, in response to USFS attempts to ignore and discount the damages to the individual and communal health of Apaches from the proposed action and all action alternatives, on July 10, 2019, San Carlos Apache Tribe Chairman Rambler wrote to USFS to confirm that "Real, substantial, and enduring harms are being perpetrated on the Tribe's lands and peoples, myself included, in the name of profit. It behooves TNF, as the agency that acts on behalf of our federal trustee, the United States, to confront this truth head-on, to explicitly and frankly assess the damages being done to Apache health and welfare, and to assure that other parties appreciate and understand this truth to the extent that they are able to do so" (**CR-EX-02 (Appendix O**)).

USFS is obligated, as a federal agency and tribal trustee, to disclose to the American People the clear and consistent warnings from tribes that great spiritual and material / health harms are imminent. Industrial mining in general, and especially industrial mining of sacred sites within tribal homelands, and most particularly industrial mining made possible by genocide directed at Native Americans by the forebears of the proponents of the proposed action, is not a good idea, and certainly not in the public interest. Regardless of the agency's mistaken view of its regulatory authority over the proposed uses of the remaining federal lands discussed above, it is unmistakably true, however, that USFS has affirmative duties—per NEPA, NHPA, Section 3003 of the 2015 NDAA, Executive Order 13175, and other authorities—to identify, disclose, analyze, and mitigate the impacts that the proposed action and action alternatives portend. If both the lack of USFS discretion and the USFS legal mandates to identify, disclose, etc. are true, then what, precisely, is preventing USFS from acknowledging the historical truth of the Pinal Apache Genocide and assessing the indirect, direct, and cumulative impacts that the history of industrial

mining have had and are having on Apache people and land (and on other Native peoples and lands)? Who and what is the Federal Government, the designated trustee for the tribes and their members and citizens, assuring benefits for by refusing to explain to tribes and the public how it came to pass that, in 1870, the Pinal Mountains were Native American land and resources, and how, a short 150 years later, a massive share of these lands and resources are being given to an international corporation with no meaningful recognition, and certainly no compensation, to the aboriginal owners? If, as USFS claims, there can be no denying of or substantial change to the proposed action (or action alternatives), then why does the DEIS fail to provide even a simple acknowledgement of the tragedy that unfolded in and around the mine's impact area in the 1800s? What is preventing USFS from following pertinent Federal statutes and regulations by disclosing this chapter in human and environmental history? Why do the USFS and DEIS fail, at bare minimum, to eliminate obstacles to potentially healthful truth and reconciliation processes by acknowledging what happened? It is legally and morally incorrect for the DEIS to fail acknowledge the Pinal Apache Genocide. It is legally and morally incorrect for the DEIS to fail to analyze relationships among the nineteenth century extirpation of the Pinal Apaches, current and foreseeable health and welfare of tribal and non-tribal communities, and the likely consequences of another massive mine that has been given initial Federal Government approval to desecrate and destroy a place cherished and held sacred by multiple tribes across dozens of generations. Law and humanity oblige reasonable disclosure, reasoned analysis, and respectful consultation on how to stop ongoing harms and reduce impacts.

9. The DEIS fails to properly identify or analyze an alternative that avoids or meaningfully reduces adverse effects and significant impacts to cultural resources.

Despite multiple requests, including clear appeals in the San Carlos Apache Tribe scoping comments (July 18, 2016) for early and continuous attention to the avoidance of cultural resource impacts, all of the action alternatives include substantial and irrevocable destruction of more than 100 cultural resource localities. All action alternatives include direct and permanent damage to the NRHP-listed Chí'chil Biłdagoteel Historic District. None of the alternatives analyze the impacts to the health and welfare of those who value, care about, care for, and derive their identity and health from the affected cultural resources.

10. The preferred alternative includes the greatest and most significant and harmful impacts to cultural resources and, thereby, to the people who value, care about, care for, and derive their identity and health from the affected cultural resources.

Chapter 2 of the DEIS claims that "impacts of mine development at the associated project facilities would have equivalent adverse effects on cultural resources" (p. 121). In clear and direct contradiction to this claim, the DEIS elsewhere confirms significant variation in culture resource site impacts across the action alternatives: "Alternatives 2 and 3 (101 sites); Alternative 4 (122 sites); Alternative 5 (114–125 sites, depending on pipeline route); and Alternative 6 (318–343 sites, depending on pipeline route)" (ES-3.12, p. ES-26; see also p. 121). In other words, despite the duplicitous DEIS claim that all action alternatives will have equivalent cultural resource impacts, the preferred alternative would impact roughly the same number of cultural resource sites as the other three alternatives combined. While many of the same cultural resource sites would be impacted under all action alternatives, the three essential points are (1) that USFS has selected the TSF alternative located the closest to tribal trust lands (San Carlos Apache Tribe lands) and the one with by far the greatest number of site impacts; (2) impacts to cultural resource sites are impacts to the people who value, care about, care for, and derive their identity and health from the affected cultural resources; and (3) the DEIS fails to adequately or meaningfully analyze this variation in site impacts and, by extension impacts to people and communities.

In this area of consideration and elsewhere, the DEIS is premature and incomplete in its disclosures and analyses. The agency-preferred Skunk Camp TSF (Alternative 6) alternative was not consistently or thoroughly included in planning or analysis prior to about June 2017. Proper disclosure would have enabled earlier, better and more complete analyses of cultural resource impacts. Because the information is incomplete and the analysis remains in progress, the DEIS fails the essential test of providing a reasoned and evidence-based rationale for the selection of Skunk Camp as the preferred TSF alternative. The DEIS release in advance of opportunities for public and tribal involvement in the comparative analysis of TSF alternatives has eliminated and foreclosed public participation in the hurried and incompletely disclosed identification of Alternative 6 as the preferred TSF alternative. One reasonable conclusion is that that USFS identified the TSF preferred alternative on the basis of factors not fully disclosed in the DEIS.

11. The DEIS fails to disclose and analyze the fact that the significant adverse effects to cultural resources are disproportionately focused on Native American people and tribes.

Only about 189 of the 721 identified archaeological sites have Euro-American components or affinities (DEIS p. 628). The rest of the archaeological sites and all of the hundreds of non-archaeological cultural resources have primary affinities with and are primarily valued by Native Americans. As detailed above in our comments and exhibits (see, especially, **CR-EX-05 (Appendix R**)), even in the face of an unbroken history of disrespectful and destructive Federal

Government and mining industry actions to destroy Native American cultures and cultural resources, tribes have again stepped forward to provide generous guidance and assistance to USFS (see, especially, Hopkins et al., 2015, **CR-EX-04 (Appendix R)**) . The USFS response in the DEIS is to ignore and discount tribal input and requests. The ongoing harms of previous mining projects across central Arizona are amply reflected in the health and welfare of the tribal people and communities most concerned about the proposed Resolution Mine and about the biophysical and cultural resources imperiled by the proposal.

Secondary and Indirect Effects to Historic Properties

The project's effects will inevitably, and through a variety of means, spread out into the surrounding landscapes and communities. The EIS should identify and address any foreseeable secondary and indirect effects to historic properties, including but not limited to the following questions. Will the historic structures and character of old downtown Superior be affected by physical, visual, and socioeconomic impacts attributable to the proposed action? What impacts may occur to historic properties outside of the project area when Oak Flat and other nearby scenic and recreational areas are closed to the public, and recreational activities (including off-road driving, camping, target shooting, etc.) are diverted onto other lands and concentrated into smaller areas? Will historic properties outside of the project area be subject to the effects of seismic events within the subsidence zone (e.g., earthquakes, rockfalls, and landslides)? How will historic properties along Queen Creek downstream from the project area be affected by major physical and hydrological changes in the upstream basin?

Environmental Justice

DEIS Section 3.15.4.3 identifies multiple potential and likely impacts on environmental justice communities (EJCs) but subsequently restricts assessment in the DEIS to two narrow and superficial areas: (1) "Quantitative assessment of economic effects… and qualitative assessment of whether these effects are disproportionate" and (2) "Qualitative assessment of disproportionate effects of adverse resource impacts."

These comments on the DEIS acknowledge and incorporate by reference those comments of October 25, 2019, relating to failure of the DEIS to address EJCs submitted by Professor Steven Boyd (EJ-EX-01). The USFS is required to disclose, analyze, and mitigate significant impacts on EJCs pursuant to Executive Order (EO) No. 12898 (59 FR 7629 February 16, 1994, which addresses environmental justice in minority populations), NEPA, and related laws and policies. Moreover, EO 12898 supplements EO No. 12250 (45 FR 72995, November 2, 1980), Sec. 1-201(a) and (d), quoted in pertinent part in the comments submitted by Professor Boyd.

Taken together, EO 12898 and 12250 mandate that projects such as RCM must address environmental justice among minority populations, such as American Indians.

The DEIS (p. 124) identifies a group of economic and environmental effects likely to have disproportionate effects on EJCs:

> … the expected influx of new workers may also lead to shortages of area housing and/or pressures on municipal infrastructure such as roads, schools, and medical facilities, and may be accompanied by price increases. Such changes would be most likely to adversely affect low-income and minority individuals in the town of Superior and other environmental justice communities in the region.
>
> … increased traffic, noise, increased potential exposure to hazardous material spills or releases, as well as loss of certain recreational opportunities and changes to area scenic resources, are anticipated to occur, but would affect everyone equally and would therefore not be disproportionate.

The DEIS then identifies 29 EJCs within Pinal, Gila, Maricopa, and Graham counties, and an additional group of EJCs located within the lands of eight Native American tribes.

The methods employed to define EJCs rely on county boundaries and thereby result in arbitrary and harmful (to tribes) exclusions of likely EJCs located immediately adjacent to EJCs recognized in the DEIS. For example, the White Mountain Apache Tribe communities of Fort Apache, East Fork, and Whiteriver, all excluded from analysis because they are located in Navajo County, are located within about four miles of Canyon Day, an EJC located in Gila County (DEIS p. 675).

The DEIS fails to provide for the tribal EJCs poverty status data that would enable comparisons with the 29 non-tribal EJCs. The DEIS identifies only eight sets of tribal communities and five of the 29 non-tribal EJCs (Superior, Globe, Hayden, Miami, and Winkleman) as having the potential to be disproportionately impacted by the proposed action.

The DEIS fails to provide adequate description or justification for the exclusion of the great majority of the EJCs from further analysis.

The DEIS fails, despite requirements in NEPA, E.O. 12898, and related law and policy, to adequately describe and meaningfully assess the impacts (that is, their magnitude, frequency, and intensity on direct, indirect, and cumulative levels) on EJCs, especially tribes and communities of Native American religious practitioners.

The DEIS fails to assess the actual, in-progress impacts from the proposed action to the human environment associated with these eight tribes, including the disruptions and anxieties associated

with the senses of duty and obligation to respond to and resist the newest in the long sequence of threats to tribal lands, people, cultures, and religions. Many tribes and individuals have been obliged by the proposed action to re-allocate funds, personal time, prayers, and tribal staff to investigate the proposed action, to attempt to educate USFS, and to find ways to stop or reduce the adverse effects of the proposed action. In its failure to acknowledge, describe, and assess the significant impacts that the proposed action is already having on the tribal EJCs, and perhaps other EJCs, the USFS and DEIS indicate indifference to the obvious, enduring, cumulative impacts and harms to tribes, their members, their treasuries, their heartfelt obligations to care for their ancestral lands and places, etc. The DEIS discounts and effectively ignores the great costs incurred by EJCs obliged to respond to the manifold threats of the proposed action instead of to other matters.

The DEIS fails, too, to meaningfully and adequately address, describe, and assess and reasonably foreseeable impacts on those tribes, especially the San Carlos Apache Tribe and its communities of religious practitioners. The DEIS fails to do more than mention the direct, proximal, and possibly cumulative effects on communities of religious practitioners and fails to acknowledge or discuss the ongoing and escalating violation of these practitioners' First Amendment rights to free practice of their religion. The DEIS fails to analyze the long history of Federal Government efforts to curb and inhibit the free exercise of the religion of the Apaches and other tribes. The DEIS fails to meaningfully describe and analyze the proposed and already in-progress desecration and destruction of known places of cultural and religious significance as the latest instance of federal trust betrayal, regardless of the lack of intent to do harm by USFS.

In these ways and other ways the DEIS places arbitrary and needlessly restrictive limits on its descriptions and analyses of EJCs, as well as on Tribal Values, Public Health, Cultural Resources, etc. The DEIS ignores and fails to address the abundant evidence for still-unfolding damages and harms to Native American tribes, people, and communities of religious practitioners from previous Federal Government actions, including multiple comparable and reckless actions authorized by Tonto National Forest that have affected and are still affecting the same tribes being actively and harmfully affected by the current proposed action. In its efforts to assess impacts from the proposed action on EJCs, USFS could and should have asserted its trust responsibility for the welfare of tribes and trial members and identified and analyzed every reasonably foreseeable impact on tribal EJCs, including cumulative impacts. The DEIS could and should have followed the many useful and relevant recommendations provided in the 2015 Ethnographic and Ethnohistoric Study of the Superior Region (Hopkins et al. 2015). The DEIS could and should have built upon the sturdy consultative foundations of that 2015 study to assess, document, and seek to identify mitigations for the significant impacts to EJCs. Instead, and as noted elsewhere in these comments, the DEIS neglects and ignores that 2015 study and

the numerous suggestions and requests from tribes to address their concerns, their Tribal Values, and their cultural resources.

The DEIS fails to adequately identify the spatial extent of the impacts from the proposed action on EJCs.

The DEIS claims, "Because there are no communities located within the project area, there would not be disproportionately high or adverse direct impacts on environmental justice communities as a result of disturbance" (p. 679). With this unsupported assertion—and without either EJC-specific consultations, necessary and required analyses, or the evidence-based justification for this approach—the DEIS excludes descriptions and assessments of how the proposed action's impacts on geology, soils, and wildlife may or will affect EJCs.

The DEIS assessment of proposed action impacts on EJCs is not proportional to the level of reasonably foreseeable impacts to EJCs, especially the Superior EJC.

Superior is already undergoing profound change as a result of the proposed action and some sections of the DEIS appear to recognize this. The May 17, 2018, memo to the Resolution EIS Project Files from BBC Research & Consulting (EJ-EX-02) offers glimpses of the changes underway, including changing demographics and demands for housing, public services, and new amenities—demands that are likely to result in significant changes having disproportionate effects on minority and low-income populations. What neither that memo nor the DEIS describe or analyze is the likely disproportionate effects on the low-income and Hispanic population of Superior. The DEIS fails to address the education and training issues that will hamper the capacity of EJCs, and especially the Superior EJC, from taking advantage of employment opportunities. The DEIS fails to address the income disparity issues, few if any of which will be alleviated by the proposed action, which limit EJC access to transportation and relocation options to escape the direct, indirect, and cumulative impacts of the proposed action. The DEIS fails to address the likelihood that EJC contributions to the Superior tax base will fund new public services and amenities that the EJCs will not need, want, or be able to afford to access.

The DEIS fails to assess connections, obvious to many, between the proposed action and the lower-than-average health status of the EJCs that would be adversely affected by the proposed action.

The DEIS acknowledges the environmental justice, public health, and Tribal Values issues, but fails to assess links among these issues or to analyze or offer options to mitigate the long lasting, irreparable, and culturally and economically destructive impacts on EJCs, including the public health of EJCs.

The DEIS attempt to exclude numerous issues and concerns relevant to the assessment of impacts from the proposed action on EJCs is not based in logic, not based in public or tribal consultations, and not based on any supporting evidence disclosed in the DEIS. The DEIS fails to include detailed descriptions and assessments of the EJCs and of the status, conditions, and trends associated with their economies, employment, housing, transportation, health, and use of the lands, waters, recreation amenities, plants, animals, cultural resources, and other resources to be affected by the proposed action. The DEIS fails, also, to disclose the methods used to identify and assess the EJCs and, as discussed below, fails to include assessments of the full range of impacts on EJCs.

The DEIS fails to describe, assess, and provide options and means for avoiding and mitigating disproportionate significant impacts of the proposed action on minority and low-income populations that are EJCs.

The DEIS (3.15.4.8, p. 686) claims that USFS "is in the process of developing a robust mitigation plan to avoid, minimize, rectify, reduce, or compensate for resource impacts that have been identified," and refers readers to Appendix J for "descriptions of mitigation concepts." The DEIS Appendix J mitigation and monitoring plan to address EJC issues is nonexistent; for the "Socioeconomics/Environmental Justice" mitigation measures on DEIS page J-22 there is a 1-word entry: "(none)." The DEIS could and should have reflected the results of a systematic and reasonably complete assessment of the impacts of the proposed action on EJCs and identified measures to avoid and reduce those impacts. Through this DEIS the USFS is demanding, in effect and without providing any useful or logical rationale for such a demand, that the public, the affected tribes, and most especially the members of the EJCs, simply and unconditionally trust that the final EIS and ROD will somehow address their needs and concerns in a time of great uncertainty, including existential anxiety for some individuals and groups. This is simply an outrageous and unconscionable demand by USFS, and one that reveals utter and apparently callous disregard for those least able to voice their concerns and respond to the DEIS and the proposed action. It also reflects a callous disregard for the requirements of NEPA, **E.O. 12898, and related and applicable Federal law and policy.**

The DEIS fails, specifically, to describe, assess, and identify plans and means to mitigate the significant and disproportionate impacts of the proposed action on Native American religions.

The DEIS (3.15.4.2, p. 678) confirms that "Loss of the culturally important area of Oak Flat would be a substantial threat to the perpetuation of cultural traditions of the Apache and Yavapai tribes. The land exchange would have a disproportionately adverse effect on Native American communities as a result of the effects on tribal values and concerns and cultural resources." The DEIS also recognizes that there will be, "Disturbance to and loss of access to sacred sites,

traditional cultural properties, and traditional resources collecting areas within the proposed mining area" (Table 3.15.4-1, p. 682). The DEIS further recognizes that the proposed action, especially mining beneath Oak Flat, will "permanently affect the ability of tribal members to use known TCPs and TEKPs for cultural and religious purposes… an irreversible commitment of resources" (DEIS 3.17.2.33). What the DEIS fails to do, and what it could and should have done, is to analyze in close consultation with the affected EJCs and the public, a reasonable and reasonably complete suite of plans and options to avoid and mitigate the adverse impacts of the proposed action on EJCs. This failure is all but inexcusable and must and should corrupt public, tribal, and EJC confidence in USFS and the Federal Government and the project proponent.

Environmental General Comments

The US Forest Service (USFS), Tonto National Forest's (TNF) Draft Environmental Impact Statement (DEIS) for the Resolution Copper Project and Land Exchange (RCPLE) has failed to analyze the ways in which the Resolution Copper Mine's (RCM) General Plan of Operation (GPO) and Land Exchange violates US Executive Orders and agency policies designed to implement them in the areas of: US Trust Responsibilities, Non-Discrimination, and Government-to-Government Consultation, while seeking the involvement of indigenous knowledge and exhibiting mutual respect. For years, the San Carlos Apache Tribe, Yavapai, other Tribal cultures in the region, as well as organizations, have repeatedly communicated the specific ways the RCPLE will impact the exercise of their religious beliefs and practices, the lack of TNF's analysis the effects of the RCPLE on their free exercise of religion is both glaring and incomprehensible. While the US Congress passed the 2015 NDAA, § 3003 that provided for the RCPLE, the USFS and, in this case, TNF have the responsibility to uphold and expose violation of constitutional protections afforded all US citizens, especially those of federally recognized Tribes.

This Environmental Justice (EJ) section will address areas in which the DEIS failed to do that.

(Not covered by this section are the potentially countless yet unknown ways in which EJ issues concerning air, chemicals and toxics, health, land, waste, and cleanup, and water, among others, will impact the predominantly Hispanic or Latino populations within the towns of Superior, Hayden, and Miami, or places such as the town of Globe or the Dripping Springs community, where Hispanic or Latino populations are significant. Since these populations are mentioned only once in the DEIS, it is argued that they should be analyzed by TNF to further understand how local communities of color will be impacted by RCM [p. 677.])

Important applicable documents and pertinent excerpts for this section are:

1. **Executive Order 12898** (February 11, 1994 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Population) requires TNF to make environmental justice a part of its mission *by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States (1-101).*

2. In the **EPA Policy on Environmental Justice for Working with Federally Recognized Tribes and Indigenous Peoples** (EPA PEJWFRTIP), July 24, 2014, The EPA defines "environmental justice" as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, enforcement of environmental laws, regulations, and policies. The EPA PEJWFRTIP is designed to better clarify and integrate environmental justice principles in a consistent manner in the Agency's work with federally recognized tribes and indigenous peoples. The EPA PEJWFRTIP, citing the EPA Policy on Consultation and Coordination with Indian Tribes, expresses seventeen principles that apply to consultation with Indian Tribes.

In the segments that follow, we note areas in the DEIS where TNF failed to identify and address specific "disproportionately high and adverse human health or environmental effects" of the RCPLE. (When citing Principles of the EPA PEJWFRTIP, a # followed by the Arabic number will be used.)

I. US Trust Responsibilities

Areas Requiring Additional TNF Analysis:

1. How, specifically, does the RCPLE violate:
    a. Treaties with the affected tribes?
    b. Federal statutes (e.g., Religious Freedom Restoration Act (RFRA) P.L. 103-141, 107 Stat. 1488)
    c. Executive Orders?
    d. Court decisions concerning the trust responsibilities of the US?
    e. The US Constitution?

The DEIS acknowledges the "Disturbance to and loss of access to sacred sites, traditional cultural properties, and traditional resources collecting areas within the proposed mining area" (Table 3.15.4-1). How does the RCPLE prohibit the "free exercise of religion" of the Apache, Yavapai, and other tribal peoples protected by the First Amendment of the U. S. Constitution and the Religious Freedom Restoration Act (RFRA) P.L. 103-141, 107 Stat. 1488?

The subsidence at Chi'Chil Bildagoteel/Oak Flat will cause "Changes that permanently affect the ability of tribal members to use known TCPs and TEKPs for cultural and religious purposes are also an irreversible commitment of resources" (DEIS 3.17.2.33). The inability of tribal members to access TCPs, especially Chi'Chil Bildagoteel/Oak Flat, presents a different set of circumstances than those underlying the claims in the Navajo Nation v. USFS, 506 F.3d 1058 (9th Cir. 2008) or Lyng v. Northwest Indian Cemetery Protective Ass'n, 485 U.S. 439 (1988). In those cases access to sites where Native ceremonies are performed were still available to the tribal plaintiffs. With the RCPLE, a primary site, Chi'Chil Bildagoteel/Oak Flat, will be made forever unavailable to the Apache, Yavapai, and others, thus preventing the exercise of their religious ceremonies altogether.

(EPA PEJWFRTIP) #8. *The EPA recognizes the right of the tribal governments to self-determination and acknowledges the federal government's trust responsibility to federally recognized tribes, based on the U. S. Constitution, treaties, statutes, executive orders, and court decisions.*

Examples of Previous Comments/Testimony: Tribal Chairman Terry Rambler (2013): "The bill would desecrate and destroy an area of religious and sacred significance to the Apache and Yavapai people in contravention of federal laws and policies governing meaningful consultation with Indian tribes and protection and preservation of sacred sites."[17]

U.S. Secretary of State, Mike Pompeo, urged just this sort of protection of religious freedom, nationally and internationally, at a recent symposium co-hosted by the Vatican and the U.S. Embassy to the Holy See. Urging the Vatican and other countries to join a new alliance to promote global religious freedom, Secretary Pompeo, affirmed that:

> *"Today each of us must gird ourselves for another battle in defense of human dignity and religious freedom.*

[17] Cited in Scoping Comments by the Forum for the Protection of Native American Sacred Sites and Rights, July 18, 2016 (FPNASSR).

When the state rules absolutely, human dignity is trampled, not cherished....

When the state rules absolutely, moral norms are crushed completely....

Freedom of religion can also be threatened when an intolerant majority rules....

We must recognize the roots of religious repression. Authoritarian regimes and autocrats will never accept a power higher than their own. And that causes all sorts of assaults on human dignity.

We must exercise our moral voice to confront them."[18]

II. Non-Discrimination

Areas Requiring Additional TNF Analysis:

1. In what specific ways does the RCPLE demonstrate a pattern of religious discrimination against Native Americans?
2. Since an abundance of data about the religious importance of the area has been repeatedly presented to Congress, the USFS, and other governmental agencies, why were these critical issues entirely absent from the DEIS?[19]

Executive Order 12250, Leadership and Coordination of Nondiscrimination Laws, November 2, 1980

> *[I]n order to provide for the consistent and effective implementation of various laws prohibiting discriminatory practices in Federal programs and programs receiving Federal financial assistance, it is hereby ordered as follows:*

[18] Joshua J. McElwee, "As Pompeo talks religious freedom at Vatican, some question 'useful distraction'" *National Catholic Reporter*, October 2, 2019.

[19] See, for example, the public Memorandum to the San Carlos Tribal Council by the San Carlos Elder's Cultural Advisory Council: Testimony, Wendsler Nosie, Chairman of the San Carlos Apache Tribe, 2007 before U.S. House Natural Resources Committee, Subcommittee on National Parks and Public Lands, Concerning H.R. 3301 Southeast Arizona Land Exchange and Conservation Act; Testimony of Terry Rambler, Chairman, San Carlos Apache Tribe before Testimony before the Senate Committee on Energy and Natural Resources Subcommittee on Public Lands, Forests, and Mining Legislative Hearing on S. 339 Southeast Arizona Land Exchange and Conservation Act of 2013. Attached to this testimony is a detailed list of tribes, tribal organizations, and other organizations opposing S. 339 / H.R. 687. November 20, 2013.

1-2. Coordination of Nondiscrimination Provisions.

1-201. The Attorney General shall coordinate the implementation and enforcement by Executive agencies of various nondiscrimination provisions of the following laws:

(a) Title VI of the Civil Rights Act of 1964 (42 U.S.C. 2000d et seq.).

(d) Any other provision of Federal statutory law which provides, in whole or in part, that no person in the United States shall, on the ground of race, color, national origin, handicap, religion, or sex, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving Federal financial assistance.

Questions and/or comments by Tribal Leaders to Congress:

Testimony of Wendsler Nosie, Sr., former Chairman of the San Carlos Apache Tribe:

Imagine further that the mine was affected by a major subsidence, one that shook and swallowed the National Cathedral. Everyone would be outraged. Every person of every faith would fight to their last breath to prevent that mine from happening. Every American understands that the desecration of any one religion affects all religions, and that such an act even threatens the free exercise protections afforded under the First Amendment of the Constitution.[20]

Signed Statement by Wendsler Nosie, Sr. and San Carlos Tribal Chairman Terry Rambler:

Usen is God. As with Christianity, Apache people pray to the Creator. If your neighbor's church is being destroyed or desecrated, most Americans would want to stop it from happening, regardless of their own faith. Not doing so in response to the destruction of Oak Flat is religious discrimination.[21]

The lack of TNF's analysis or even mention of the impact of RCPLE on the religious practice of the San Carlos Apache, Yavapai, and other affected Native American groups raises the question

[20] Before U.S. Senate Subcommittee on Public Lands and Forests June 17, 2009.
[21] Apache Stronghold Comments to the Resolution Copper Project and Land Exchange DEIS, August 2019, Signed by Wendsler Nosie, Sr., Apache Stronghold and former San Carlos Apache Tribe and Chairman and Terry Rambler, Chairman, San Carlos Apache Tribe (AS).

as to whether TNF would not analyze or mention the effects of the RCPLE, if the site lay under the National Cathedral (Washington, DC), the Kahal Kadosh Beth Elohim (Charleston, SC: Oldest Synagogue in continuous use in the United States), or the Mother Mosque of America (Cedar Rapids, IA).

III. Government to Government Consultation

Areas Requiring Additional TNF Analysis:

1. Since EPA PEJWFRTIP, #3 requires TNF "to understand definitions of human health and the environment from the perspective of federally recognized tribes, indigenous peoples throughout the United States…" how, specifically, does the RCPLE affect the hundreds of cultural resources (including the land, water, plants and animals, inter alios) and associated values, including religious practices, identified in the expert testimony of Apache, Yavapai, Zuni, Hopi and others in the *Ethnographic and Ethnohistoric Study of the Superior Area*?

2. The DEIS asserts that "Native American communities would be disproportionately affected by the land exchange because Oak Flat would be conveyed to private property and would no longer be subject to the NHPA (see section 3.12). Loss of the culturally important area of Oak Flat would be a substantial threat to the perpetuation of cultural traditions of the Apache and Yavapai tribes. The land exchange would have a disproportionately adverse effect on Native American communities as a result of the effects on tribal values and concerns and cultural resources." In consultation with the Apache, Yavapai, and other affected tribes, the TNF must identify specific ways in which the RCPLE prohibits the "free exercise of religion," of current and future practitioners, including for example, the impact in the affected area on:

    a. Sunrise ceremonies;

    b. The Holy Ground crosses and ceremonies;

    c. The connection between Apache Leap Chi'Chil Bildagoteel;

    d. Currently identified and yet to be identified burial sites;

    e. The Ga'an people as understood by the affected tribes; and

    f. The written history preserved by the petroglyphs in Devil's Canyon,

3. The DEIS reports the "potential for some portion of existing yet currently unidentified prehistoric and historic artifacts and resources to be disturbed or destroyed, especially

within the Oak Flat subsidence area and the footprint of the tailings storage area. These losses could potentially include human burials within these areas" (DEIS, ES-3). What does the historical knowledge of the San Carlos Apache Tribe, the Yavapai people, and other Indigenous peoples reveal about the cultural and religious resources of the area affected by the RCPLE?

4. Identify the cultural and religious values of the Native medicine men, elders, and the spiritual pilgrims who have come to the RCPLE affected area.

TNF must engage in meaningful government-to-government relations and consultations in compliance with Section 106 of the NHPA; the American Indian Religious Freedom Act of 1978 (AIRFA), 16 U.S.C. Â§ 470a(a)(6)(A) and (B); Presidential Executive Memorandum related to "Government-to- Government Relations with Native American Tribal Governments" 59 Fed. Reg. 22951 (April 29, 1994); Presidential Executive Order 13007, "Indian Sacred Sites"; Presidential Executive Order 13175, November 6, 2000, "Consultation and Coordination with Indian Tribal Governments"; and other applicable laws and requirements. As noted above (EPA PEJWFRTIP) adds specificity to what constitutes meaningful relations and consultation in the area of environmental protection of Indian land, especially sacred sites. EPA PEJWFRTIP "recognizes the importance of the United Nations Declaration on the Rights of Indigenous Peoples and the principles that are consistent with the mission and authorities of the Agency."

Air Quality

Construction, mining operations, tailings piles, the subsidence zone, vehicle emissions from trucks, and reclamation activities related to the proposed Resolution Copper Mine and along transportation and utility corridors will increase dust, airborne chemicals, and mobile emissions in the region and could compromise air quality standards. Particulate matter 2.5 microns in size ($PM_{2.5}$) would increase over background levels and particulate matter 10 microns in size (PM_{10}) would also increase over background levels, and could contribute to an exceedance of National Ambient Air Quality Standards (NAAQS) for particulates, which is a health-based standard. Air emissions from the proposed Resolution Copper Mine could cause and contribute to the degradation of visibility in the Superstition Wilderness Class I airshed and the impacts to that airshed are underestimated in the DEIS.

Mines are known to create problems with blowing dust due to many miles of dirt roads, and exposed and denuded surfaces such as tailings and waste rock piles. Due to the amount of subsidence associated with this mine, it is quite likely the entire area will be devoid of vegetation and that also means more dust. This was not adequately addressed in the DEIS. The dust related to mining activities can contain a variety of toxic materials, and can cause exceedances of

health-based air quality standards, as well as provisions that protect Class I airsheds such as the Superstition Wilderness. The Forest Service has underestimated the impacts of the air pollution that would be generated by this mine on the health of both employees and area residents, region-wide visual impact on scenery and view sheds, and the impact on plant and animal life. Consideration of the impacts on recreational values and property values was also not adequately considered.

There are real and significant public health issues related to particulate emissions. When particulates ($PM_{2.5}$ and PM_{10}) are inhaled, they can affect the heart and lungs and increase respiratory symptoms, irritation of the airways, coughing, breathing difficulty, and more. The elderly, children, and those with respiratory or other health issues are at greatest risk relative to particulate pollution. A study released in 2008 by the Arizona Department of Environmental Quality (ADEQ) showed that when the levels of PM_{10} in Central Phoenix were high, there was a significant increase in asthma incidents in children (Arizona Children's Health Challenge Grant, 2008).

There are also significant health impacts from Hazardous Air Pollutants (HAPs) emitted by this proposed facility. Several of the HAPs are known or suspected carcinogens, affect development and reproduction, and our immune systems. Chemicals found in fugitive dust that are of significant concern include: Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Lead, Manganese, Mercury, Nickel, Selenium, and Antimony (page 35-36 MPO). The impacts of these emissions on public health and the environment, potential contamination of water, and other factors should have been thoroughly evaluated in the DEIS.

The DEIS should have fully evaluated the direct, indirect, and cumulative impacts of this project on the air quality in the area, but has failed to do so. For example, tailings and waste piles will be sources of dust. Prevailing winds can blow this dust toward residential areas. The likelihood that the air quality in the National Forest and surrounding residential areas such as Superior, Queen Valley, and Superstition Vistas will be degraded by both dust and truck exhaust associated with mine operations is significant.

Further, the DEIS acknowledges other projects in the area that affect air quality, but then fails to adequately account for the impacts of those projects on overall air quality in the area. The Pinto Valley Mine Expansion will increase particulate pollution as well as pollution associated with diesel exhaust, yet the DEIS just indicates "…no data are available at this time to determine how these potential future increases may cumulatively affect overall air quality in the analysis area." (DEIS at pg. 292). Likewise, the DEIS dismisses impacts from the proposed Ray Mine land exchange by stating "…however, no details are currently available as to potential environmental effects, including to air quality, resulting from this possible future mining operation." (DEIS at

pg. 292). These statements in the DEIS result in an inaccurate picture of emissions in the region and no real cumulative impacts analysis of the impacts to air quality, impacts that present real potential health impacts to the public and real potential negative impacts to Class I airsheds.

The Forest Service should have completed a conformity analysis with the State Implementation Plan for the West Pinal PM10 Nonattainment Area and Hayden PM10 Nonattainment Area, especially in light of the fact that the DEIS did not account for increased emissions from other projects in the area. This project, along with the others proposed for the region, could contribute to additional exceedances of air quality standards. Air pollutants emitted as a result of the mine's activities (including but not limited to coarse and fine particulate matter, volatile organic compounds, and carbon monoxide) would negatively affect the National Ambient Air Quality Standards ("NAAQS") established under the Clean Air Act, 42 U.S.C. 7409.

The Filter Plant and Loadout Facility, portions of the Magma Arizona Railroad Company (MARRCO) Corridor, and most of EPS are already within the boundaries of a designated PM_{10} non-attainment area (pg. 37 of Mining Plan of Operations). The impacts from these and other activities should have been considered relative to the NAAQS.

The DEIS should have evaluated a full range of measures to mitigate the impacts to air quality, including revegetation with native plant species, minimizing travel on dirt roads or cross-country, minimizing and finding alternative locations for tailings, and the full range of best management practices for reducing air pollutants. Monitoring and mitigation strategies for fugitive dust may not be sufficient or might cause new problems. The dust-suppression program for the gravel roads used at Project sites that involves periodic watering and/or chemical treatment (page 205 MPO) creates additional issues including further increasing water usage and adding more chemicals to the area. Additionally, the plan to set reasonable speed limits on access roads within the General Project Area (GPA) (page 205 MPO) falls short as a dust-prevention solution since no enforcement strategies are set forth to ensure vehicles will obey speed limits. Further, the strategy to mitigate fugitive dust emissions remains vague, as it states the emissions "will be monitored and actively managed with sprinklers and dust suppressants as necessary" (page 205 MPO). However, the plan does not expand upon the amount of fugitive dust "necessary" to trigger action. That should be identified and evaluated in the DEIS.

The DEIS should have studied in detail the fugitive dust potential of all tailings designs and systems being considered, as well as the site-specific impacts fugitive dust problems would have at any of the proposed tailings locations. Mitigating practices – particularly tailings cover design – should have been fully assessed.

All PM sizes including PM10, PM2.5 and PM1.0 have been demonstrated at other mining sites in Arizona to be deposited into communities near the mining operations. This has resulted in an ongoing and highly expensive mitigation process for existing mine operators because of the overwhelming evidence that these particulate matter cause health problems including lung inflammation and related diseases. Recent data also suggest that these particles carrying toxic metals such as arsenic also contribute to cardiovascular diseases. Previously noted were that the ultrafine PM(0.1-2.5), not even complexed with toxic metals, induces inflammation and predisposes for related diseases (National Health and Environmental Effects Research Laboratory). The DEIS does not address this issue related to air quality and impact on public health. **Since there is clear evidence from medical research, it is incumbent that the USFS demand that Resolution address these concerns upfront and present a plan for preventing such pollution of both toxic metal particulates and fine particulate matter into the air that the public breathes.**

At one of Arizona's Superfund sites, Iron King Mine, taxpayers are paying for the cleanup of toxic mine tailings which are impacting the community of Dewey-Humboldt. Once mining ceased at the site, the company left the aftermath and cost to the public to clean up the highly contaminated site. **There is limited documentation on how Resolution will be responsible and cover any costs for cleanup after the mining has stopped.**

The DEIS omits monitoring of air pollution and its effects on vegetation in Superstition Wilderness Area. The DEIS notes that air pollution may impact the Superstition Wilderness Area, but does not indicate that any entity will measure and monitor such impacts in or on the Wilderness. Most impacts to the Wilderness discussed in the DEIS relate to visibility, but with potential toxic air pollutants, visibility analyses are not enough.

The comments on air quality that follow apply to all USFS studied alternatives other than the "No Action" Alternative because the problems cited affect the entire process used to evaluate impacts on these alternatives.

(1) The DEIS does not reference statistical relationships and correlations between existing air quality monitoring sites of federal and county sponsorship, thus ignoring how these sites mutually impact each other. Neither background data nor the DEIS acknowledge this basic data quality control operational need.

(2) The DEIS acknowledges that "Parts of the West Plant Site were

historically used as a concentrator and smelter site for the Magma Mine. . . . Particulate emissions from the smelter stack and fugitive emissions from other mineral processing operations (e.g., crushing and concentrating) led to soil contamination with elevated levels of arsenic, copper, and lead." (DEIS at pg. 576-577). Despite this, the DEIS indicates that lead emissions are below the threshold required for analysis (DEIS at pg E-47). Lead is a trace component of the source minerals, plus one of the pollutants emitted in the previous smelting operation.

(3) The DEIS referenced modeling of pollutants does not address photochemistry and aerosols which are major mechanisms and constituents for reduced opacity. Two air pollution models, AERMOD and CALPUFF were used to model selected air pollution dispersion scenarios. Both are accepted models, but neither model can address photochemistry or non-linear chemical reaction kinetics. Ozone production is a photochemically activated set of reactions which have non-linear kinetic mechanisms. Arizona has intense solar radiation in the areas of the mine site, more than sufficient to provide the necessary photocatalysis. Further, neither model is particularly well-suited for aerosol calculations.

(4) The DEIS ignores the fact that ozone is not the only toxic substance for which a photochemically active pollutant system occurs. The combination of ozone, NOx and sulfates can photochemically oxidize arsenic, chromium, nickel and manganese. The oxidation of arsenic will produce arsenates which are soluble and/or sorbed on sulfates and sulfuric acid mist. Thus, arsenic can disperse by two atmospheric routes: as particulate matter and as soluble materials suspended in aerosols, the latter moving with the ozone/NOx/sulfate plume. Because this second form of dispersal of toxic materials is unmonitored under present DEIS requirements, arsenic emissions can produce a violation of the hazardous air pollutant requirements. The aerosol transport mechanism will also increase human and ecological exposure to arsenic compounds. The arsenic sources include tailings piles and possible volatile process emissions. Studies by the University of Arizona have confirmed arsenic emissions in the particulate matter from active copper mines.

(5) Even the combination of the AERMOD and CALPUFF models and

maximum emission calculations for scenarios used to model the effects of the mine on the urban environment still cannot assure that the primary air quality standards will not be violated. The AERMOD model works best in places where it does not need to look at the contributions of an urban plume to a rural source. This does not mean there is no impact of urban sites on the mine. It is marginally suited to the complex terrain (mountains, mesas, etc.) and regional scale topography of the various areas in Arizona likely to be impacted by air pollution from the mine. It is also a model recommended by EPA for preliminary calculations. The CALPUFFS model is suited to the urban environment. It has a chemical reaction subroutine based on linear kinetics. In many cases, the very dilute nature of atmospheric concentrations of various reacting species permits linear approximations. It is also a model recommended by EPA. However, neither model can handle aerosols or photochemistry. AERMOD has no chemical reaction subroutine. At best, the combined use of AERMOD and CALPUFF can approximate any local chemical interactions as additive systems with linear kinetics, but with unknown errors. The concern in using these two models is their inability to assess the effect of the mine on the urban environment when there is a non-linear chemical interaction between urban plumes and the mine plume such as local production of ozone. The DEIS does not cite these concerns.

(6) The DEIS is deficient because it fails to require measurements and monitoring of all primary air pollutants. The DEIS does not require measurements and monitoring of all primary air pollutants. While the USFS has a primary interest in the visibility issue and secondary air quality standards, limiting measurements to particulate matter without measurements of the other primary air pollutants at the sites of USFS concern reflects an inability to warn of a need for remedial and mitigation measures on a timely basis. This especially will occur in the case of damage from NOx, ozone, and sulfate as it affects opacity and visibility and causes damage to sensitive vegetation.

(7) **The DEIS does not require measurements of fugitive emissions from the tailings piles.** But climate conditions in Arizona make such measurements necessary. There is little evidence, none provided in the DEIS, that the measures cited will make any improvements in mitigating

dispersion by wind. In looking at fugitive emissions from the tailings, the concern seems only with the total amount of particulates, without regard to their chemical or mineralogical composition. This is a major deficiency because these fugitive emissions contain potentially toxic elements and minerals.

(8) Because the DEIS has not related the geochemical composition of the source minerals to air pollution problems, the DEIS has seriously underestimated the potential release of toxic and hazardous pollutants during blasting and ore processing, the fact that some toxic elements can pass through the various mineral capture processes untouched and be released at any point which offers such an opportunity, and that other toxic elements which are processed are not necessarily chemically changed to provide for safe disposal. The geochemical composition of the source minerals contain numerous toxic elements at trace quantities, but given the volumes and tonnage of ore to be processed, there are sufficient quantities of many of these toxic elements to cause a violation of the toxic and hazardous materials restrictions of the Clean Air Act.

(9) Elements of greatest concern are: As, Pb, Ni, Cr, Se, Zn, Mn and F. All are both air and water pollution issues either because of adverse effects on human health or because they are toxic to fish and aquatic invertebrates.

Beryllium as an air pollutant problem is a human carcinogen, but beryllium rarely becomes a water pollution problem because its various chemical forms are usually found as insoluble mineral or bound in sediments. Its bioaccumulation and uptake capacity in tissues from aquatic sources is very small. Both antimony and thallium are toxic to animals and people. Boron is rarely an air pollutant but it can be a major water pollutant, especially if the waters are used for agricultural purposes. Boron affects the growth of certain crops, and is toxic to the larval stages of certain amphibians. Indicates that 3 to 4 tons per year of hazardous air pollutants would be released by mine activities," has no scientific support.

(10) The DEIS ignores the radioactive elements present in the source materials. These are thorium, uranium, and radium. Although these might

show up in the waste rock tailings, the blasting process to produce ore for further extraction of copper, silver, and molybdenum, will also likely release these elements from the mineral matrices and you will also have radioactive particulate matter. **The DEIS requires no measurements of radioactivity of particulates. During the processes of extracting copper and molybdenum, if these radioactive components of the ore become soluble, their soluble state will allow them to pass through many of the processes untouched.** Many of these radioactive elements also can form volatile fluorides and the presence of fluoride in the ore materials, allows the formation of these compounds in various processing steps under appropriate conditions. Neither the background documents nor the DEIS indicate that such conditions are not found in the various steps, and therefore the formation of these radioactive compounds cannot be dismissed. The fluoride compounds of these radioactive elements, if formed in various reaction steps, will be vented as volatile toxic chemicals from these processes.

(11) The DEIS fails to consider that the mobility of toxic and hazardous materials released from the ore is enhanced by the processes of the Resolution Copper Mine, especially crushing and grinding, to produce small particles. These are more readily absorbed to aerosols and other particulate matter and increase transport of toxic materials from the mine site to sensitive ecosystems and populations.

(12) The DEIS does not consider the likelihood of multiple and sustained exceedances and violations of primary and secondary air pollution regulations. The DEIS indicates that likelihood of exceedances and violations are small because the modeling shows that the emissions do not come near the thresholds for violations. The modeling, however, did not consider the impacts of toxic substances, the issue of aerosols, radioactivity and a host of problems discussed in previous items in this section. Under the conditions described in various items in this section, the likelihood of exceeding the ambient standards are high. Because of the extreme climate conditions in Arizona at different times of the year, there is a strong likelihood that these violations will be multiple and sustained in duration.

The DEIS only analyses (inadequately as noted above) the air quality impacts and baseline

conditions in the area around Superior. DEIS at 286-87. In addition, even in these areas, ozone is not modeled or the extent of ozone pollution ascertained. No detailed air analysis is done for all of the alternative locations (such as for Skunk Camp), or whether all air quality standards will be met for all NAAQS (including ozone) at all locations that may be affected by the project.

The DEIS also fails to adequately analyze both the baseline air quality conditions in all of the areas in the various alternatives (especially the preferred Skunk Camp area), as well as failing to include a complete analysis of all past, present, and reasonably foreseeable future sources of air emissions.

For baseline conditions, there is no detailed analysis of the Skunk Camp area, as the DEIS focuses on the site of the proposed action, not the areas of the other alternatives. "NEPA requires that the agency provide the data on which it bases its environmental analysis. Such analyses must occur before the proposed action is approved, not afterward." N. Plains Res. Council, Inc. v. Surface Transp. Bd., 668 F.3d 1067, 1083 (9th Cir. 2011) (an agency's "plans to conduct surveys and studies as part of its post-approval mitigation measures," in the absence of baseline data, results in a failure to take the requisite "hard look" at environmental impacts).

The DEIS also fails to have any detailed analysis of the cumulative air emissions in all of the alternative locations. DEIS at 292-93 (merely listing other air emission sources in the area with no detailed analysis). For example, the DEIS admits that nearby activities such as the Pinto Valley Mine Expansion "would foreseeably result in construction-related vehicle exhaust emissions (including NO2, SO2, and diesel-generated particulate matter) as well as potential increases in airborne particulate matter through large-scale earthmoving, wind effects on newly disturbed and exposed ground, and other activities. However, **no data are available at this time to determine how these potential future increases may cumulatively affect overall air quality in the analysis area."** DEIS at 292 (emphasis added).

The DEIS must do more than provide a list, it must also fully review the impacts from all "past, present, and reasonably foreseeable future actions." These are the "cumulative effect/impacts" under NEPA. Cumulative effects/impacts are defined as:

> [T]he impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

40 CFR § 1508.7. In a cumulative impact analysis, an agency must take a "hard look" at all actions.

> [A]nalysis of cumulative impacts must give a sufficiently detailed catalogue of past, present, and future projects, and provide adequate analysis about how these projects, and differences between the projects, are thought to have impacted the environment … Without such information, neither the courts nor the public ... can be assured that the [agency] provided the hard look that it is required to provide.

Te-Moak Tribe of Western Shoshone v. U.S. Dept. of Interior, 608 F.3d 592, 603 (9th Cir. 2010) (rejecting EA for mineral exploration that had failed to include detailed analysis of impacts from nearby proposed mining operations).

A cumulative impact analysis must provide a "useful analysis" that includes a detailed and quantified evaluation of cumulative impacts to allow for informed decision-making and public disclosure. Kern v. U.S. Bureau of Land Management, 284 F.3d 1062, 1066 (9th Cir. 2002); Ocean Advocates v. U.S. Army Corps of Engineers, 361 F.3d 1108 1118 (9th Cir. 2004). The NEPA requirement to analyze cumulative impacts prevents agencies from undertaking a piecemeal review of environmental impacts. Earth Island Institute v. U.S. Forest Service, 351 F.3d 1291, 1306-07 (9th Cir. 2003). The NEPA obligation to consider cumulative impacts extends to all "past," "present," and "reasonably foreseeable" future projects. Hall v. Norton, 266 F.3d 969, 978 (9th Cir. 2001) (finding cumulative analysis on land exchange for one development failed to consider impacts from other developments potentially subject to land exchanges); Great Basin Mine Watch v. Hankins, 456 F.3d 955, 971-974 (9th Cir. 2006)(requiring "mine-specific … cumulative data," a "quantified assessment of their [other projects] combined environmental impacts," and "objective quantification of the impacts" from other existing and proposed mining operations in the region). As the Ninth Circuit has further held:

> Our cases firmly establish that a cumulative effects analysis "must be more than perfunctory; it must provide a *useful analysis* of the cumulative impacts of past, present, and future projects." Klamath–Siskiyou, 387 F.3d at 994 (emphasis added) (quoting Ocean Advocates v. U.S. Army Corps of Eng'rs, 361 F.3d 1108, 1128 (9th Cir.2004)). To this end, we have recently noted two critical features of a cumulative effects analysis. First, it must not only describe related projects but also enumerate the environmental effects of those projects. *See* Lands Council v. Powell, 395 F.3d 1019, 1028 (9th Cir.2005) (holding a cumulative effects analysis violated NEPA because it failed to provide "adequate data of the time, place, and

> scale" and did not explain in detail "how different project plans and harvest methods affected the environment"). Second, it must consider the interaction of multiple activities and cannot focus exclusively on the environmental impacts of an individual project. *See* Klamath–Siskiyou, 387 F.3d at 996 (finding a cumulative effects analysis inadequate when "it only considers the effects of the very project at issue" and does not "take into account the combined effects that can be expected as a result of undertaking" multiple projects).

Oregon Natural Resources Council Fund v. Brong, 492 F.3d 1120, 1133 (9th Cir. 2007), quoting Klamath–Siskiyou Wildlands Center v. BLM, 387 F.3d 989, 994, 996 (9th Cir. 2004).

NEPA regulations also require that the agency obtain the missing "quantitative assessment" information:

> When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking.
> (a) If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement.
> (b) If the information relevant to reasonably foreseeable significant adverse impacts cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the agency shall include within the environmental impact statement:
>
> (1) A statement that such information is incomplete or unavailable;
> (2) a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment;
> (3) a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment, and
> (4) the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. For the purposes of this section, "reasonably foreseeable" includes impacts which have catastrophic consequences, even if their probability of occurrence is low,

> provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.

40 CFR § 1502.22. "If there is 'essential' information at the plan- or site-specific development and production stage, [the agency] will be required to perform the analysis under § 1502.22(b)." Native Village of Point Hope v. Jewell, 740 F.3d 489, 499 (9th Cir. 2014).

The Ninth Circuit specifically requires such cumulative air emissions analysis, as detailed in its recent decision rejecting an EIS for a large mine.

> That analysis suffers from many of the same shortcomings as the BLM's analysis in *Great Basin Mine Watch v. Hankins*, 456 F.3d 955 (9th Cir. 2006). There, we faulted the BLM for failing to include "mine-specific or cumulative data" in its analysis of cumulative impacts to air resources. *Id.* at 973. The BLM had "merely stat[ed] that ambient air quality data for the region currently reflects impacts of existing mining operations in the airshed," but did not "identify and discuss the impacts that will be caused by each successive project, including how the combination of those various impacts is expected to affect the environment." *Id.* at 973–74 (internal quotation marks and alterations omitted). For that reason, we held that the FEIS was insufficient. *Id.* at 972–73. Similarly, the **BLM in this case did not provide sufficiently detailed information in its cumulative air impacts analysis.** The BLM made no attempt to quantify the cumulative air impacts of the Project together with the Ruby Hill Mine and vehicle emissions. Nor did the BLM attempt to quantify or discuss in any detail the effects of other activities, such as oil and gas development, that are identified elsewhere in the FEIS as potentially affecting air resources. … The cumulative air impacts portion of the FEIS fails to "enumerate the environmental effects of [other] projects" or "consider the interaction of multiple activities." *Or. Nat. Res. Council Fund v. Brong*, 492 F.3d 1120, 1133 (9th Cir. 2007). Accordingly, we hold that the cumulative impacts portion of the FEIS does not comply with NEPA.

Great Basin Resource Watch v. BLM, 844 F.3d 1095, 1105-06 (emphasis added).

Here, the adverse impacts from the Project when added to other past, present or reasonably foreseeable future actions is clearly essential to the USFS's determination (and duty to ensure) that the Project complies with all legal requirements and minimizes all adverse environmental impacts. The agency cannot ensure compliance with all air quality standards under federal law,

including the Clean Air Act and agency mining and public land regulations (even under the Part 228 regulations which require compliance with all air and water quality standards) when it lacks accurate baseline data and fails to include an accurate and detailed analysis of all cumulative air impacts.

"[W]hen the nature of the effect is reasonably foreseeable but its extent is not, we think that the agency may not simply ignore the effect. The CEQ has devised a specific procedure for 'evaluating reasonably foreseeable significant adverse effects on the human environment' when 'there is incomplete or unavailable information.' 40 C.F.R. § 1502.22." Mid States Coalition for Progress v. Surface Transportation Board, 345 F.3d 520, 549-550 (8th Cir. 2003)(emphasis in original). The DEIS's failure to obtain this information, or make the necessary showings under § 1502.22, for all direct, indirect and cumulative impacts violates NEPA.

The DEIS' failure to adequately analyze all baseline conditions and cumulative impacts for air quality at all alternative locations is also found in the DEIS' similar failures regarding the other affected resources covered in the DEIS, including water quality and quantity, wildlife, plants, recreation, and cultural/historical resources.

Biological Resources

Wildlife and Biology

The DEIS fails to adequately analyze the direct, indirect, and cumulative impacts to wildlife/biological resources at all alternative locations, fails to adequately analyze baseline wildlife/biological conditions at all alternative locations, and fails to fully analyze all cumulative impacts to wildlife/biological resources at all alternative locations.

The proposed RCM project would transform large portions of the TNF from natural habitat to an industrialized mining and mine waste zone. The EIS must, by law, consider the mine's direct, indirect and cumulative impact on native biota and the ecosystems that support these species, to include foreseeable impacts to threatened and endangered species, migratory birds and other species of conservation concern. An adequate EIS must analyze the potential impact of a range of reasonable alternatives to the affected area's biology and ecology to a sufficient level of detail that allows for the comparison of alternatives. The EIS must also detail how the identified impacts can be avoided altogether (where possible) and minimized. For those impacts that are unavoidable under a reasonable range of alternatives, adequate conservation and mitigation measures must be identified and agreed upon in consultation with federal and state agencies.

The DEIS cites the problem of "uncertainties and unknown information" and "assumptions", including "limitations in the use of GIS data," "lack of current scientific data," and "reliance on other resource analyses" that further this problem (Ch. 3, p. 450). In general, these problems can be overcome through careful, thorough survey work, including field surveys wherever necessary, and independent analysis of the issues presented by the proposed action. It is not a sufficient excuse to simply cite the fact that other analyses may be inadequate, or say that "we just don't know." The TNF's obligation is to thoroughly analyze all of the issues on the table, not make excuses for why it cannot do so.

With regard to hydrological impacts in particular, previous modeling and assumptions provided by the proponent are not a viable basis upon which to conduct an analysis of water issues, as those analyses have been shown to be consistently wrong. This problem directly hinders the analysis of impacts to species that rely on aquatic and riparian habitat, including creeks, springs, and shallow groundwater areas that will almost certainly be damaged by the proponent's vast groundwater removals, as discussed below. The EIS must conduct a more thorough, independent analysis of hydrological impacts in order to fully analyze and understand the related impacts to wildlife and habitat.

The DEIS states, "We do not anticipate any impacts on wildlife or special status wildlife species from water quality impacts at any of the tailings locations during operations, as any stormwater that comes in contact with the tailings piles would be contained in the tailings facilities or in the seepage ponds downstream" (Ch. 3, p. 460). This ignores the very real possibility of a failure of a tailings dam and/or other containment strategies, which could have catastrophic impacts on wildlife and habitat. The DEIS should analyze the possibility of spills and dam failures with regard to impacts on wildlife and habitat.

Re: Management Indicator Species (MIS), the DEIS states that "The action alternatives are not anticipated to change the current MIS species trends based on the low percentage of acres that would be impacted" (Ch. 3, p. 463). However, for many species, impacts in certain areas can have a disproportionate impact in terms of habitat fragmentation, loss of movement and dispersal corridors, breeding success, population viability, etc. This determination is more than just a simple areal calculation and much more detailed analysis needs to be done in order to support such a sweeping dismissal of concerns. The same goes for BLM sensitive species discussed on p. 476, where the DEIS states that "the proposed project may adversely impact individuals, but is not likely to result in a loss of viability in the analysis area, nor cause a trend toward federal listing of these species as threatened or endangered."

The cumulative effects analysis on pp. 476-9 lists a number of reasonably foreseeable future actions, but lacks sufficient detailed analysis of how these actions are interrelated or potentially synergistic with the proposed action, or what the potential consequences would be.

The DEIS states that "Disturbance and direct mortality would cease at mine closure, and reclamation would eventually allow wildlife habitat to reestablish itself" (Ch. 3, p. 481). This statement begs belief, for several reasons, and is not supported by facts or analysis in any event. The dynamic of subsidence that will commence upon closure of the mine threatens to render the area of Oak Flat unstable for decades or centuries to come, potentially resulting in landslides, open fissures, and other features that would definitely harm and kill wildlife. Also, it is entirely possible that the subsidence area will eventually fill with water and create a toxic pit lake, which would utterly destroy the area in terms of its habitat value.

Below we identify a range of potential impacts from the RCM project to wildlife and the ecology of the affected area that requires detailed analysis, additional studies, inter-agency consultations and careful consideration by TNF throughout the NEPA process.

Oak Flat

Avifauna

Several biotic communities (Interior Chaparral, Madrean Evergreen Woodland, Interior Riparian Deciduous Forest and the Arizona Upland Subdivision of Sonoran Desertscrub) converge in a relatively small area around the proposed mine site. This combination of complex biotic communities interspersed with riverine, pond, and cliff habitat, attract an abundance of avifauna to Oak Flat and the surrounding area (Oak Flat).

Individual observations, E Bird listings, North American Migration Count (NAMC), and Audubon Christmas Bird counts combine to offer a rich picture of the birds that utilize the proposed mine site. In addition, Westland Resources (Westland), compiled prior data, conducted independent surveys, and published the *Bird Survey and Occurrence Record Compilation* in 2012. This compilation documents the occurrence of 172 bird species at Oak Flat.

Data Analysis

Data from previous surveys and independent observations allow the FS a rare opportunity to thoroughly evaluate the impact the proposed RCM project will have on native biota. Although, RCM considered federally listed and USFS Migratory Species of Concern, relatively little mention was made of how the hundred or so other potentially vulnerable species will be affected. In order to rectify this deficiency, we recommended in our scoping comments that all bird observations at Oak Flat should be cross-referenced with the following vulnerability ratings:

- North American Bird Conservation Initiative (NACBI) Watch list—State of the Birds Report (2016).
- Arizona Department of Game and Fish (AzGFD)—Species of Greatest Concentration Need (SGCN). This list should be updated to include all species that have been observed in the Affected Area (AA).
- Partners in Flight (Arizona Bird Conservation Initiative or ABCI) Priority Species Rankings—include all birds with a score of 20 and above.
- Migratory Bird Treaty Act (MBTA)—All birds sighted in the AA should be included in the analysis.
- The US Fish and Wildlife Service (FWS) listings (endangered, threatened, candidate, and species of concern).
- The US Forest Service (FS)—Management Indicator Species (MIS), Sensitive (S), and Migratory Species of Concern (MSBC). The latter two lists should be updated to actually reflect the bird species that occur in in the AA.

It appears from the DEIS that some of these resources were consulted, while others were not. In our scoping comments, to examine the rarity of birds that utilize Oak Flat, we cross-referenced Westland's avian compilation data with scorings from NABCI. This first-ever conservation vulnerability assessment of all native bird species that occur in Canada, the continental U.S., and Mexico was compiled by a team of experts from all three countries. This analysis, based on vulnerability scores from multiple factors, created a *Watch List* of species of the highest conservation concern. Birds with scores of 14 or higher, or a concern score of 13 and a deeply declining population trend, were considered to be in jeopardy of extinction without the application of significant conservation measures. In addition to the two federally listed birds that have been observed in the AA, nine species met the Watch List criteria. **Birds identified by the NACBI Watch List should be provided the same treatment as federally listed species in terms of the level of detailed analysis, impact avoidance, minimization and mitigation measures**. In addition, 7 other bird species nearly made the Watch List with scores of 13. Impacts to these declining species should also be analyzed and their utilization of Oak Flat should be closely monitored.

In preparing the Biological Assessments and Evaluations, the USFS should insure that the EIS utilizes historical data from all available reliable sources, assesses the risk the mine and tailings pose to vulnerable avifauna, and considers alternatives to avoid impacts to populations of all affected species. For all bird species known to be of conservation concern, the EIS should evaluate the direct, indirect and cumulative impacts of the proposed mine, to include the following:

- What will the impacts to avifauna be from the dewatering, and subsequent devegetation of riparian areas and aquatic habitats?

- How will loss of habitat from the subsidence crater and ancillary facilities impact resident, breeding and wintering avifauna?

- How will powerlines affect birds? Will they create additional nest/perching sites for predatory species e.g. ravens?

- What impact will the loss of avian breeding and wintering habitats have on native bird populations?

- How will water pollution and waste/settling ponds affect avifauna and successful migration?

- How will noise pollution, vibrations from equipment and lighting impact these species? How will these impacts affect migration, breeding behaviors and breeding success?

- What impact will the loss of habitat have on avian food resources, including local populations of prey species?

- How will a dramatic increase in edges and "edge effects" due to mine construction and ancillary facilities impact breeding behaviors and success (e.g. noise impacts to bird communication and other breeding behaviors, and increased avian predation and nest parasitism)?

In general, the section evaluating impacts to avifauna is superficial and lacking serious analysis of the overall impacts. While there is a table listing modeled acreage of habitat for species potentially affected and some general discussion of potential impacts, the DEIS lacks detailed analysis of consequences for population dynamics, esp. differentiated among species. It is quite likely that some species will be more seriously impacted than others, yet there avifauna impacts

are lumped into a general discussion of potential impacts that are then routinely dismissed as having no impact on populations.

Federally Listed Bird Species

Of the four sub-species of willow flycatcher only one, the Southwestern Willow Flycatcher (SWFL), is federally listed as endangered. On at least two occasions, observations of an undifferentiated willow flycatcher have been made at Oak Flat. According to the *Arizona Breeding Bird Atlas* (2005), the peak migration for the SWFL is in early September with stragglers through mid-October. As both sightings of this species were made during September, is it possible that the SWFL is utilizing Oak Flat as a stop-over during migration.

Westland Resources (2011) has also documented the federally threatened Western Yellow-billed Cuckoo (WYBC) in nearby Mineral Creek and possibly in Ga'an Canyon. According to Westland (2015) survey report, "A total of five YBCU detections were recorded during the 2015 survey: one from the Middle Ga'an Canyon transect and four from the Mineral Creek transect (Figures 3 and 5; Appendix B). The YBCU at Middle Ga'an Canyon was detected during the first survey (June 22). At Mineral Creek, three different YBCUs were detected during the third survey, on July 23, including two different YBCUs at one calling station and the third YBCU approximately 2,400 ft (732 m) up the canyon. The fourth detection at Mineral Creek was during the fourth survey (August 6), more than 1 mile down the canyon from the two that were detected together."

The DEIS indicates that areas of Ga'an Canyon and Mineral Creek which connect directly to proposed critical habitat for WYBC and SWFL along the Gila River could suffer from "reduced surface flows due to the upstream watershed decreasing in size as well as potential reductions in inputs of groundwater from project-related pumping. Potential habitat changes include loss of riparian habitat and a conversion of habitat to a drier, xeroriparian habitat. This could cause habitat to become unsuitable for nesting by the species" (Ch. 3, p. 473). Re: SWIFL, the DEIS also cites "removal of riparian vegetation, including potentially suitable nesting, foraging, and dispersal habitats and a corresponding localized reduction in insect prey populations used by the species" (Ch. 3, p.475). These impacts should be quantified and analyzed and considered along with cumulative impacts of groundwater removals in the context of new, independent hydrological analysis as discussed above.

The Forest Service should undertake the following:

- Conduct field research to determine if, and the extent to which, the Southwestern Willow Flycatcher is utilizing the affected area.

- If the presence of SWFL is confirmed, habitat for this species should be mapped and quantified.

- Continue to conduct annual WYBC surveys. Expand WYBC survey areas to include oak woodland and mesquite habitats; particularly in bands surrounding major drainages and near water sources (surveys for WYBC conducted by Westland and the Tucson Audubon Society (2015) in "sky island" drainages have detected consistent WYBC occurrence and breeding behavior). Habitat for this species should be mapped and quantified.

- The EIS should analyze how the WYBC, and its habitat in the affected area, will be affected by mining facilities and operations, with special emphasis on impacts to riparian habitat informed by new, independent hydrological analysis.

- Consultation with the FWS, under Section 7 of the Endangered Species Act (ESA), should be conducted concerning both SWFL and WYBC.

- The EIS should identify impact avoidance and minimization measures, as well as adequate mitigation measures for both SWFL and WYBC.

Oak Flat Migratory Birds

In addition to providing habitat for breeding and wintering birds, Oak Flat hosts a large variety of migrating avifauna. The 1918 Migratory Bird Treaty Act (MBTA) prohibits the take and possession of birds and their parts, nests, and eggs without a valid USFWS permit.

With regard to the Migratory Bird Treaty Act of 1918, the FWS states:

> Specific provisions in the statute include: Establishment of a Federal prohibition, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . .

> for the protection of migratory birds . . . or any part, nest, or egg of any such bird." (16 U.S.C. 703)
>
> This prohibition applies to birds included in the respective international conventions between the U.S. and Great Britain, the U.S. and Mexico, the U.S. and Japan, and the U.S. and the Russia. Authority for the Secretary of the Interior to determine, periodically, when, consistent with the Conventions, "hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any . . .bird, or any part, nest or egg" could be undertaken and to adopt regulations for this purpose. These determinations are to be made based on "due regard to the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times of migratory flight" (16 U.S.C. 704).

The RCM proposal has a high potential to result in mortality and harassment of migratory birds and to impact "the zones of temperature, distribution, abundance, economic value, breeding habitat and times of migratory flight," and therefore should be disclosed and analyzed in depth in the EIS, in consultation with the FWS.

In addition, Executive Order # 13186, issued by President Bill Clinton in 2001, places procedural requirements on the analysis of federal actions on the conservation of migratory birds. RCM's GPO (page 229) "anticipates that a Migratory Bird Treaty Act analysis will be completed" during preparation of the EIS, yet the DEIS does not indicate that this was done. There are some very basic, general statements regarding impacts of artificial lighting, noise, and powerlines, and there is a table with acreages of potentially affected habitat, but no real analysis on what those impacts would do to migration patterns, population numbers, habitat availability, cumulative impacts, etc. That analysis should cover all of the migratory species identified by the FWS that have been observed in the AA. The EIS should also identify migratory corridors favored by particular species and analyze whether other avenues for migration will be available to those birds if impacts associated with RCM facilities result in the inability of migratory species to successfully migrate through this key portion of TNF.

Many of the birds which utilize the AA are neotropical migrants. These species conduct long distance trips between Canada, the United States, Mexico, Central and South America. Additional protection for these birds is provided by the 2000 Neotropical Migratory Bird Conservation Act (NMBCA) and should be considered in the EIS.

The MBTA analysis proposed by the GPO should:

- Comply with the procedural requirements of Executive Order #13186.

- Analyze the corridors used by each migrant species documented in the affected area.

- Evaluate the viability of migratory corridors and stop-over sites if Oak Flat and the TSFs are converted from native habitat to mining facilities.

- Calculate the amount of riparian habitat used by migrants now and the amount that will remain if the mine is built, to include projections of habitat loss due to de-watering.

- Calculate the amount of all habitat types utilized by migratory species in the affected area that is projected to be lost or degraded by the RCM proposal.

- Evaluate concerns stipulated in the MBTA.

Although the TNF lists 25 Migratory Species of Concern for Oak Flat it is likely that this list does not reflect current knowledge of species that utilize the AA.

- Update the TNF MSC listings to reflect current knowledge and consider the following:

    - Evaluate existing data, and if necessary, conduct surveys to identify migratory bird species that occur in the AA.
    - Differentiate between neotropical and local migrants and determine the extent to which these species are utilizing the AA and surrounding areas.

    - Identify all vulnerable species that utilize the AA including those listed by the following organizations: FWS, Watch Listed by NABCI, Arizona State SGCN, and APIF Priority Species.

Once a comprehensive list of migratory bird species is completed, the USFS should evaluate the direct, indirect and cumulative impacts to resident, wintering, and breeding bird species from the proposed mine and ancillary facilities, addressing the following issues and questions:

- How will populations of vulnerable migratory species be impacted and protected?

- How will the projected loss of habitat, and especially the dewatering and devegetation of riparian zones and wetted areas, affect migratory birds?

- What are the impacts to nesting and roosting habitats, including cliffs?

- What will the impact of the subsidence crater and associated loss and alteration of habitat characteristics have upon these species?

- What are the impacts from noise, vibration, and disturbance upon migratory species?

- How will the presence of toxic waste water and other open water bodies impact migratory bird species?

- Given that most bird migration occurs at night, what impact will artificial lighting have on migratory bird behaviors, including habitat selection, local and regional movements and breeding success?

    - What impact will the mine have on food supply, including local populations of prey species?

- How will the proposed powerlines that will be required to power the RCM proposed project impact bird species?

- How will the likely increase in the distribution of non-native vegetation impact migratory birds?

- Given that the Colorado River Basin Project Act of 1968 places Arizona's claim on Colorado River water in a subordinate position, what impact would a loss of Colorado River water have on local surface water and groundwater and what effects can be projected for bird populations?

- What wildlife management tools will insure that birds survive even if RCM fails to actively monitor birds at the mine site?

Tailings Facilities

Near West Avifauna

The Near West proposed tailings storage facility (TSF) lies immediately west of Superior, Arizona and one km north of the Boyce Thompson Arboretum. Sandwiched between an Important Bird Area (IBA) and the Superstition Wilderness, the Near West TSF supports a diverse array of avifauna. Surveys conducted by Westland (*Results of Bird Surveys Conducted at Near West, 2013*) in April and June of 2013 discovered a total of 59 bird species. While these data provide a good foundation for an avian inventory, it is likely that these abbreviated surveys missed numerous species. For example, during a field trip to the TSF in the spring of 2016, Maricopa Audubon members observed numerous bird species that were not observed by Westland. Records from the nearly adjacent Boyce Thompson Arboretum document the occurrence of over 200 bird species.

Birding trips by Maricopa Audubon Society members to Happy Camp Canyon, Potts Canyon, Hewitt Canyon and across the Montana Road suggest, that birds found on, or near, the TSF may be utilizing desert washes that extend from the Queen Creek drainage to migrate into the Superstition Wilderness. Maricopa Audubon birding trips in spring of 2016 documented an abundance of migrants in riparian vegetation, including Bell's Vireo, Black-headed Grosbeaks, Lark Sparrows, and Western Tanagers.

Due to the relatively small amount of data that has been collected on the Near West TSF, it is likely that the importance of this area to migratory bird species has been underestimated. While the *Migratory Bird Treaty Act Report for the Baseline Hydrological and Geotechnical Data Gathering Activities on the Tonto National Forest, Pinal County* (2015), examines existing data, it is not adequate to satisfy the requirements of the MBTA.

The Final Environmental Assessment for the *Resolution Copper Mining and Baseline Hydrological and Geotechnical Data Gathering Activities Plan of Operations, (USDA 2016)* suggests that no cottonwood/willow riparian forest occurs in the project area. However, substantial riparian zones are adjacent to the Near West TSF in Hewitt and Camp Canyons, and along portions of the Arizona Trail. These areas will likely be impacted by mining activities and are heavily utilized by migratory bird species as well as for nesting by passerines and raptors.

- Although the *Migratory Bird Treaty Act Report for Baseline Hydrological and Geotechnical data Gathering Activities on the Tonto National Forest* (2015) provides useful information, a full research study delineating the utilization of the TSFs migratory birds should be conducted. We suggest a three-year field study would be appropriate to fulfill the requirements of the Migratory Bird Treaty Act.

- AzGFD, and to a lesser extent the TNF, have data which specifically evaluates the rarity of birds in the TSFs. Both agencies should update their vulnerable species lists to reflect existing and future data.

- All habitat concerns previously stated for avifauna at Oak Flat should also be applied to species on the TSFs.

The EIS should carefully analyze the direct, indirect and cumulative impacts to riparian habitats, as this increasingly rare habitat type supports the life cycle of many migrant species. "[r]iparian woodlands comprise a very limited geographical area that is entirely disproportionate to their landscape importance… and immense biological interest. It has been estimated that only 1% of the western United States historically constituted this habitat type, and that 95% of the historic total has been altered or destroyed in the past 100 years (Krueper 1993, 1996). Riparian woodlands are among the most severely threatened habitats within Arizona. Maintenance of existing patches of this habitat, and restoration of mature riparian deciduous forests, should be among the top conservation priorities in the state" (ABCI Conservation Plan, 1999).

Eagles

The DEIS has entirely failed to conduct meaningful analysis (or mitigation) of the project impacts on Bald and Golden eagles with respect to their legal obligations under BGEPA.

In fact, the U.S. Fish and Wildlife Service has recognized the importance of Eagles to the religious, traditional and cultural practices of Tribes, stating in 2009: "Some Tribes and tribal members may consider eagle nests sacred sites provided for in the American Indian Religious Freedom Act (42 U.S.C. § 1996) (some are frequently referred to as Traditional Cultural Properties (TCPs), and as potential historic properties of religious and cultural importance under the NHPA. […] In addition, some tribes may consider all eagles and eagle nests as TCPs or sacred sites, and potential historic properties of religious and cultural significance which must be considered under Section 106 of the NHPA."[22] The DEIS (Table 3.8.4-2, pp. 466-468) notes that hundreds of thousands of acres of Eagle habitat "potentially would be impacted under each action alternative" (referencing only the tailings alternative sites and not the mine site) but no analysis appears anywhere on how the project activities - including but not limited to dewatering and water use – will directly, indirectly, and cumulatively impact Eagles and Eagle habitat.

[22] *See* U.S. Fish & Wildlife Serv., Div, of Migratory Bird Mgmt., Final Environmental Assessment: Proposal to Permit Take as Provided Under the Bald and Golden Eagle Protection Act (Apr. 2009). ¶

Oak Flat and Tailings Storage Facilities

Mammals

Special Status Species: Ocelot

On April 18, 2010, an ocelot was killed by a motorist near the proposed mine site on Highway 60 between Superior and Top of the World. At the behest of federal and state officials, the ocelot's carcass underwent a forensic analysis that determined the ocelot was wild in origin. The nearest known breeding population of ocelots is currently thought to be located in northern Sonora, Mexico. The highway where the ocelot died is further away from the Sonoran breeding population than any ocelot dispersal distances documented in the scientific literature. Therefore, it is possible a breeding population exists in southern Arizona. Furthermore, based upon known habitat characteristics of the Sonoran population, suitable habitat for the ocelot clearly exists in the AA.

Inexplicably, the DEIS analysis completely lacks any discussion or analysis of ocelot in the AA. A keyword search indicates that the only place this species is mentioned throughout the DEIS is in discussion of sensitive species that could occur on a few of the exchange parcels offered by the proponent. That this species is being suggested as possibly occurring on these parcels (where there is no record of it occurring), but not in the AA (where there is a relatively recent record of it occurring), seriously undermines the credibility of the DEIS. One of the parcels mentioned as possibly harboring ocelot is Dripping Springs, yet there is no consideration in the DEIS analysis of the possibility of ocelot occurring at the nearby Skunk Camp tailings location, let alone the consequences of destroying thousands of acres of potential habitat. Instead, the document plays up the possibility of ocelot occurring in the exchange parcel, apparently to inflate its perceived ecological value. What rational explanation could there be for such glaring deficiencies and contradictions in the DEIS?

No ocelots have been detected near the AA since the individual mortality in 2011, but this does not necessarily prove the absence of the species. Ocelots are notoriously difficult to survey for, as they have relatively small home ranges compared to other wild cats and prefer to move cryptically in dense cover as much as possible. However, there is plenty of good habitat in the

AA with dense vegetation, substantial prey base and permanent water that would be perfectly suitable for ocelot habitation, so it is entirely possible that other individuals persist in the area.

In order to evaluate this important, yet elusive endangered species, the FS should conduct the following, as outlined in our scoping comments:

- Investigate all unconfirmed sightings of ocelots.

- Work in conjunction with federal and state agencies to conduct a credible survey for ocelot in the affected area using a variety of techniques, such as camera traps, scat analysis, hair traps, etc.

- Map and analyze the impact of the proposed action on suitable/potential habitats and movement corridors.

- Evaluate the impact of the proposed action upon the potential for future ocelot natural recolonization and/or reintroductions to the affected area.

- Engage in formal consultation with the US Fish and Wildlife Service, under Section 7 of the Endangered Species Act, concerning ocelot to prevent further endangerment of this species.

Bats

Nineteen species of bats have been detected in Oak Flat and in the vicinity of the TSFs. In addition, AGFD suspects several other bat species could occur in the AA. Many bats that occur in and around the AA are designated SGCN by the state, and one, the Lesser long-nosed bat, was until recently listed as endangered by the FWS. Bat populations across the United States are now at risk due to the presence of white-nose syndrome, other diseases and habitat loss. The FS should prioritize the following:

- Continue bat inventories in the RCM AA and in the surrounding area.

- Update vulnerable species listings for all bat species that utilize, or may potentially utilize the AA.

- Evaluate impacts to bats from RCM's facilities on breeding, wintering and roosting habitat.

- Determine the impacts to foraging sites, including ponds, other water bodies and riparian zones that bats may potentially use.

- Quantify the impacts to bats from habitat loss/de-vegetation, degradation, water pollution, artificial night lighting, noise, vibration, and other disturbances associated with the mine and ancillary facilities.

- Evaluate the impacts to bat prey species, nectar-producing plants and other food sources from habitat loss.

- Evaluate the impact to plants and other species due to the potential loss of pollination services provided by bats and other mutualistic relationships.

- Consultation with the US Fish and Wildlife Service, under Section 7 of the Endangered Species Act, should be conducted concerning the lesser long-nosed bat to prevent further endangerment of this species.

- Consultation with federal and state wildlife agencies should occur to identify best management practices, conservation and mitigation measures for all affected bat species.

The DEIS discusses mitigation measures for "loss of abandoned mine or cave habitats," but does not address all of these issues.

Other Native Mammal Species

Few mammals, with the exception of bats, have been studied at Oak Flat or the TSFs. However, camera traps set out by Westland and the Arizona Mining Reform Coalition have documented habitat use in Oak Flat by mountain lion, bobcat, fox, coyote, coatimundi, black bear, deer, javelina, skunk and ringtail. In addition to these species, bighorn sheep utilize cliff faces and associated desert vegetation near the western border of the Near West TSF. Habitat for many mammal species will be irretrievably lost from the development of RCM's proposed facilities. The FS should study the impact of RCM's plan on common mammalian species, and address the following:

- Provide an inventory, population estimate, and density of all mammal species that inhabit the AA.

- Determine whether certain features within these areas, such as springs, food, or mineral sources, may be critical to the survival of mammal populations that inhabit the AA or surrounding lands.

- How will migratory corridors for big game and other species be affected by the RCM project?

- Examine how the proposed mine and ancillary facilities will impact mammal habitat selection, usage, foraging/hunting abilities

- What impact will RCM have on prey species for carnivorous mammals?

- What impact will artificial night lighting, noise, vibration, olfactory pollution and associated disturbances have upon mammals?

- Conduct a radio-telemetry study to determine the usage of the TSFs by bighorn sheep.

- What will be the impacts on mammals from dewatering riparian zones, ponds, springs and wetted areas?

- How will habitat loss, fragmentation and edge effects impact mammalian species' habitat selection, territories, dispersal movements, breeding behaviors and breeding success?

- Consultation with federal and state wildlife agencies should occur to identify best management practices, conservation and mitigation measures for all affected mammals.

Fish, Reptiles and Amphibians

The DEIS discusses general impacts on reptiles and amphibians at Ch. 3, pp. 462-3, but for the most part fails to specify which species are being considered or offer any relevant detailed analysis of the effects of the impacts.

Sonoran Desert Tortoise

Surveys for Sonoran Desert Tortoise (SDT) were conducted on the Near West TSF during late summer of 2012 and 2013 *(Results of Sonoran Desert Tortoise Survey in the Tonto National Forest Near Superior Arizona* (2013). Findings from this study suggest that the Near West provides quality, year round habitat for this species. Westland concluded that tortoises were widely distributed throughout the study area, with increased concentrations noted in certain desert washes. Unfortunately, the limited scope of these surveys did not permit density calculations for SDT that inhabit the proposed TSF. It is also highly likely that Sonoran desert tortoise inhabit the other TSF location alternatives as well.

Core, higher density populations of this species tend to be "island like" and associated with steeper terrain and aspects, making the species very vulnerable to connectivity disruptions associated with the development of mines, roads, transmission lines, pipelines, and other associated infrastructure. In addition, ravens have been documented use transmission lines as a means to scout out and prey upon young tortoises. The DEIS mentions some of these impacts and discusses "applicant committed" measures to address them as part of a Candidate Conservation Agreement between USFWS and Resolution Copper, including pre-construction surveys and removals, but the details of this agreement are not discussed, nor is the mechanism by which it would be implemented and enforced, other than a "voluntary" commitment by the proponent.

Although a "not warranted" decision concerning the listing of the SDT was made by the FWS, there are still significant concerns about their survival. In order to help prevent a future listing of the SDT the FS should address the following concerns:

- Conduct SDT surveys throughout the TSFs that enable density to be calculated.

- Quantify how the destruction of a significant amount of SDT habitat will impact the Superstition tortoise population.

- How will edge effects impact tortoise habitat selection, movements, breeding behaviors and breeding success? For example, powerlines often provide nesting/perching structures for avian predators. Will this increase in nesting substrate result in predation of SDT juveniles? What will the impact of raven predation be? How will this be avoided, addressed and/or mitigated for?

- How will the footprint of RCM's proposed project, including roads and ancillary facilities, impact desert tortoise burrows? For example, how many tortoise burrows are anticipated to be caved-in and lost due to the development of the proposed mine and associated human activities and maintenance? How much roadkill is anticipated, and how can that impact be avoided and minimized through best management practices and mitigation?

- How will the genetic diversity of tortoises in the Superstitions be affected?

- What will be the protocol for tortoise monitoring and relocation? Will pre-construction monitors be required?

- Consultation with the USFWS and AZGFD concerning desert tortoise should occur to map habitat, identify and map important habitat features, and to identify best practices and conservation and mitigation measures to prevent the further endangerment of this species.

- Mitigation measures that are specific to habitat fragmentation, direct mortality from burrow cave-ins, collisions with vehicles, raven predation and other impacts identified through consultation should be identified, developed and implemented.

Sonoran Desert Tortoise & Gila Monster

The DEIS (p. 458) indicates only that pre-construction surveys for Sonoran desert tortoise and Gila monster will be conducted "before surface ground-disturbing activities start," which means that they have not been done. This is improper, these surveys should have been done during the NEPA process and subject to public comment. A vague promise to conduct them after-the-fact on lands which, in part, will likely have already been transferred out of state and federal jurisdiction and into private ownership is grossly inadequate for the purposes of NEPA review. Regarding mitigation and avoidance, the DEIS (p. 458) merely states that project crews will be "instructed" to look below construction equipment for these species and to move them out of harm's way if observed. This is nowhere near sufficient for the purposes of mitigation.

Other Reptiles, Fish, and Amphibians

Westland conducted surveys for amphibians and reptiles during 2003, 2004 and 2011 in portions of the AA. Although surveys were intended to be comprehensive, AGFD predicts that several species of SGCN reptiles went undetected during this effort.

The GPO repeatedly assumes that water shortages rule out the possibility of many species inhabiting the AA. For example, no surveys were conducted for invertebrates in the Near West TSF because it was determined to lack perennial streams. However, springs, seeps and ephemeral water sources that potentially support indigenous biota are present in both Oak Flat and the TSFs. Furthermore, additional species may not have been detected as amphibians estivate during periods of drought.

Although not observed in 2011, the lowland leopard frog--a federal Species of Concern, a 1A SGCN, and a Forest Service Sensitive species--has been observed in both Ga'an Canyon and in nearby stock tanks. It is likely that this species still persists in the AA and that additional survey work will be needed to detect it.

In 2000 AzGFD biologists surveyed the section of Mineral Creek immediately downstream of the confluence with Ga'an Canyon. Three species of fish including the native Gila longfin dace, green sunfish and the federally endangered Gila Chub were collected. A subsequent survey by AZGF in 2002 found that Mineral Creek was "totally devoid of fish"; it is unknown what caused this extirpation. In August of 2006, AZGF biologists restocked Mineral Creek with Gila longfin dace. This species was present when Westland Resources biologists surveyed Mineral Creek in November of 2007. Currently, the Gila longfin dace is considered to be a Sensitive species by the FS. Although no native fish species were discovered in Ga'an Canyon in 2007 (Westland 2009) it is possible that the pools in Ga'an Canyon could once again support substantial populations of native fish species.

According to the DEIS, Gila chub were not found in any of the recent surveys conducted for this species in Mineral Creek, up to 2017. This prompts the statement that, "As this area is not currently occupied habitat, potential impacts on surface water and groundwater would have no potential impact on the species" (Ch. 3, p. 476). It is not necessary for habitat to be occupied in order for there to be negative impacts to a listed species. Indeed, recovery depends upon listed species being able to recolonize areas that they once lived in but have been extirpated from. There is certainly the possibility for this to occur in the AA, with designated critical habitat in nearby Mineral Creek, which connects directly to Ga'an Canyon. The TNF must analyze the proposed action's potential harm to this dynamic with regard to recovery of Gila chub.

The DEIS then describes potential damage to nearby critical habitat in Mineral Creek above the confluence with Ga'an Canyon, including "reduction of perennial pools and a conversion of vegetation toward xeroriparian species", but concludes that "groundwater modeling for the action alternatives does not indicate that impacts from groundwater drawdown would significantly impact Mineral Creek in the area of designated critical habitat" (Ch. 3, p. 476). We reiterate the previous groundwater modeling has already been shown to be fatally flawed, and new, thorough independent study is necessary to properly understand and analyze the effects of the likely massive drawdown of the aquifer created by project-related groundwater pumping, subsidence, consequent changes in hydrological function, and related impacts to aquatic species such as Gila chub.

- What will be the impact of the RCM proposed project on the Gila chub, and the prospect of recovery and/or successful reintroduction of this species?

- What will be the impact to Gila longfin dace, and the prospect of reintroduction of this species?

- Consultation with the US Fish and Wildlife Service, under Section 7 of the Endangered Species Act, should be conducted concerning Gila chub. Consultation with USFWS and AzGFD should be undertaken to identify best practices and conservation and mitigation measures for Gila chub and Gila longfin dace.

The FS must first determine what fish, reptile, and amphibian species are present, based on actual data, rather than assumptions. The FS should study the impact of the proposed action on these species, addressing the following:

- Determine whether the lowland leopard frog still inhabits the AA; if it does, the EIS should analyze impacts to this species, and discuss measures to avoid, minimize and mitigate impacts to this population.

- Assess the impacts on fish, reptiles and amphibians due to habitat loss and/or contamination.

- Conduct a detailed inventory of springs, seeps, water holes in the affected area and the native biota they support.

- What impacts can be expected from dewatering, including loss of riparian areas, springs, and water holes?

- Analyze the impact of the proposed mine and ancillary facilities in terms of habitat loss, degradation, fragmentation and the resulting isolation of populations.

- How will the proposed mine and ancillary facilities impact habitat selection, foraging/hunting local prey species populations, breeding behaviors and breeding success? For example, how will edge effects associated with changes in microclimate, artificial night lighting, noise, vibration, olfactory pollution and associated disturbances impact fish, amphibians and reptiles?

Plants

Several biotic communities (Interior Chaparral, Madrean Evergreen Woodland, Interior Riparian Deciduous Forest and the Arizona Upland Subdivision of Sonoran Desertscrub) converge in a relatively small area around the proposed RCM project. These complex plant communities already suffer from their proximity to the urban pollution of Phoenix, prior mining in the area, overgrazing and climate change. Climate change affects the diversity and composition of plant communities, particularly at higher elevations. Studies also suggest climate change has contributed to the spread of invasive buffelgrass - *Pennisetum cliare*, in the area. In accordance with Executive Order 13653, the EIS must evaluate the project's impact on climate change; plants in an upland desert environment can be expected to be particularly affected.

The GPO acknowledges that Arizona law imposes procedures for the treatment of invasive and noxious plant species; the GPO promises that RCM will develop a plan to control noxious weeds (p. 240). The GPO (p. 247) commits RCM to consultation with TNF before noxious weed control measures are implemented and to using chemicals approved by TNF to control invasive species.

The DEIS indicates that surveys for endangered Arizona hedgehog cactus were conducted on "approximately 4,738 acres and covered most of the East Plant Site and subsidence area, as well as portions of the transmission corridor from Silver King to Oak Flat, Alternative 6 (both the south and north pipeline options), and Alternative 6 north and south transmission corridor," resulting in 98 individual cacti being detected (Ch. 3, p. 178). However, Table 3.3.4-4 (Ch. 3, p. 203) indicates much larger acreages of potential impacted habitat for this species, which should

also be surveyed. Moreover, there appears to be no discussion of avoidance or mitigation measures for this species, which is required under the ESA.

The EIS should address the following issues and questions:

- General locations of Arizona hedgehog cactus *Echinocereus triglochidiatus* in the affected area and how many individuals are expected to be impacted and/or lost; identification of critical / suitable habitat; results of the FS's consultation with the FWS under the ESA concerning direct, indirect and cumulative impacts to the Arizona hedgehog cactus; and measures proposed to avoid, minimize and mitigate damage to individual cacti and habitat from the proposed mine and ancillary facilities;

- Expected extent of de-vegetation in the affected area from construction, mining activity, and air pollution, identifying particular species of concern;

- What impact on endemic plant communities can be expected using different assumptions about dewatering of springs, ponds and riparian zones?

- What will be the impact from invasive plants upon native plant communities under various scenarios?

- Do the existing TNF procedures designed to control invasive plants and designating chemical agents to control noxious weeds require revision in light of the scale of the RCM project?

- Whether RCM has produced the plan to control invasive species promised in the GPO and whether that plan is adequate.

- How will cross-contamination of non-native and invasive seed species between sites via all RCM machinery and staff operations be analyzed and addressed?

- What will be the impact to species in the affected area that have symbiotic and mutualistic relationships with native plants? How will those impacts be analyzed and addressed?

- What will be the impact(s) upon native vs. non-native plant composition and abundance, fire regimes, and trophic interactions in the affected landscape? How will those impacts be addressed?

- Consultation with the US Fish and Wildlife Service, under Section 7 of the Endangered Species Act, should be conducted concerning the Arizona hedgehog cactus to prevent further endangerment of this species.

Fencing and "Non-lethal harassment"

The GPO concedes that RCM's wildlife plans are "preliminary" (p. 237), and the DEIS lacks sufficient detail on many issues. The GPO and the DEIS say that mammals will be excluded through perimeter fencing and birds through "non-lethal harassment." What will be the impacts to mammals and birds from exclusion fencing and the proposed nonlethal harassment techniques (e.g. habitat fragmentation / population isolation, site avoidance, unintentional mortality, sites and sounds of hazing techniques, open pipes, getting "hung-up" on fencing and other hazards for mammals and birds associated with fencing and harassment)? Appendix X in the GPO, totaling five pages, purports to be a Wildlife Management Plan but in fact simply lists mine facilities where birds and other wildlife can be anticipated and states general plans to exclude, watch, or otherwise protect them. The DEIS has minimal discussion of the impacts of such measures.

- The EIS must include a detailed analysis of the impacts of perimeter fencing

- The EIS must include a detailed description and analysis of non-lethal harassment.

- Alternatives in the EIS must analyze alternatives that seek to avoid, minimize and mitigate for fencing and non-lethal harassment. What exactly does RCM mean by "nonlethal harassment?" Non-lethal harassment must be clearly defined in the EIS. The EIS must be based on approval of concrete, specific measures to protect wildlife. The Forest Service must insure that a comprehensive, sensible Wildlife Management Plan replaces the current Appendix.

Land Exchange

Re: wildlife resources impacted by the proposed action, the DEIS states that "The removal of the Oak Flat Federal Parcel from Forest Service jurisdiction negates the ability of the Tonto National Forest to regulate effects on these resources or manage them to achieve desired conditions" (Ch. 3, p. 457). However, this does not absolve the TNF of analyzing the impacts of that removal or devising avoidance and mitigation measures for the affected species in the DEIS. Related issues include:

- How would the flora and fauna be affected by the land exchange?

- How does the land exchange affect threatened, endangered, candidate, migratory and SGCN species?

- How will ecosystem structures, functions and composition be affected by the land exchange?

- The land exchange and the RCM proposal require separate, but mutually informed analyses regarding their respective impacts to flora and fauna. Analyses must be detailed enough to be able to compare alternatives.

- The EIS must analyze the loss vs. gain of all habitat types as a result of the land exchange and RCM proposal.

- Does the land exchange achieve "like for like" in terms of wildlife habitat loss vs. gain of habitat types? If not, how will this be addressed through modifications, conditions and mitigation measures?

- Does the exchange ensure the integrity of riparian habitats such as the 7B exchange parcel protected from nearby developments (i.e. the water rights associated with the approved 35,000 unit development adjacent to the 7B on BHP property near San Manuel that threaten to dewater this reach of the San Pedro River)? If not, how will this be addressed through modifications, conditions and mitigation measures?

- What will be the impact of the land exchange in terms of wildlife and habitat resources, watchable wildlife opportunities and associated revenues? Is the land exchange in the best interest of the public in terms of wildlife and habitat resources, watchable wildlife

opportunities and associated economic revenues? How will losses of watchable wildlife opportunities and economic revenues be addressed and mitigated for?

- The "No Action Alternative" for the land exchange should be analyzed and discussed in relation to the public interest and the land exchange legislation.

Springs

As noted in the water section herein, contrary to preliminary analysis supplied by the proponent, there appears to be a hydrological connection between deeper groundwater areas that will be dewatered due to mining activity and a shallow groundwater layer near the surface of the AA. This carries the potential to impact many springs in the area. Springs are keystone features of the landscape, providing microhabitat for specific spring-dependent plant and invertebrate species and water sources for a myriad of animal species. Many spring dependent species are rare and endemic.

While there appears to be only one mapped spring in the land exchange/subsidence area, three unmapped springs in the vicinity were visited and surveyed by Sky Island Alliance (SIA) staff and volunteers in December 2015, including a large cienega and a small cave seep within the land exchange/subsidence area and a deep pool in a drainage close to the edge of that impacted area. Subsequent visual observations of these areas in the following years have revealed dramatic drop in available surface water, indicating that they may already be suffering damage from the effects of dewatering, either in the deeper aquifer or in the shallow groundwater areas as a result of exploratory drilling. Several more surface water areas were observed that could be the result of spring flow, but these were not formally surveyed. It is highly likely that the three surveyed springs within and immediately adjacent to the land exchange/subsidence zone would be dewatered and destroyed by further dewatering.

A 1901 topo map (available at http://historicalmaps.arcgis.com/usgs/) indicates that travel routes through the Oak Flat area passed immediately adjacent to the three springs SIA surveyed. SIA has noted that in some areas that contain many springs, a significant percentage are unmapped, as only the most useful (for human needs) tend to show up on historical maps, so it is likely that there are more springs in the Oak Flat area that have simply not been mapped or studied. A thorough search for evidence of springs in the area should be conducted, and any extant springs that are found should be formally surveyed, including the documentation of rare and endemic species.

The DEIS states that "There are 338 springs mapped within 5 miles of the project footprint. This includes 24 springs and several stream segments that are considered to be groundwater dependent with the potential to be impacted by the project" (Ch. 3, p. 452). The DEIS then states that "many of these springs would not be impacted by project activities unless directly within the project footprint." It is quite possible that the effects of groundwater pumping/dewatering will reach far beyond the immediate land exchange/subsidence area, depending on hydrology, and it is very likely that far more of these surface waters are groundwater dependent and will be damaged or destroyed by further dewatering. A thorough, independent analysis should be conducted with regard to the hydrology of the area, how it fits within the larger region, and particularly with regard to impacts to regional spring resources, as these locations are critically important to many plant and wildlife species.

In general, it appears that the Oak Flat area is an important shallow groundwater area with much potential to support springs, and it is likely that historical and ongoing mining activities have already negatively impacted or obliterated surface waters. Many drainages in the area have mesic habitat, more than what would generally be expected for an area of such relatively sparse rainfall. The EIS should analyze all available historical data to determine to the greatest extent possible what spring resources have already been lost and the potential for further losses, in order to fully inform its analysis of the potential cumulative impacts of groundwater pumping/dewatering that would result from RCM and the proposed TSFs.

Another key part of the EIS analysis on this subject is the relative location of springs on the landscape and their effects on wildlife movements and metapopulations. For instance, a series of springs within a reasonable distance of each other could provide critical support for dispersing species, but destroying those springs and creating much larger gaps in surface water availability could have very serious regional impacts on population viability and movement corridors for a range of species. There is a potential wildlife linkage zone that parallels U.S. Highway 60 in this area, and its utility could be severely compromised dues to the impacts of the proposed action, including the loss of important springs in the area. The EIS should analyze this linkage area and the contribution that springs make to its value, as well as the potential impacts of the proposed action and the currently proposed TSFs on its ecosystem functionality.

There are a number of springs mapped within the footprint of the TSFs. The same considerations apply to this area as at Oak Flat, with regard to the potential for more unmapped springs and endemic species to exist there, as well as their importance to wildlife linkages and ecosystem functionality. A thorough search for evidence of springs, formal surveys of extant springs, and documentation of species present should also be conducted in the TSF areas, as well as an analysis of their role in the larger landscape.

Lastly, springs often have very important cultural significance in Native American contexts, so Tribes should be consulted as to the cultural significance and historical use of any springs that are included in the EIS analysis. According to verbal communication of San Carlos Apache oral history, at least one of the springs at Oak Flat surveyed by SIA fits this description.

Mitigation

In general, avoidance and mitigation measures discussed in the DEIS and in the Draft CWA Section 404 Conceptual Compensatory Mitigation Plan in Appendix D are either woefully inadequate to actually compensate for damage done by the proposed action, lacking sufficient detail to assess their likely effectiveness, or absent altogether in many instances. **It is essential that the public be provided with an opportunity to comment on a complete, thorough mitigation proposal before the EIS is finalized.** "Voluntary" commitments by the proponent and brief, vague "conceptual" plans thwart meaningful public input and are not sufficient under the law.

The DEIS states that as part of the mitigation plan "most water sources potentially impacted by the project would be replaced", but does not make it clear whether there will be consideration of the relative ecological value in this equation (Ch. 3, p. 480). Replacing natural springs with stock tanks or other artificial water sources is a poor substitute for a fully functioning spring ecosystem and the diversity of species it supports. Even more problematic, the DEIS states that the loss of habitat "would not be replaced in the immediate project area", which severely limits the effectiveness of the mitigation and tends to make the damage done by lost habitat permanent and irreplaceable as far as the project area is concerned.

In general, the DEIS cites the value of the exchanged lands as adding to the overall mitigation of projected impacts, but many of these parcels are far away from the project area, in entirely different watersheds and containing different habitats. Moreover, the general value of the exchange parcels pales in comparison to what would be lost in the project area (see our analysis of the exchange parcels elsewhere in these comments), rendering their mitigation value minimal at best.

Wildlife Camera Data

In October of 2011 the Arizona Mining Reform Coalition implemented a wildlife camera project at Oak Flat to document wildlife and human activity. The study focuses on the Greater Oak Flat Watershed east of Superior, Arizona. The survey area is bounded on the west by Apache Leap,

no more than 1 km north of Highway 60 on the north, 1 km east of Gaan Canyon (known as Devil's Canyon on most maps) on the east, and an arbitrary southern limit. The survey area is primarily public land within the Tonto National Forest, managed by the US Forest Service. The primary human uses of the Greater Oak Flat Watershed include recreation, mining, and cattle grazing (Spangle 2008).

The goal of the project aims to assist land managers and decision makers in understanding movement, behavior patterns, and distributions of species that use the watershed and to understand the frequency and movement of human recreational activities within the watershed. A secondary interest was the collection of data to provide a record of the survey area. Such a baseline could prove valuable to future research on the habitat, use, and migration impacts of development.

Biome

Previous flora and fauna surveys have shown that Gaan Canyon is botanically diverse and supports a high diversity of bird species (Jacobs 2009). Eleven special status bird species exist within 5 miles of the project area according to review tools provided by the Arizona Game and Fish Department.

Interior chaparral vegetation includes manzanita (Arctostaphylos pungens), catclaw acacia (Acacia greggii), desert broom (Baccharis centennial), and scrub oak (Quercus turbinella) (Spangle 2008). Other common upland species include hop bush (Dodonaea viscosa), birchleaf mountain mahogany (Cercocarpus betuloides), jojoba (Simmondsia chinensis), wait- a-minute bush (Mimosa biuncifera), cholla (Opuntia sp.), and agave (Agave sp.) (Jacobs 2009). Vegetation composition throughout the uplands is significantly influenced by Arizona Uplands division Sonoran Desert elements as evidenced by the presence of saguaros (Carnegiea gigantea), which are fairly common on rocky east- and south-facing slopes.

Prior Findings

Ten cameras were deployed in early October of 2011 and information gathered and analyzed from that date to September or 2019. We located cameras primarily in riparian and xero-riparian drainages. Locations were chosen as logical wildlife corridors to obtain a sampling of wildlife while allowing relatively easy access to cameras for data collection.

Methodology

Site Selection

We adopted a standardized remote camera protocol to validate presence/absence of mammal species in a given area (Chavez and Ceballos 2006). The selection of camera sites was chosen carefully to maximize probability for photographing land mammals. We established basic criteria to select camera locations using regional topographic maps, satellite imagery, and GIS surveying for the following variables: topography, geographic connection of mountain ranges, elevation, vegetation type, presence of temporary or permanent water source, and size of corridors (arroyos).

Camera Placement

10 Cuddeback cameras within lockable bear proof camera safes (Cuddeback 2012)[23] are located within the 6,500 hectare study area. We did not use any type of attractants, lure or bait near our cameras, to avoid species bias or modification of behavior. Cameras are placed with minimal disturbance to the surrounding vegetation.

Several cameras have been moved during the course of the survey to date. Potential for damage/theft based on proximity to human activity prompted us to reposition several cameras. More than one camera was moved due to a lack of mammal activity at the site. Over the 8 years of the project so far, two cameras were stolen, three or four were destroyed by flooding, and one was burned in a forest fire. Seven camera locations have been stationary over the course of the study so far. Of note to the camera manufacturer, several of the cameras are original and have been in the Oak Flat environment taking photos around the clock for 8 years.

Over the past 8 years of data collection, we obtained a total of 15,779 data points after culling all false positives.

Table 4: Total Observations with Timeframe and Frequency

Camera	Observations	Per Week	Days in Operation	Timeframe
Camera 1	2,907	7.09	2,871	10/11 to 8/19
Camera 7b	2,429	14.10	1,206	1/12 to 5/15

[23] Cameras and safes were supplied at a discount by Cuddeback and we are grateful for their support.

Camera 8b	2,377	6.11	2,725	2/12 to 7/19
Camera 7c	1,602	7.16	1,566	5/15 to 8/19
Camera 5	1,148	2.80	2,874	10/11 to 8/19
Camera 2a	1,065	3.90	1,913	1/12 to 4/17
Camera 9a	1,064	2.70	2,761	1/12 to 8/19
Camera 6	926	2.26	2,874	10/11 to 8/19
Camera 3	616	1.60	2,697	10/11 to 3/19
Camera 4a	604	1.49	2,836	11/11 to 8/19
Camera 2c	308	0.77	2,783	11/11 to 6/19
Camera 10	266	0.65	2,865	10/11 to 8/19
Camera 2b	154	2.87	376	7/15 to 7/16
Camera 11	116	33.83	24	10/11 to 11/11
Camera 4	96	7.72	87	10/11 to 1/12
Camera 7a	87	7.00	87	10/11 to 1/12
Camera 9	9	0.06	1,087	1/12 to 1/15
Camera 8a	5	0.56	63	10/11 to 12/11
Grand Total	**15,779**			

Data

The data obtained from the project is presented here in raw form. The only manipulation of data at this stage was to categorized as noted below. The complete draft reports in an appendix to these comments and a final report (or report) will be published at a later date. Each data point equates to one species regardless of how many species were in the photo (coatis tended to travel in troops with more than one individual in the photo and hikers also tended to travel in groups). Conversely, individuals (especially cows) sometimes congregated around cameras and were captured several times. Vehicles were counted as an individual no matter how many occupants.

For this report, we did not differentiate certain species. Although both White-tailed and Mule deer are present, they were "lumped" as deer species. The same for chipmunk and squirrel species. When we couldn't identify individual species (skunk, birds, and others) they were identified in more general categories. The "hiker" category may (and do) include bird watchers, seekers of spiritual solitude, search and rescue trainees, and the occasional surveyor. Climbers

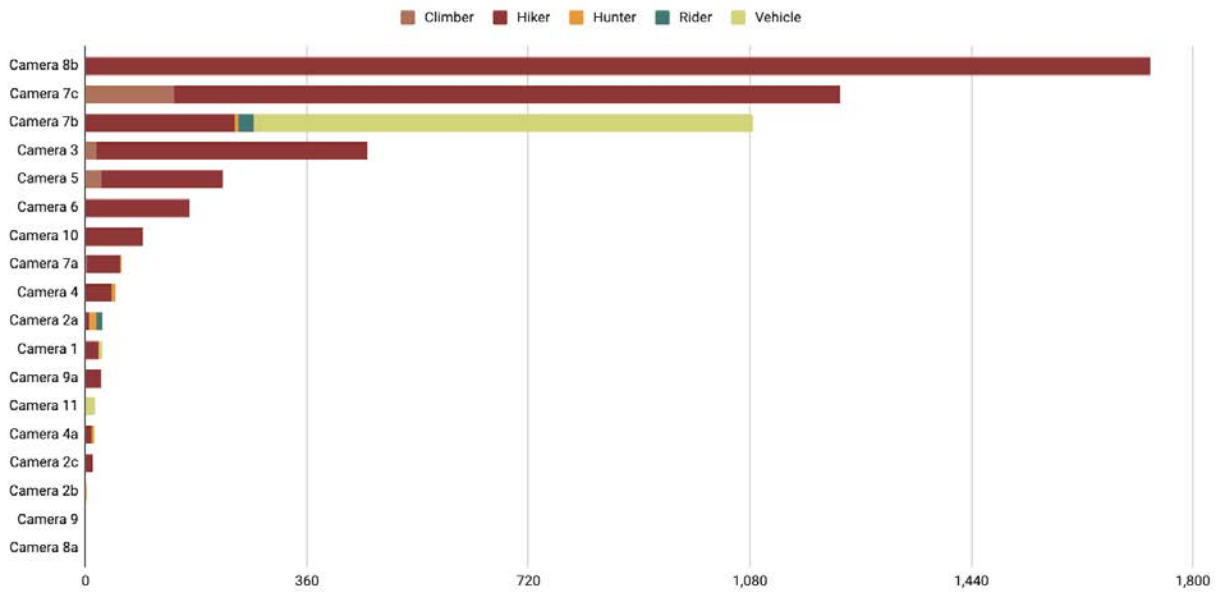
were identified by climbing gear hanging from packs so it's possible that hikers may have been climbers. Riders were on horses and hunters had guns. Vehicles were all off-road capable.

Humans were categorized as hiker, climber, hunter, rider, and vehicle.

Table 5: Observed Human Activity

Human Activity	Sightings	% Total
Hiker	4,130	79.2%
Vehicle	831	15.9%
Climber	188	3.6%
Rider	36	0.7%
Hunter	32	0.6%
Grand Total	5,217	100.0%

Figure 6: Distribution of Human Activity Across Cameras



We categorized wildlife species into scavengers, prey, predators, domestic, birds, and miscellaneous.

Table 6: Observed Wildlife by Categorization

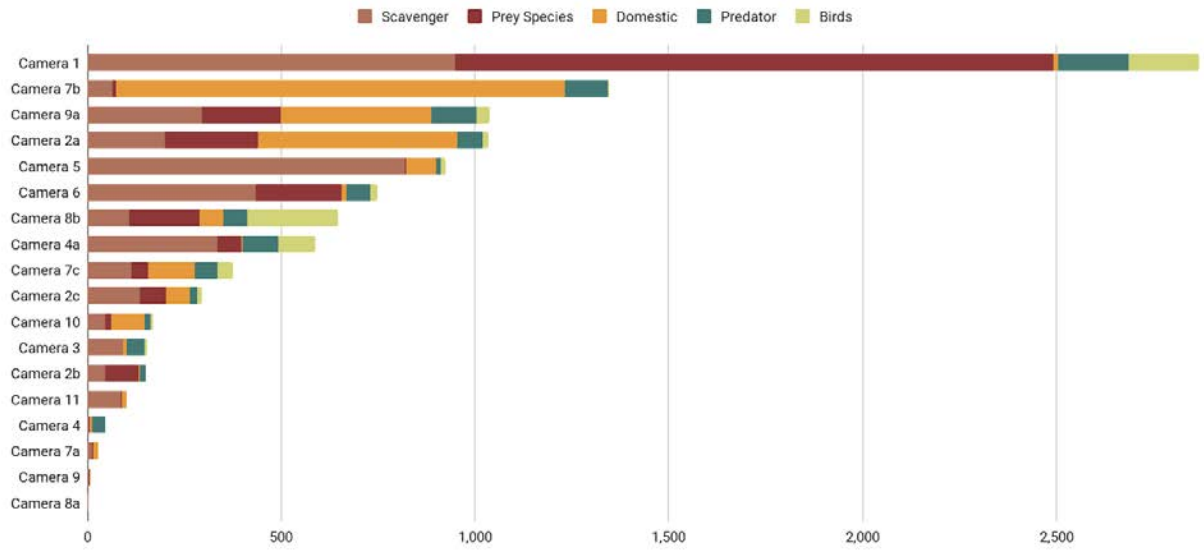
Scavengers	Predators	Birds	
Grey fox	Coyote	Northern flicker	Owl species
White-nosed coati	Mountain lion	White-winged dove	Mourning dove
Striped skunk	Bobcat	Western scrub jay	Mexican jay
Spotted skunk	Black bear	Spotted towhee	Mallard duck
Ringtail		Unknown	White-crowned sparrow
Skunk species	**Domestic**	Turkey vulture	Hawk species
Javelina	Dog	American robin	Hutton's vireo
Raccoon	Horse	Ruby-crowned kinglet	Gray hawk
Hog-nosed skunk	Cow	Canyon towhee	Flycatcher species
Hooded skunk	Cat (housecat)	Roadrunner	Western screech owl
		Green-tailed towhee	Cardinal
Prey	**Misc.**	Gambel's quail	Duck species
Eastern cottontail	Reptile	Bird species	Dark-eyed junco
Squirrel species	Butterfly	Hummingbird	Common black hawk
Rock squirrel	Not identified	Curve-billed thrasher	Clark's nutcracker
Chipmunk species	Bat	Red-tailed hawk	Black-throated sparrow
Mouse	Arachnid	Raven	Black phoebe
Deer species			Belted kingfisher

Table 7: Observed Wildlife Activity

Wildlife Category	Sightings	% Total
Scavenger	3,751	35.5%
Prey Species	2,689	25.5%
Domestic	2,524	23.9%

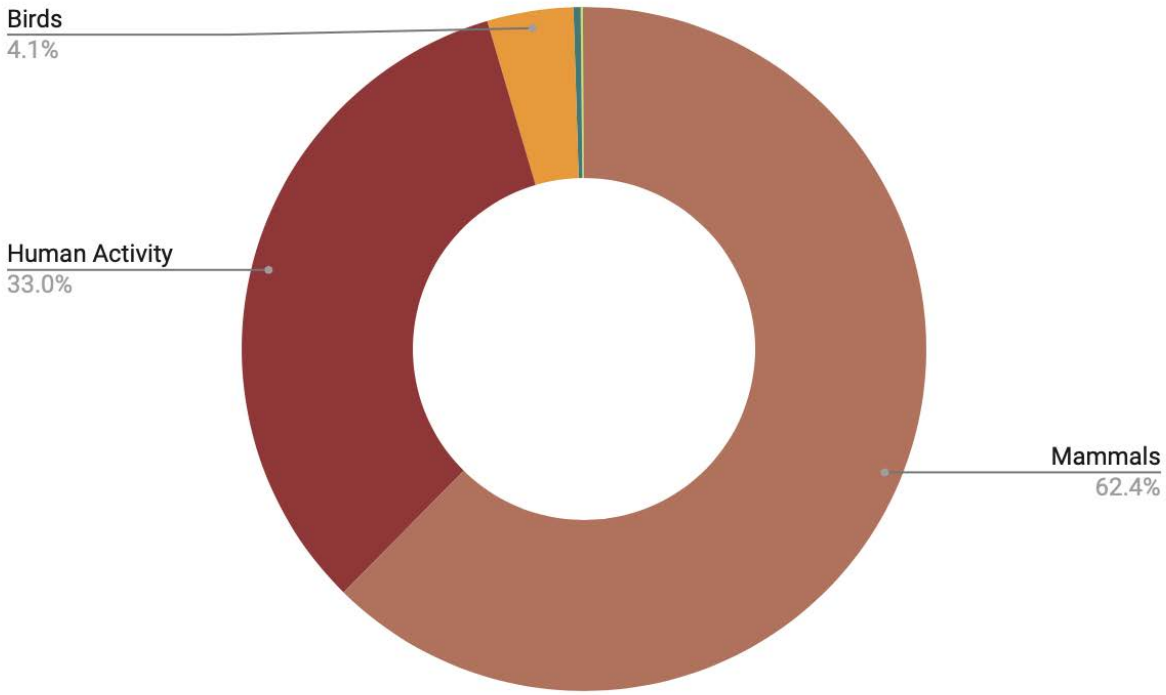
Predator	901	8.5%
Birds	667	6.3%
Miscellaneous	30	0.3%
Grand Total	**10,562**	**100.0%**

Figure 7: Distribution of Animal Life Across Cameras



*Miscellaneous count (30 total observations) not included for ease of viewing

Figure 8: Distribution of categories across study



Additional Species

In hiking to our cameras several additional species were encountered that were not observed on the cameras. Those species include gila monster, tarantula, and a number of (currently) healthy and happy Arizona Hedgehog Cactus who move too slowly to be "captured" on the wildlife cameras. Not seen, but heard frequently within Ga'an and Hackberry Canyon were canyon wrens.

Recreation

Adequate mitigation for the loss of recreation at Oak Flat does not exist. Recreation is a major factor in the overwhelming public opposition to RCM. As the TNF is acutely aware, rock climbing, camping, off-road vehicle use, hiking, and wildlife viewing are among the most popular uses of Oak Flat, Queen Creek, Apache Leap, Ga'an Canyon, and the proposed tailings location. Oak Flat has been Federally protected from all mining activity since 1955. In spite of being located in an established mining district, the Eisenhower administration realized the recreational importance of Oak Flat for camping and other recreational uses and specifically

withdrew it from mining for those purposes by issuing PLO 1229. Oak Flat is an important and irreplaceable recreational resource for rock climbers and boulderers in Central Arizona. Over the last several decades, climbers from the Phoenix metro area, just 50 miles away, have developed the climbing potential at Oak Flat and turned it into a destination winter climbing area. The proposed Resolution mine project will result in the largest loss of recreational rock climbing in the history of the United States. This will be due to surface subsidence caused by the block cave mining method that Resolution proposes for this project.

The rock climbing resources at Oak Flat are irreplaceable, and cannot be mitigated for or managed under a 1:1 replacement strategy common in mitigation and restoration plans. Oak Flat climbing is a high value, site-specific resource with significant historical value. For fifteen years running, until 2004, Oak Flat was the location for the world's largest rock climbing competition—the Phoenix Boulder Blast. With eight hundred competitors and thousands of spectators, the annual event was attended by climbers from across the country and also drew a number of international competitors. Oak Flat is still heavily used by recreational rock climbers and boulderers and the out of print 400-page guidebook to the area by Marty Karabin routinely fetches $200 or more on eBay, due to high demand. The campground itself is also still heavily used and it is often full on weekends during the cooler months. In addition to climbers, hikers, bikers, bird watchers, off-road vehicle riders and others come to Oak Flat for the wonderful recreational opportunities the area affords. The loss of Oak Flat will diminish quality of life measures for those who currently recreate there and will also have negative financial impacts for Oak Flat users, the surrounding communities, and the entire State of Arizona.

The consideration of alternative mining methods that would allow mining to coexist with ongoing recreational use of Oak Flat (as it has for many decades) was inadequate and must be redone. Methods apart from block or panel caving were rejected on the faulty reasoning that other methods would allow RCM to only extract a smaller percentage of the ore body to which they are legally entitled under the 1872 Mining Act. Any land exchange involving Oak Flat that effectively vacates PLO 1229 will, by definition, convey 100% of the Resolution copper deposit to RCM. RCM would therefore be legally entitled to extract 100% of the copper in question. As the USFS has said many times, it is not the job of the Forest Service to determine how much profit a mine is allowed to make or can make. That is their problem. The Forest Service should therefore perform a detailed mining study that evaluates other mining methods to block caving that would cause no surface subsidence and minimal surface disturbance—so that any future mining at Oak Flat would be compatible with continued recreational and cultural uses of Oak Flat. It is significant that the proposed Twin Metals mine project in Minnesota is envisioning exactly this scenario—backfilling mineworks with tailings to reduce the amount of above ground tailings storage.

No proper socioeconomic study of the mine was done in the DEIS. The socioeconomic impacts of the mine that appear in the DEIS extend only through the lifetime of the mine. When evaluating the socioeconomic impacts of the Resolution mine project, the Forest Service should consider that outdoor recreation contributes more than twice as many dollars to Arizona as all of mining does—over $10 billion annually, compared to less than $5 billion for the entire mining industry. These figures come from the Outdoor Industry Association and the Arizona Mining Association, respectively. USFS should also consider that recreation is sustainable and can contribute to Arizona's bottom line in perpetuity. That is why doing an economic study only for the life of the mine leads to an erroneously rosy looking picture for the project. The EIS needs to include an extended socioeconomic analysis for this mine project that goes far beyond the mine's relatively short operating lifetime of roughly 40 years to include the time after mine closure when any financial contribution of the mine to the State will go to zero dollars in perpetuity.

Despite the common characterization of the TNF as being a "recreation forest" for the growing population of Arizonians, this topic is given short shrift in the DEIS. Indeed, there is no Recreation Specialist Report available in the project record. This report must be made publicly available as soon as possible. If there is no Recreation Specialist Report this oversight must be corrected. Major areas of oversight include the possible realignment of the Arizona National Scenic Trail, the displacement and relocation of other designated recreation uses of the proposed project area and inadequate, incomplete analysis of mitigation measures.

The recreational significance of Oak Flat cannot be overstated. For more than 60 years it has been managed specifically for recreational use and is widely known as a place where one can picnic, camp, enjoy the scenery, watch wildlife, stargaze, hike, explore, or merely relax in a beautiful natural setting. Although it is nearly a backyard amenity for Superior, it is also used by residents of the Phoenix metropolitan area and by visitors from throughout the region and the nation. The easy access and the rustic, simple, no-fee campground provide an oasis of beauty, calm, and quiet that is open and available to anybody. The DEIS does not acknowledge the qualities that make Oak Flat a unique and meaningful recreational area rather than merely a replaceable commodity.

Oak Flat and the surrounding region (including Ga'an Canyon, Queen Creek Canyon, and Apache Leap), an hours' drive from the Phoenix metro area and less than that from the East Valley, has the potential to become a major regional recreational asset. The dramatic rock formations, high cliffs, plunging canyons, gentle valleys, streams, waterfalls, oak groves, and mixed desert and conifer are reminiscent of the Granite Dells area near Prescott and Chiricahua National Monument east of Tucson, both of which are high-value destination points by outdoor

recreation seekers. The Oak Flat region could be to Phoenix what those areas are to Prescott and Tucson. The DEIS fails to adequately consider the social and economic value (both short-term and long-term) of the loss of these areas for recreational purposes as they are destroyed, diminished, or fragmented by large-scale industrial development and loss of access.

The impact to outdoor recreational opportunities becomes even greater when other local recreational assets are considered, such as Picketpost Mountain, the Boyce Thompson Arboretum State Park, the southeastern portion of the Superstition Wilderness Area, and the White Canyon Wilderness Area. Many of these areas would suffer visual impacts from tailings pile locations, making them less attractive for those seeking to enjoy Arizona's famed scenic vistas. Dust and haze would diminish visibility, and airborne particulates could pose a health risk to those desiring physical exercise (hiking, climbing, biking, jogging, etc.). Seismic activity related to subsidence could pose a threat in certain recreational areas, and water-based recreation associated with springs, streams, ponds, and waterfalls would be affected by mine dewatering and by the diversion and damming of certain drainages. In addition, these areas may become overcrowded and degraded from overuse when Oak Flat and other recreational resources are no longer available for a growing population of outdoor enthusiasts. The DEIS largely ignores these threats to outdoor recreational resources in the broader region that surrounds the project area.

Missing and Incomplete Information

The following are examples of "significant" adverse effects and management challenges of all action alternatives, not addressed in the DEIS:

The DEIS fails to analyze the relocation of recreation activities currently taking place in the proposed Resolution Copper project footprint to new areas away from the project location. To the extent possible, the shifts of off highway activities and other recreation must be identified and the effects on the new areas analyzed.

The DEIS should contain analysis of foreseeable restrictions and closures that would be put into place to protect these new areas from the increased OHV use caused by a Resolution Copper closure, the order of priority these restrictions might take, and the methods the Forest Service would employ in monitoring and regulating these increases in recreational use. These analyses and mitigation alternatives should be made available in a revised or supplemental DEIS for public review and comment, with cost projections of maintenance, enforcement and rehabilitation resulting from all action alternatives.

One of the issues that needs to be analyzed in the context of displaced OHV activity is noise. While the DEIS examines ambient noise levels for the purpose of noise modeling, it offers no comparative discussion of OHV noise level, or lack of it, within and beyond the Resolution Copper project area. The same topographic features that discourage unauthorized off-road travel also act as acoustic baffles, limiting the noise level affect of ATVs and shooters to hikers, campers and equestrians in the immediate area. A Resolution Copper project area closure that would displace OHV traffic to other areas would increase noise levels in these areas disproportionate to any scenario envisioned in a no-action alternative. A revised or supplemental DEIS should include distance/decibel data in and around the proposed project area and distance/db data for areas likely to experience increased OHV and shooter use because of a Resolution Copper project area closure for a side-by-side comparison.

A large percentage of OHV users and hunters also camp at Oak Flat as part of their recreational pursuit. Campers will move into areas less capable of bearing the added pressure of displacement because of a Resolution Copper project area closure. The DEIS should include analysis of foreseeable restrictions and closures that would be put into place to protect these areas, the order of priority these restrictions might take, and the methods the Forest Service would employ in monitoring and regulating displaced campers. These analyses and mitigation alternatives should be made available in a revised or supplemental DEIS, with cost projections for maintenance, enforcement and rehabilitation resulting from all action alternatives.

Hikers, campers, horseback riders, birdwatchers and other non-motorized users enjoy Oak Flat, the proposed tailings alternative locations (including pipeline and powerline corridors) and other parts of the Tonto National Forest as well as other public and private lands within and beyond the analysis boundary. Non-motorized users typically desire a sense of solitude in outdoor pursuits and will seek environments that offer an impression of remoteness.

User numbers are conspicuously absent from the DEIS. See data from our wildlife camera project in an earlier section of our comments for more precise figures of recreational use of the proposed project area. A closure will push OHV users out of the Resolution Copper project area onto other public lands. The DEIS should have examined issues of trail maintenance and recreation management more thoroughly and over a much wider area as a result of motorized increases in areas that at present are enjoyed by non-motorized users.

Light, noise, dust and view degradation will discourage non-motorized users in a wider radius disproportionate to motorized users from the proposed mine site. This translates to a net loss of recreation opportunities by non-motorized users far beyond what the DEIS fails to but must

analyze.

Appraisal and Land Exchange

Overview

The only information on the appraisal process in the DEIS is the reprinting in Volume 3 of the 2015 Act authorizing and directing the Forest Service to conduct the Resolution Copper land exchange (NDAA Section 3003). Some of that Act's language is summarized in the DEIS, with the only additional information being that the appraisal process began on December 12, 2017, and that an appraiser was selected and began work in 2019 (Volume 1, Chapter 2, p. 35). The appraiser was not identified. The four short paragraphs simply repeat the Act's language that the appraisal report, or a summary thereof, will be made available for public review prior to the completion of the land exchange.

Why is at least a preliminary appraisal report not included in the DEIS? The Act gave Resolution Copper special privilege in making reports valid for at least three years, so there is no deadline problem, given the Final EIS is expected in about one year. The appraisal process is at the heart of the land exchange and figures prominently in helping offset the environmental impacts of the mine and is deserving of public review. *There is no meaningful public review when appraisals are released close to publication of the Final EIS or between the FEIS and Decision Notice.* Additionally, not only has Resolution Copper stated repeatedly that all aspects of mine review be contained in one NEPA document, the NDAA itself required the use of a single EIS for all federal actions.

The land exchange must conform with all federal laws. For example, the exchange must be in the public interest, as outlined in the Federal Land Management Policy Act of 1976. The appraiser must grapple with not only the expected economic benefits the mine might provide but also loss of religious and cultural properties, risk that the mine proves to be technically unfeasible, massive unforeseen environmental impacts and contamination with remediation costs passed on to the taxpayers, and mitigation measures that are not successful. These are not idle concerns.

The shape of the Oak Flat area, and indeed the entire project area, is fiercely defended by Native Americans as a place of religious significance that contains hundreds of archeological and cultural sites. The area was listed in 2016 on the National Register of Historic Places as a Traditional Cultural Property (TCP). To the east of Superior, the failed Carlota Copper Project has produced a fraction of the value of what was predicted in its EIS at great cost to the riparian areas in Haunted Canyon and Pinto Creek. A little further east of that, the Pinal Creek groundwater cleanup project has passed its 20th year with direct costs shared by mining companies, but ultimately, of course, passed on to the public in the form of increased goods and

services. Lastly, mitigation measures to water Haunted Canyon and also to transplant Arizona hedgehog cactus at the Carlota mine did not meet expectations laid out in the DEIS and mostly failed. The DEIS should have analyzed what guidelines are in place and what previous court decisions have found to help determine all of the public interests that are at play in this important part of the appraisal process.

The appraiser also has to determine the highest and best use of the selected lands. Again, this assessment would seem obvious, given the large copper ore deposit, but all aspects of this question need to be addressed. In addition to the loss of the religious and cultural area at Oak Flat (of paramount value to tribes), risk of a failed mine, and unforeseen spills and accidents, the appraiser should take into account several other negative impacts. First, access would be lost for decades to over 10,000 acres at the Skunk Camp tailings site, if that preferred alternative is chosen. There would be permanent loss of the 760 acres at the Oak Flat campground and withdrawal area. In addition, there is the permanent loss of the bulk of the subsidence area and fenced protective zone, estimated at another 2,000 acres. These areas would be lost for recreation and cattle grazing.

The appraiser also needs to consider the negative economic impacts borne by others of the projected use of about 600,000 acre feet of water over the mine's lifetime, as humans feel the effects of climate change and water uncertainty. Not to be forgotten are lost rock climbing opportunities at Oak Flat, remembering that recreation in Arizona brings in more dollars than mining. When evaluating the socioeconomic impacts of the Resolution mine project, the appraiser should consider that outdoor recreation contributes more than twice as many dollars to Arizona as all of mining does—over $10 billion annually, compared to less than $5 billion for the entire mining industry. These figures come from the Outdoor Industry Association and the Arizona Mining Association, respectively. USFS should also consider that recreation is sustainable and can contribute to Arizona's bottom line in perpetuity.

More challenges for the appraiser include reduction of property values near the tailings site and the probability and cost of catastrophic dam failure resulting in loss of life and property. An honest look at highest and best use is certainly in order and should have been discussed in the DEIS.

The 2015 Act authorizing the land exchange states that: "The appraisal prepared under this paragraph shall include a detailed income capitalization approach analysis of the market value of the federal land which may be utilized, as appropriate, to determine the value of the Federal land, and shall be the basis for calculation of any payment under subsection c." As stated in that section, the income capitalization approach "may be utilized … to determine the value of the Federal land" to be exchanged to Resolution. Such an approach is not required.

It is not possible to determine from this language to what extent the income capitalization approach will be employed, but it is worthwhile noting that the Uniform Appraisal Standard for Federal Land Acquisitions discourages its use. It is not clear what the Uniform Standards are for Federal Lands that are offered for disposal, but it is obvious that the comparative sales approach is considered far superior, even when good comparative sales are not available. It is our assumption that this is true for disposing of federal lands as well as acquisitions. The DEIS should have discussed the limitations of the income capitalization approach, given the cautions issued against it and discussed thoroughly the different approaches to placing monetary value on mineral exchange lands.

Less than one page of the DEIS is devoted to the appraisal of selected and offered lands. The readers are left to estimate for themselves what the eight parcels of offered lands might be worth. If the exchange is to be an equitable dollar amount, any reasonable estimation leaves American taxpayers wondering how the reputedly vast wealth of copper under Forest Service lands could be appraised so low. The DEIS gives no explanation why appraisal information is not available and is mute on when the public might see it. The Forest Service said as early as 2016 that it was in the process of selecting an appraiser. Did the selection process really take three years? The Forest Service should issue a revised DEIS that answers these questions and includes at a minimum a preliminary appraisal document.

FOIA violation

In order to obtain information to fully comment on the DEIS, a member of several of the commenting organizations, Dr. Robin Silver, filed a Freedom of Information Act (FOIA) request to the Southwestern Region of the Forest Service on October 20, 2019 asking for:

> *A complete copy of the appraisal evaluating the Resolution Copper lands proposed for trade for Oak Flat.*

On October 22, 2019, the Southwestern Regional Forester responded to Dr. Silver saying:

> *Please be advised that the appraisal evaluating the Resolution Copper lands proposed for trade for Oak Flat has not been completed at the time of your request, and the report, as well as all related records are still in draft form. Therefore, we are providing a "no records" response for the final report. Should the draft documents be requested at this time, they would be withheld in full under (b)(5) of the FOIA as pre-decisional.*

This violates the FOIA, as even if some portions of the records have yet to be completed, the records that have are subject to release under FOIA (at a minimum, the reasonably segregable portions of such records/documents).

In a further attempt to gain information about the progress of the appraisal, Roger Featherstone, Director of the Arizona Mining Reform Coalition, sent an email to Neil Bosworth, Supervisor of the Tonto National Forest on October 25, 2019 asking:

> *"Hi Neil,*
>
> *One thing that continues to confuse us is the appraisal process. It seems that an appraiser has been hired (we'd requested in one of our meetings with you a while ago to meet with that person), but that the appraisal has not been completed. What's the status of the appraisal and when will there be public comment on the appraisal? What documentation of the appraisal would we be able to see and what form would the pub*[l]*ic comment process on the appraisal take?*
>
> *Thanks,*
> *Roger"*

Supervisor Bosworth responded on the same day (October 25, 2019) writing:

> *"Hi Roger. I can't comment on the appraisal or that process since its being handled out of the RO. I'm cc'ing Tracy Parker. He's our Lands and Minerals Director."*

Mr. Featherstone has received no correspondence from Supervisor Bosworth or Mr. Parker since the October 25, 2019, email from Supervisor Bosworth. It is clear that the intent of NEPA, the NDAA, and the FOIA are being thwarted by the Forest Service on this critical component of the DEIS severely limiting us from providing meaningful comments as required by law on this action.

Informed public participation in federal agency decision-making is essential to NEPA, 40 C.F.R. § 1500.1(b), and public commenting procedures are at the heart of the NEPA process. Cal. v. Block, 690 F.2d 753, 770 (9th Cir. 1982). In order to participate effectively, the public is entitled to receive not only the NEPA analysis itself, but also all incorporated documents and documents underlying the Project's NEPA analysis. 40 C.F.R. §§ 1502.21, 1506.6(f); Idaho Sporting Cong. v. Thomas, 137 F.3d 116, 1146 (9th Cir. 1998) (NEPA requires that the public receive not just conclusions in an EA/EIS, but also the underlying information); *see also* 36 C.F.R. §218.24 (USFS must tell the public how it can obtain additional information). CEQ regulations specifically require federal agencies to make such documents available pursuant to

FOIA requests, 40 C.F.R. § 1506.6(f), and in order for it to be meaningful, the public must have those documents before they comment on or object to any draft NEPA analysis. Block, 690 F.2d at 771 (by withholding information during the commenting process the agency can effectively insulate its decision-making process from public scrutiny). It is especially problematic when an agency fails to make environmental information available, even after receiving a FOIA request. LOWD v. Connaughton, 2014 WL 6977611, *17 (D. Or. Dec. 9, 2014).

Even under the somewhat reduced standards for public review of EAs, as compared to EISs, the Ninth Circuit has held that "when preparing an EA, [an agency] must provide the public with sufficient environmental information, considered in the totality of circumstances, to permit members of the public to weigh in with their views and thus inform the agency decision-making process." Bering Straight Citizens for Responsible Res. Development v. U.S. Army Corps, 511 F.3d 1011, 1026 (9th Cir. 2008). Under this test an agency's failure to provide the public with documents that exist when it seeks public input is an important part of the "totality of the circumstances." *See* Sierra Nevada Forest Prot. Campaign v. Weingardt, 376 F. Supp. 2d 984, 992 (E.D. Ca. 2005).

Thus, the agency's refusal to provide relevant documents to the public violates NEPA.

Forest Service Has Yet to Comply with the Equal Value and Appraisal Requirements of Applicable Law

Conservation Groups' scoping comments[24] highlighted the need and importance of the Forest Service to comply with equal value and appraisal requirements that are found in Section 3003 of the National Defense Authorization Act (hereinafter "Oak Flat Rider"), the Federal Land Policy Management Act of 1976 ("FLPMA"), and the National Environmental Policy Act ("NEPA"), as well as Forest Service regulations. To comply with these laws, the Forest Service must conduct the appraisal in accordance with the FLPMA appraisal requirements and make the appraisal available to the public for comment with adequate time to review the document.

Despite thorough discussion on this matter in Conservation Groups' scoping comments, the DEIS lacks any information and analysis pertaining to the appraisal. According to the DEIS, an appraiser was not selected and did not commence work until this year, 2019, although the DEIS was released for public review and comment on August 1, 2019.[25] Because the Oak Flat rider

[24] Conservation Groups' scoping comments are hereby incorporated in full in these draft EIS comments. Conservation Groups' "Equal Value Appraisal Comments" are found at 16-24.
[25] Draft Environmental Impact Statement at 35; Dear Reader Letter (Aug. 1, 2019).

established that title is to be conveyed no later than 60 days after the date of publication of the final environmental impact statement, the delay in starting the appraisal process until the NEPA process is well-underway raises significant concerns about transparency, legitimacy of public review, and the Forest Service's compliance with the law.[26]

If the agency is to comply with its legal mandates, it must immediately cure these shortfalls and do so prior to a Final Environmental Impact Statement being released.

As noted in Conservation Groups' scoping comments, Congress could have, but did not, waive the Forest Service's mandate to comply with FLPMA for this appraisal.[27] Because Congress incorporated by reference the FLPMA regulations that govern the appraisal process, it clearly left the agency with considerable discretion and authority to carry out the exchange under FLPMA and other applicable law. Moreover, while Congress has mandated some form of land exchange in the Oak Flat legislation, it also did not waive FLPMA or any other law, leaving the Forest Service most of its discretion to process the land transaction. The general rule remains that unless Congress states otherwise—*which it did not do in this exchange*—the Forest Service is to process the land exchange according to FLPMA and its regulations, including the USFS regulations.

FLPMA requires that all land exchanges must yield equal value to both sides in the transaction before the exchange can be completed, that the land exchange serve the public interest, and that the exchange undergo an environmental impact analysis.[28] All three of these requirements must be met for an exchange to move forward, yet the record is void of these three requirements.

To determine equal value, the Forest Service must consider all of the following factors:

> (i) Determine the highest and best use of the property to be appraised;
> (ii) Estimate the value of the lands and interests as if in private ownership and available for sale in the open market;
> (iii) Include historic, wildlife, recreation, wilderness, scenic, cultural, or other resource values or amenities as reflected in prices paid for similar

[26] 128 Stat. 3736, §3003(c)(1) (transfer of title to occur within 60 days of final environmental impact statement); 128 Stat. 3726 §3003(4)(B)(iv) (requiring public review of the appraiser).
[27] Conservation Groups' scoping comments at 16-17, 23.
[28] Conservation Groups' scoping comments at 17; 43 U.S.C. § 1716(b); Conservation Groups' scoping comments at 17; 43 U.S.C. § 1716(a) ("A tract of public land or interests therein may be disposed of by exchange . . . where the Secretary concerned determines that the public interest will be well served by making that exchange . . ."); 36 C.F.R. § 254.3(b) ("The authorized officer may complete an exchange only after a determination is made that the public interest will be well served.").

properties in
the competitive market;

(iv) Consider the contributory value of any interest in land such as water rights, minerals, or timber, to the extent they are consistent with the highest and best use of the property….[29]

Conservation Groups' scoping comments noted in detail the factors and issues that the Forest Service's equal value appraisal must account for, including historic, cultural, scenic, wildlife, wilderness, recreation, mineral, water quality and quantity, air pollution, and climate impacts.[30] The need for these values to be addressed also still stands. Indeed, Conservation Groups are not aware of any valuation surface and sub-surface (e.g., mineral value) of the publicly managed lands that are proposed to be privatized.

There is concern that the parcels may be undervalued and/or the parcels to be exchanged are overvalued. Large landscape scale appraisals can be particularly prone to one-sided estimates because of the unsupervised relationship between the appraisal client (the federal agency) and the appraiser. Such undervaluation is not unheard of or even uncommon. Both the Forest Service and Bureau of Land Management have "not always obtain[ed] equal value in their exchanges. In some exchanges, BLM and the Forest Service improperly adjusted appraisals…."[31] The Government Accountability Office has also found that, at least in the past, the Forest Service has not had "a systematic method for assigning and recording the costs of processing exchange proposals,"[32] raising concern that although the rider requires that "Resolution Copper shall agree to pay, without compensation, all costs that are—A. associated with the land exchange . . ."[33] that all such costs may not be properly captured and accordingly paid for.

Conservation Groups' assessment (provided below) of the lands to be traded is that they are not of equal value, as FLPMA requires. This reality raises significant concerns that the Forest Service is not meeting its FLPMA mandates and must be addressed by the agency. It is emphasized again, that although the Oak Flat Rider may have been waived, the FLPMA provision that cash payment is not allowed to exceed 25% of the value of Federal Land to be conveyed, it did not waive the fundamental requirements that the government obtain equal value and that the exchange be in the public interest.

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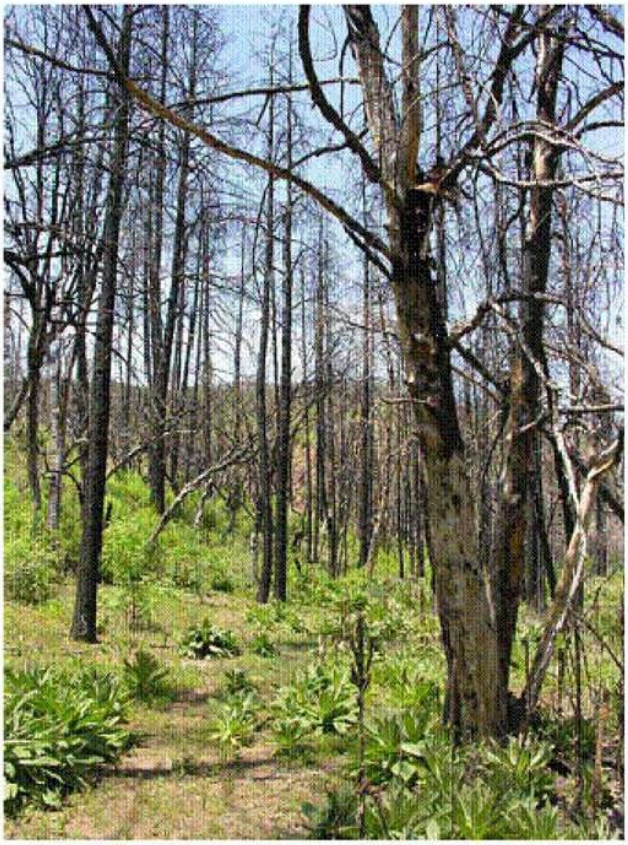
[29] 36 C.F.R. § 254.9(b)(1)(i)-(iv).
[30] Conservation Groups scoping comments at 19-20.
[31] United States General Accounting Office, Federal Land Acquisition Land Exchange Process Working But Can Be Improved, *see e.g.* 3, 30, 32-36, 41-42 (Feb. 1987).
[32] *See e.g. id*. at 39-40, 42.
[33] 128 Stat. 3726 §3003(c)(7).

(A) the approximately 147 acres of land located in Gila County, Arizona, depicted on the map entitled `Southeast Arizona Land Exchange and Conservation Act of 2009-Non-Federal Parcel-Turkey Creek' and dated January 2009;



Three years ago the Pitcher Fire burned much of this 147-acre ranch including both its riparian hardwoods and the ranch's adjacent ponderosa forest. With decades of overgrazing, one finds little unburned mature riparian vegetation here. The stream flow currently is intermittent (underground at times) with only a trickle on the surface, even after a record wet spring this year. The ranch's nearly impassible 4WD access road makes this property inaccessible to the general public.

(B) the approximately 148 acres of land located in Yavapai County Arizona, depicted on the map entitled `Southeast Arizona Land Exchange and Conservation Act of 2009-Non-Federal Parcel-Tangle Creek' and dated January 2009;

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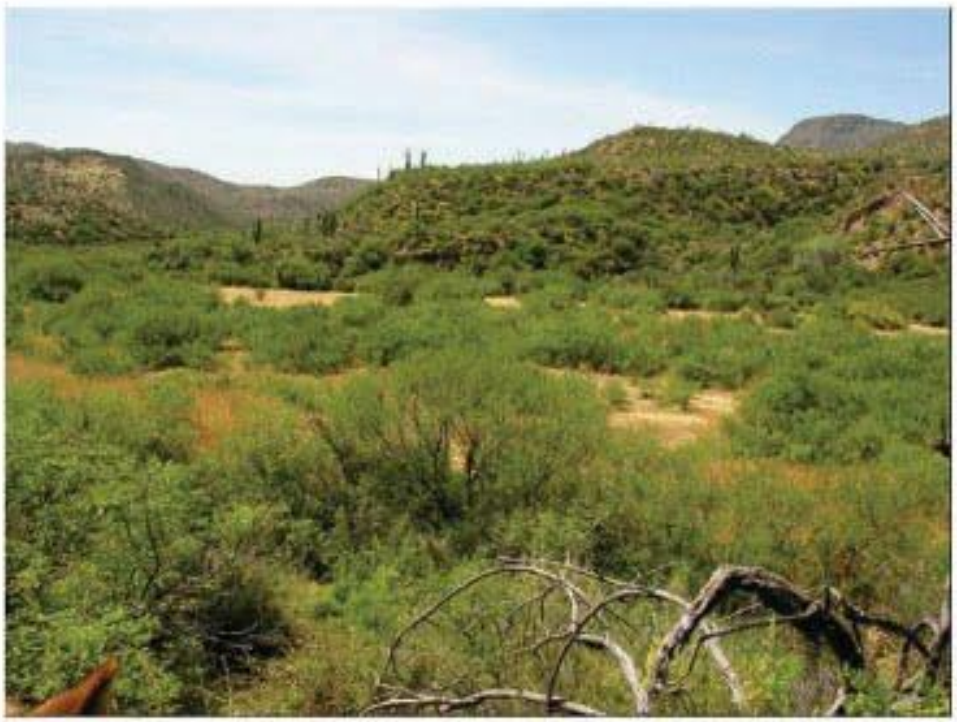
[34] It is currently unclear whether parcel may have been dropped from inclusion as a parcel to be exchanged.

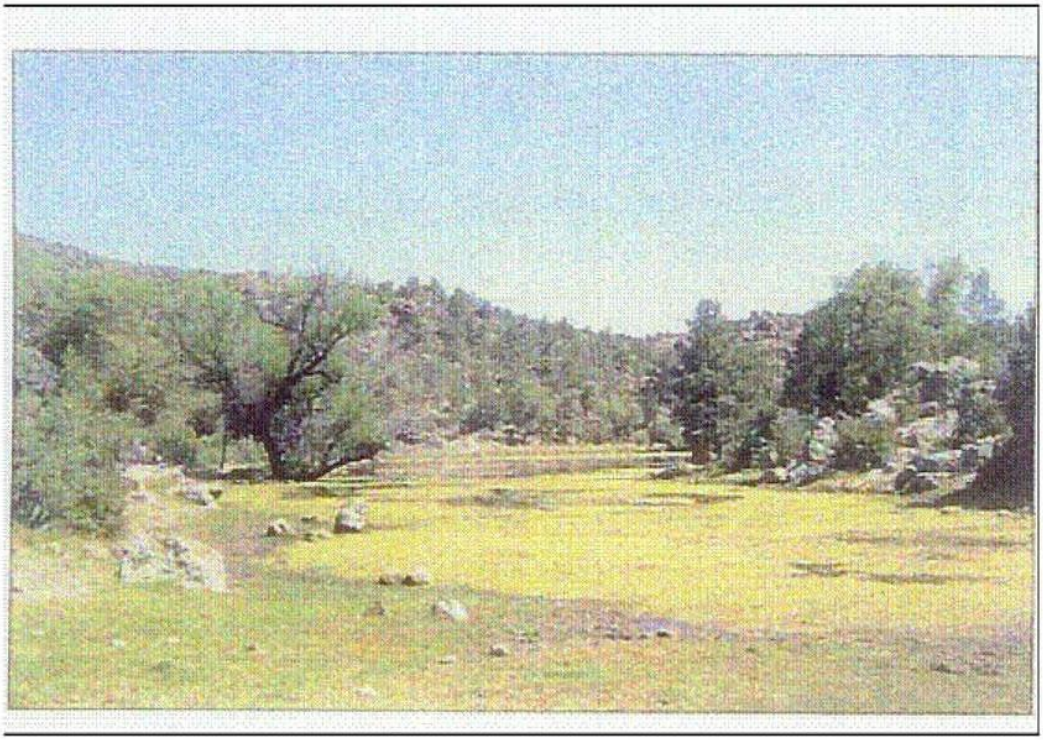
This ranch also has a bone-dry river bottom for the full one mile length of the ranch. It is devoid of sufficient water to support cottonwood, willow, sycamore or ash riparian vegetation even if it were over-grazed. Only three forlorn medium-to-small sycamores exist near the dry creek. There is one willow at a nearly dry, filthy, algae-filled stock pond near the abandoned homestead. Like the Cave Creek and Turkey Creek swap properties, this cattle-devastated parcel will continue to be grazed after it is traded to the Forest Service. The acquisition of this property is of little or no real benefit to the Tonto National Forest or the public at large.

(C) the approximately 149 acres of land located in Maricopa County, Arizona, depicted on the map entitled `Southeast Arizona Land Exchange and Conservation Act of 2009-Non-Federal Parcel-Cave Creek' and dated January 2009; [ie, 6L Ranch]



The property is limited in size, and heavily disturbed by past settlement and chronic overgrazing. The area's rich archeological resources are protected by the defacto non-motorized access created by the Spur Cross Ranch Conservation Area to the South, and the forest lands that surround it on all sides. The existing resource values of the area will not change nor be enhanced as a result of a change in ownership. The acquisition of the 6L property is of little benefit to the Tonto National Forest or the public at large.

(D) the approximately 88 acres of land located in Pinal County, Arizona, depicted on the map entitled `Southeast Arizona Land Exchange and Conservation Act of 2009-Non-Federal Parcel-J-I Ranch' and dated January 2009;



This ranch has hoof and cow dung impacted stock ponds and a brief half-mile ephemeral stream with mature sycamore and oak vegetation. One stock tank is described as "perennial" in Resolution Copper's PR literature to Congress. They describe that pond as a site for a replacement campground for the Oak Flat Campground and that this "stock pond area would be highly desirable for dispersed camping opportunities." Resolution mis-describes that degraded stock pond and its one willow tree (the only riparian habitat tree species there) as "...habitat for a large array of birds..."

(E) the approximately 640 acres of land located in Coconino County, Arizona, depicted on the map entitled `Southeast Arizona Land Exchange and Conservation Act of 2009-Non-Federal Parcel-East Clear Creek' and dated January 2009;

It is claimed that one of the swap properties includes four miles of trout fishing. While East Clear Creek in this regionundoubtedly has trout, the four or so miles of adjacent riparian miles of this ranch property is never fished. On four different visits at different times of the year, summer and winter, we never saw any fisherman. Reasons may include cattle riparian abuse, no water gaps to stop cattle, difficult access, remote and very poor roads. The Land Swap bill includes no money from Resolution to maintain, protect or fence or improve this highly abused cattle ranch property.

(2) to the Secretary of the Interior, all right, title, and interest that the Secretary of the Interior determines to be acceptable in and to—

(A) the approximately 3,073 acres of land located in Pinal County, Arizona, depicted on the map entitled `Southeast Arizona Land Exchange and Conservation Act of 2009-Non-Federal Parcel-Lower San Pedro River' and dated January 2009; [ie., Seven B Ranch]

This parcel of land is owned by BHP Copper Company and is under no duress for need of protection. In Arizona, the Copper Companies buy parcels of agricultural land in order to have the water rights. There is no danger of mining here, or developing homes here, because it is in a flood plain. This was an opportunity for BHP to unload this piece of property and for Nature Conservancy to collect some fees for managing it. There is one small perennial spring on the 3,000 acres, which creates a small habitat of about a city block in size.

Further, BHP does own another riverside parcel with riparian habitat. BHP does plan to develop homes in that area, some 35,000 units. As of this time, they have made no commitment to protect this riparian habitat. It would be foolish for the public to take the non-desirable dry riverbed for conservation, when next to it, BHP may endanger the true valuable river streambed that does have intermittent flow year around and a developed riparian system.

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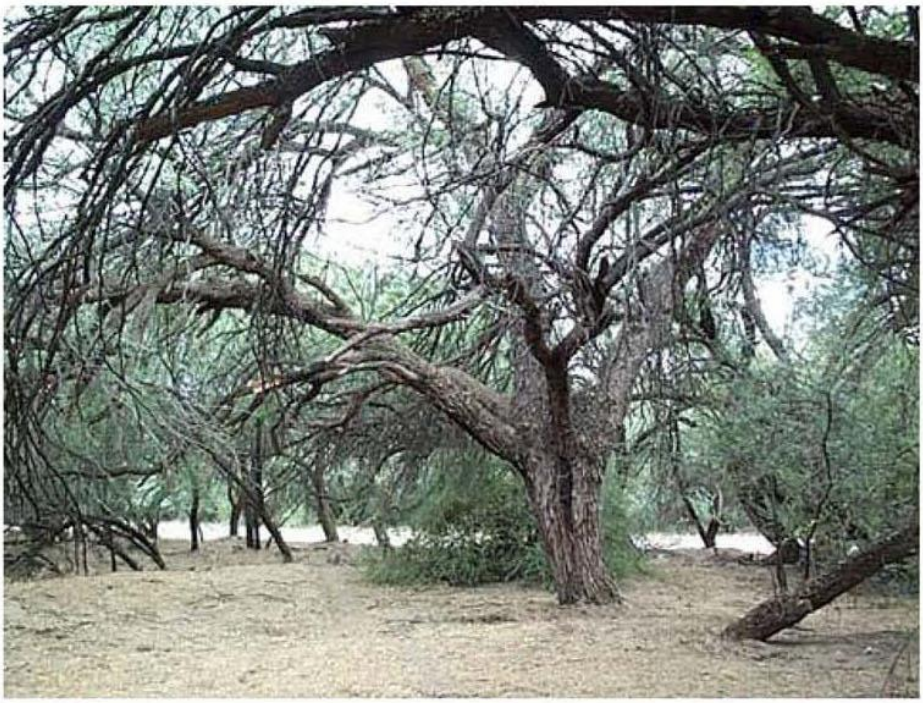
[35] Although the acreage amounts may have slightly changed, that does not affect the substantive issues that are discussed for this parcel.

The San Pedro is not free-flowing at the 7B Ranch. The 3072 acre ranch consists of seven miles of bone dry San Pedro riverbed devoid of surface water. It is bereft of the San Pedro's famously lush willow, cottonwood, ash, sycamore or walnut riparian groves! Any photos with water were taken during the two months of summer thunder storms. The west bank is ecologically sterile, consisting of the dying mining town of Mammoth and huge piles of tailings from the defunct copper mine. However, the dry bed does serve as a roadway for off-road vehicles.

The dry San Pedro at 7B Ranch & Highway 77 crossing—looking south

The lone cottonwood illustrates the lack of any typical riparian system—looking north from Highway 77

The 7 B ranch is no gift to the beleaguered San Pedro riparian ecosystem, despite its 800-acre, same-aged, monoculture of upland mesquite on its east bank. Only birds found in mesquite all over southern Arizona live here.



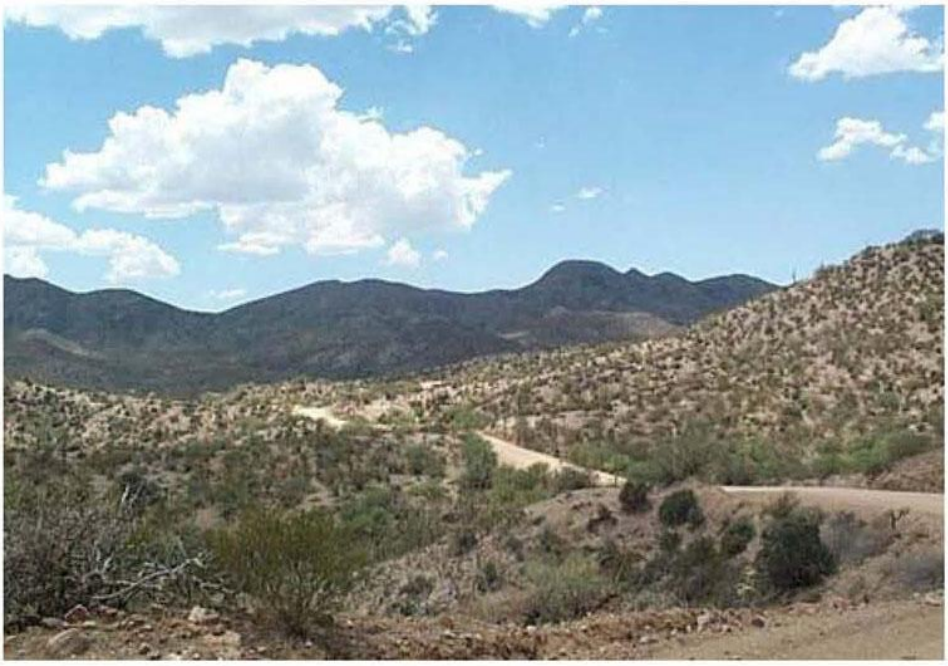
This is certainly no "old-growth" forest. This tree was the largest we could find with a 1 ½ foot diameter trunk. Trees may grow up to 4 feet (1.2 meters) in trunk diameter and live for several hundred years. As illustrated by the dead branches on this tree, since mesquites grow so prolifically, the older trees are crowded out from the thick shade. Most of the trees are less than 1 ft. diameter trunks, typical of the change from ranching to allowing the mesquites to take over during the past 50 years under BHP ownership.

Mesquite Bosques are prevalent along Highway 77

(B) the approximately 160 acres of land located in Gila and Pinal Counties, Arizona, depicted on the map entitled `Southeast Arizona Land Exchange and Conservation Act of 2009-Non-Federal Parcel-Dripping Springs' and dated January 2009; and

Dripping Springs is a dry wash that until 1970 was called Dumping Springs

There is no info available on this parcel. There is no dripping and no springs going on here. Dripping Springs is a 10 mile or so dry wash. Because of the lack of information in the Bill, it was not possible to ascertain which stretch of the dry wash was designated for public use. In any event, the area is studded with privately-owned small ranches. The Department of Interior stated in a previous Senate hearing that they do not have resources to manage the land, and that they would turn it over to the State of Arizona for a state park and campground. However, at this time Arizona has plans to close eight State Parks due to budget considerations. The time to travel here from Phoenix would be doubled—or more if the wash-board dirt road remains.



No one has volunteered to pay for a road to the site to replace the curving, wash-board dirt hilly road.

(C) the approximately 956 acres of land located in Santa Cruz County, Arizona, depicted on the map entitled `Southeast Arizona Land Exchange and Conservation Act of 2009-Non-Federal Parcel- Appleton Ranch' and dated January 2009.

The Appleton Ranch is a well-managed ranch with extensive grasslands. The only question: Is it isolated from other Bureau of Land Management lands, so that it will be difficult for them to continue its management.

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Lastly, the Conservation Groups' position remains that the Forest Service, under the Administrative Procedure Act and other laws, must make the draft appraisal available to the public for comment with adequate time to review the document. This process should have aligned with the DEIS, but has not. If an agency accepts the appraiser's final valuation recommendation and makes an offer of exchange to the non-Federal party, it is considered a final agency action and can be challenged in court.[37] Accordingly, Conservation Groups again implore the Forest Service to ensure that the appraisal process is carried out as FLPMA and other

[36] Although the acreage amounts may have slightly changed, that does not affect the substantive issues that are discussed for this parcel.

[37] *See Mt. St. Helens Mining and Recovery Ltd. Partnership v. U.S.*, 384 F.3d 721 (9th Cir. 2004).

applicable law requires and that legitimate public review is provided prior to a Final EIS being released.

Special Use Permits vs. General Plan of Operations for Tailings Pipeline

As detailed above, the DEIS is based on the USFS's fundamentally-flawed view of the proper regulatory structure governing Resolution's proposal to use the remaining federal lands (i.e., lands not exchange away). The DEIS makes virtually no mention of how the Forest Service intends to permit miles of tailings pipelines across its land. The closest the DEIS comes to any discussion is when it says special use permits "may be needed for power lines built by SRP, access roads, or other features" (Volume 1, p. 15). "Other features" are not defined. Elsewhere the DEIS states that SRP power lines could be permitted either by special use permit or as part of the GPO (Volume 1, p. 9).

The DEIS contains no discussion of the difference between special use permits and permitting as part of the GPO. This omission is major, as the various measures and requirements of the project proponent vary considerably between the two. The northern option for the pipeline route from the west plant site to the Forest Service's preferred Alternative 6 at Skunk Camp, for example, is about 20 miles long with much of it on Forest Service land. Total facility disturbance and impacts to productivity for this pipeline is 16,116 acres (Volume 3, E-15).

Impacts from tailings pipelines are obviously substantial. Corridors are 110 – 230 feet wide, and can be 1,000 feet wide in steep areas (Volume 1, p. 57). Corridors will include roads, pumps and apparently transmission lines. Discussion is limited to short sections on pipeline construction techniques and the possible diameter of pipes (Volume 1 p. 47, 51). No real discussion can be found on what the corridor will look like when construction is completed or impacts such as disruption of wildlife movement or loss of recreation opportunities.

Failing to have identified the method of permitting the tailings pipeline, the DEIS at a minimum should have applied FLPMA and its implementing regulations at 36 CFR 251, the governing federal code for special use permits.

As we know, Resolution Copper has abandoned its original plan (widely touted at first) to dispose of tailings in abandoned mine pits. At least five of these proposed disposal sites less than 15 miles away could remain in play, albeit with varying time schedules (Volume 3, Draft Practicability Analysis, p. 5). The DEIS makes no effort to expand on the idea of backfilling the Brownfield sites and basically takes a defeatist attitude and in effect says Resolution Copper does not want to do it anymore.

Similarly, the DEIS refuses to seriously take on the issue of an alternative techniques to panel caving to mine the ore. The issue is dismissed in two or three pages in Volume IV, Appendix F, without facts or figures to show that another approach, while less profitable, might nonetheless be workable.

The discussion on what is or is not reasonably justified goes to the heart of the matter. Is a pipeline that runs 20 miles reasonably incident when a shorter underground conveyor to the Pinto Valley Mine, as originally proposed, might still be possible? If Resolution Copper thought it was a good plan 15 years ago, have the company since approached Capstone to try to work out some arrangement or perhaps even purchase the mine? Is a delay in the start time of the Resolution Copper mine possible until a mine pit is available? While these might seem to be tough hurdles, how justifiable is a 4,000 acre, 450 foot high tailings dump that will likely pollute groundwater, blow tailings dust, and threaten inundation of downstream communities in comparison? What is more reasonable from a mining plan of operations standpoint, a 2 mile wide, 1,000 foot deep subsidence area at the Oak Flat that will forever be inaccessible, or a less profitable mine due to an alternative mining technique?

The DEIS should be revised and include a thorough discussion of special use permits versus permitting under the GPO with respect to tailings pipelines, and explain its rationale for the approach it has chosen.

Highest and Best Use of the Land

Oak Flat and other lands included in the footprint of Rio Tinto's proposal currently have many uses (recreation, religious observation, subsistence gathering, grazing, and other uses). The proposal would preclude those uses for the foreseeable future. The highest and best use of Oak Flat is not for the short-term gains that may occur as a result of this proposal, but rather for the longer term and intangible uses that currently occur and could occur, absent this proposal.

BLM Should be a Decsionmaker

A significant portion of Alternative # 5, the Peg Leg Tailings Storage Facility, and both potential pipeline corridors for Alternative 5 are situated on public land under the control of the Bureau of Land Management (BLM). In addition, it appears from maps supplied in the DEIS that the Shunk Camp preferred alternative for the Tailings Storage Facility would also impact public land managed by the BLM.

The BLM must have a decision making role, given the difference between regulations between the Forest Service and the BLM. At a minimum, the DEIS cannot simply refuse to discuss the

BLM's role in reviewing Alternative 5 just because it is not currently the proposed or preferred alternative. Because the DEIS states that Alternative 5 is "reasonable" (otherwise it would not have considered it), it must fully analyze/involve BLM's regulatory role in the process.

Mining Plan of Operations, Reclamation, and Bonding

Alternative Mining Techniques

Much of the controversy surrounding Resolution Copper's General Plan of Operations regards the subsidence crater at Oak Flat. In the 2017 Draft Alternatives Evaluation Report and its corresponding Appendix C, as well as in the Resolution Copper DEIS, arguments are made to dismiss any and all possible alternative to Resolution Copper's preferred mining method of panel caving. Earthworks believes the general dismissal by the Forest Service of taking a hard look at these alternative mining techniques – which would leave Oak Flat intact for the numerous Native American and social groups who use the area regularly and hold it sacred – runs contrary to the intention of the National Environmental Policy Act, as well as its general role of stewards of the land recognizing a multiple use approach.

Unfortunately, instead of taking this hard look, the Forest Service appears to have simply accepted – via SWCA Environmental Consultants -- a report from Dr. Charles Kliche entitled *Technical Memorandum for Alternative Mining Methods.* Dr. David Chambers, who like Dr. Kliche is also a physical engineer with 40 years of experience in mining and geotechnical engineering, contributed to the Arizona Mining Reform Coalition's comments on this topic. Had he been the chosen consultant to write about alternative mining techniques for the DEIS through SWCA, his conclusion would be vastly different than Dr. Kliche's in terms of the economic feasibility of other mining techniques. This is an indication that the Forest Service should have consulted multiple independent parties on this topic and compared findings, before simply accepting for the DEIS the conclusion of a single person and a single report, prepared by a for-profit large consultancy that likely has many ties to the mining industry.

It is clear that the Forest Service acknowledges that other mining techniques will vastly reduce or eliminate surface impacts at Oak Flat (Alternatives Evaluation Report, p. 25):

The Forest Service recognizes and agrees with scoping comments that use of mining techniques other than panel caving could substantially reduce impacts to surface resources, both by reducing or eliminating subsidence and by allowing the potential to backfill tailings underground.

In all materials, Dr. Kliche and the Forest Service also acknowledge that alternative mining techniques are technically feasible. Cost is cited as the prohibitive factor for any technique other than panel caving – Resolution's preferred method for profit maximization. But the data provided in the DEIS and the technical memorandum is open to interpretation, and therefore needs far more detailed analysis in a revised or supplemental DEIS.

Dr. Kliche points to a study outlining underground mining operating costs in Figure 2.3-1, using a spectrum of low, medium, and high. Neither the chart or the report elsewhere specify which factors indicate what constitutes low, medium, or high cost, or how Resolution Copper fits within the spectrum. The difference here is substantial; for block caving, figures vary from $4.53 to $20.87. The low range of room and pillar mining (a technique compatible with tailings backfill) is virtually identical to the mid-range of block caving. Without knowing where Resolution Copper stands in the range, it becomes impossible to compare costs if their ranges overlap as they do in this faulted analysis. As another example, the low range of cut and fill mining compared to the high range of block caving is very close – within 10%. The mid-range of mechanized cut and fill is actually lower than the high end of block caving. This analysis must be redone to reflect actual conditions with the Resolution ore deposit, with possible variations in the cost range analysis and methodology supported by sound, thorough research and cited as such. The analysis must also specify these costs in relation to Resolution's plan of panel caving, whereas chart 2.3-1 refers to block caving. While similar, these are considered different techniques, with different costs. Panel caving at Resolution may indeed be more expensive than block caving, rendering this chart obsolete.

It is also unclear from the materials presented in the analysis in which country these costs refer to. The cost of mining using different techniques varies by country. This analysis should have only used data from the US (or better yet, Arizona data) to reflect costs here, not as what is likely a worldwide aggregate. Beyond this, costs should be unique to Resolution Copper, including the vast expenses possibly associated with dewatering and cooling the deposit, which as pointed out in the Coalition's comments via Dr. Steven Emerman, could make the entire project economically infeasible as planned.

The Alternatives Evaluation Report indicates that Dr. Kliche was using limited information to form his analysis. Appendix C, page 1 states as much, noting that the objective of the report was to:

...develop an estimate, based on limited information provided by RCM, of the total tons of potentially mineable material above a cut-off grade of 2% which lies at or above the -2,500 ft level

An analysis that the Forest Service is using to guide its decision whether or not to seriously consider alternative mining techniques, thereby protecting Oak Flat, cannot be based on limited information. The Forest Service must therefore perform a new analysis based on all available information unique to the Resolution Copper ore deposit, as well as operating costs specific to panel caving in the United States, and factoring in other costs unique to Resolution Copper, such as dewatering and cooling. This new analysis should use the same ore body modeling that Resolution Copper uses as it advances its own project, not information based on simple drawings of the 1% and 2% copper shells and aggregate ore body grades.

A new, independent analysis should include the most detailed 3-dimensional data and modeling available (which Resolution Copper certainly has) because that is the data that can inform alternative mining techniques. Instead, Dr. Kliche's report has convinced the Forest Service to entirely dismiss any alternative mining technique from consideration in the DEIS based on simple, generalized assumptions. A legitimate analysis would assess areas of higher ore grade to determine how more

targeted mining techniques can access higher grade ore first, then potentially shift to other techniques later, utilizing backfill in all cases to eliminate surface subsidence. Instead, the DEIS treats all techniques as the only one that would work categorically for the entire deposit, as if all ore is homogenous.

Dr. Kliche refers to "graphical information" provided by Resolution Copper to aid in his analysis, but doesn't cite that data nor define it further. He refers to some areas of higher quality ore being further away from others, but doesn't provide the data set he used in his analysis or characterize further. He referenced his "independent assessment of the tonnage of ore within the greater-than-2 percent shell" but doesn't provide this analysis, instead only showing a chart with all average ore grades above a 1% cutoff being blank. This chart refers to "Resolution data" but there is no explanation of what this data is or how other experts can access it.

Regarding rock quality and ore body characteristics (table 2.3-1 and table 1 in Appendix C), Dr. Kliche has cited general data with an asterisk showing a "match to the characteristics of the Resolution Copper ore deposit" but doesn't cite the data he used to make these claims. In table 1, he cites information from the US Bureau of Mines from 1964 and 1982, but none of this data is specific to Resolution Copper, and it is woefully outdated. Mining techniques in 2019 and geotechnical engineering is orders of magnitude more sophisticated than it was in 1964, and significantly better than 1982. Footnote 6 indicates data was taken from the Resolution Copper GPO, but there is no actual reference here. Footnotes appear to jump from 5 to 7, so it is unclear what this is referring to.

Cutoff Grades

Both the Alternatives Evaluation Report and the DEIS repeatedly emphasize cutoff grades (COG) for block caving. However, the cutoff grade is based on many highly dynamic factors. Dr. Kliche concludes that 80% of the ore available for milling would not be available for exploitation if any other mining technique were to be employed, because the cutoff grade would make only approximately 20% of the deposit economically viable. But how is it possible to determine this when no analysis has been performed that would evaluate specific COG's for alternative methods, or a combination of mining techniques? Or, by not including a robust, long term market analysis that may favorably impact COG numbers over the life of the mine.

Cutoff grades present an idea of economic feasibility using today's copper prices and operating costs, which change over time. The price of copper on November 4th, 2019 was $2.67 per pound. Had this analysis been written in 2011, when copper was $4.50 per pound, the COG would be much different, and validate alternative mining techniques more than today, because the company would be equally or more profitable despite using potentially more expensive mining techniques. As the COG shifts, so would the analysis indicating how much ore would be able to be mined profitably.

As the world shifts to renewable energy, we expect a global increase in the price of copper, meaning Resolution Copper is positioned well to enjoy a much more favorable COG moving ahead. On the other hand, we also expect Resolution Copper and industry-tied consultants like Dr. Kliche and SWCA to continue to justify the cheapest-possible mining method regardless of the COG. But until

more sophisticated analysis is complete, there will be ambiguity. Dr. Kliche admits this on page 25:

It cannot easily be known what COG would be required to break even on mining a ton of ore if the cut and-fill technique were hypothetically mandated for the Resolution Copper Project. Given that the per-ton mining costs are as much as seven times greater for cut and fill vs. panel caving, it is not unreasonable to estimate that the COG might increase from 1 percent to 2 or 3 percent.

The above indicates that the existing analysis falls short of answering the questions the DEIS is supposed to answer, and is a vague, extrapolative statement. It should be the goal of DEIS to understand the ore body holistically, so that if alternative mining techniques were hypothetically mandated, it would be possible to understand the economics behind them. Unfortunately, Dr. Kliche and therefore the Forest Service, are admitting they are either unwilling to do the proper analysis that would determine a COG for other mining methods or a combination of them, or that the analysis might be too difficult to do. Dr. Kliche apparently had no difficulties ascertaining a COG for block caving, but apparently this is too challenging for any other method.

Dr. Kliche states that mining cost are "as much as" seven times greater than panel caving, even though chart 2.3-1 provides a low end range for cut and fill at $18.41 versus high end cost for block caving as $20.87. Again, without presenting costs specific to Resolution Copper, we cannot know where these ranges actually fall. The bias of Dr. Kliche is evident when he makes a statement suggesting costs are seven times higher when his own charts show cost overlaps under different scenarios, yet doesn't provide a rationale for where on the spectrum these costs may be at Resolution Copper. And again, he uses block caving figures, not panel caving, which may be different in cost.

Table 2 in Appendix C – where Dr. Kliche appears to be basing his statement about a seven-fold increase in cost -- is also flawed, because it uses a cut and fill daily production rate of $1/30^{th}$ that of the given block cave numbers. Economics determine that the scale of production determines the cost of production by unit. Therefore, this particular chart cannot be relied upon unless it levels the playing field with similar production rates to arrive at a cost estimate, and whether it does this or not is unclear in the materials. This chart is also not specific to Arizona, which enjoys significantly lower tax rates and operating costs than other locations which likely contributed to the data within the chart. Arizona has a major mining presence, meaning materials and labor costs are likely lower than other jurisdictions. It's also unclear whether table 2 is specific to the US or the world as a whole.

Even if these numbers are accurate as-is, we see room and pillar mining – again a backfill compatible technique – to be only twice the cost of block caving. In our view, even if mining costs were twice that of block caving, the cost of mining technique is not fully representative of the cost of running Resolution Copper as a whole. A complete analysis would look at all costs of running the entire project, and present financial data in that context. It is possible that, as a whole, running Resolution Copper using alternative techniques may only be slightly more expensive than block caving, given all the other administrative and physical costs of running a major mine that have nothing to do with the mining technique.

Finally, Dr. Kliche's analysis should have included a detailed summary of total extractable ore

volumes under every technically feasible mining technique. It is understood generally that panel caving with 70-78 degree cave angles will render about 15% of the total ore within an ore body inaccessible, because the material between the panels will never be mined. How does this 15% compare to other methods? While Dr. Kliche includes tonnage estimates for Resolution Copper block caving using various COG's, no comparison is given for how much ore might be extracted or not extracted using other techniques.

This is of paramount importance, because if it can be shown that, for example, room and pillar mining can extract 75% of the ore body, versus 85% for block caving, our view is that these numbers are close enough to warrant a mandate for room and pillar mining. And if costs are actually comparable as they could be using Dr. Kliche's own chart 2.3-1, it could be the case that mining the deposit using room and pillar could only be only slightly less lucrative for the company than panel caving. Again, using the COG approach for analysis is less useful, because what matter most is 1.) how much of the ore body can be mined fully and 2.) what the actual per ton cost is using various methods. Unfortunately, Dr. Kliche's analysis does not get us to either conclusion. All we are left with are general industry figures, varying widely and often overlapping, and yet still no idea where costs actually fall with Resolution Copper, and how much of the deposit can be mined using various techniques.

Ore Resource

The analysis for the underground mining alternatives in the DEIS was based largely on a report commissioned by SWCA, the third party contractor to the Forest Service for the DEIS, and written by Charles A. Kliche, P.E., PhD, in November, 2017. The Kliche report identifies a number of significant facts about the proposed mine, including:

• An indicated plus inferred resource of 1.969 billion short tons containing 1.54 percent copper and 0.035 percent molybdenum at depths of 5,000 to 7,000 ft below the surface, with 1.538 billion tonnes of ore grading 0.99% copper.

• Approximately 2.02 billion tonnes of ore reserves grading 0.86% copper lying at about 350 metres below the existing undercut level of the mine.

• A loss of 12 to 15% of the ore due to the block caving method.

<u>Resource Sterilization</u>

Since the draw angle is relatively steep in the Resolution ore body (cave angles of 70 to 78 degrees – DIES 2019), then in addition to the 12 to 15% of the ore that will be lost due to dilution in block caving, after mining at proposed levels has ceased, any ore located in the same horizontal horizon will also likely be lost to future mining. The ore located below the existing mining levels would still be accessible.

Ore Grade

Dr Kliche had to work without any data support from Resolution Copper. He noted that his estimate was:

> *"**based on limited information provided by RCM**, of the total tons of potentially mineable material above a cut-off grade of 2% which lies at or above the -2,500 ft level.*" (Kliche 2017*, **emphasis added**)* Dr Kliche also noted some data was taken from a report produced for Resolution Copper, *Geologic and Mineral Resource Model - Suitability for Declaration of Mineral Resources and Support for Mine Plans to Develop a Block or Panel Cave Mine, Letter prepared exclusively for Resolution Copper Mining (RCM), by Harry M. Parker, Amec Foster Wheeler E&C Services Inc., March 14, 2017*, which was not made available in the DEIS support documents. It too might provide more information on Resolution Copper's predicted production costs, but it is evidently not available for public review.

Dr Kliche notes in his introductory remarks that this is a "*relatively low grade ... resource*". (Kliche 2017). This view underlies his mining cost analysis. But, this is not a low grade copper resource. In fact, Resolution Copper itself has called the deposit "***large, high-grade**, hypogene copper-molybdenum deposit"* (Hehnke et al 2012, ***emphasis added***)

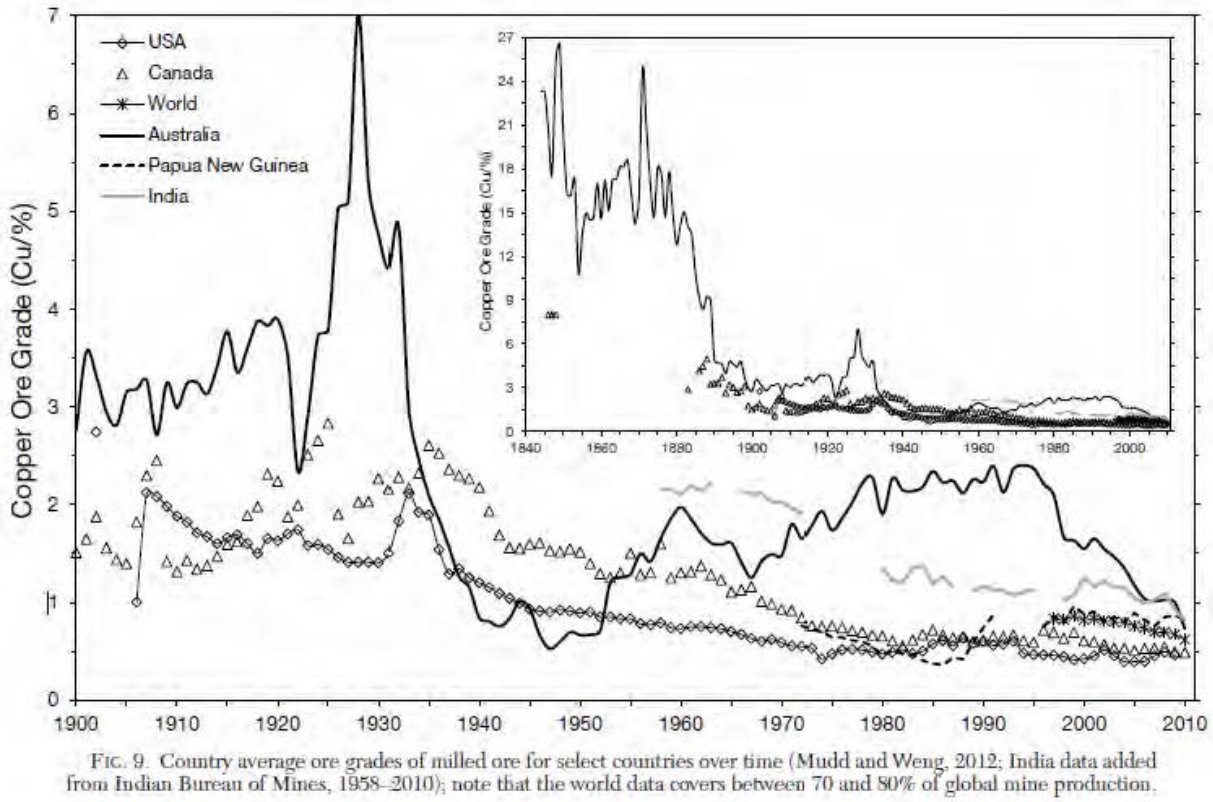

FIG. 9. Country average ore grades of milled ore for select countries over time (Mudd and Weng, 2012; India data added from Indian Bureau of Mines, 1958–2010); note that the world data covers between 70 and 80% of global mine production.

Figure 9: from Mudd et. al. (2012), document that the average copper grade worldwide is decreasing with time, and in 2012 was approximately 0.5 – 0.7% Cu. The Resolution deposit is roughly three times this grade level.

Mudd et. al. (2012) rate Resolution as the 16th largest deposit of contained copper in the world, and the second largest in the US, behind the Pebble deposit. However, this is based only on the proposed mine. If the 2 billion tons of ore below existing deposit were included, Resolution would probably rise to the number seven position worldwide. The proposed Pebble mine also plans to have an underground mine, at a similar depth to Resolution and utilizing block caving, but its deep ore grade is closer to 0.6% Cu equivalent. This suggests mining Resolution with block caving should be very lucrative.

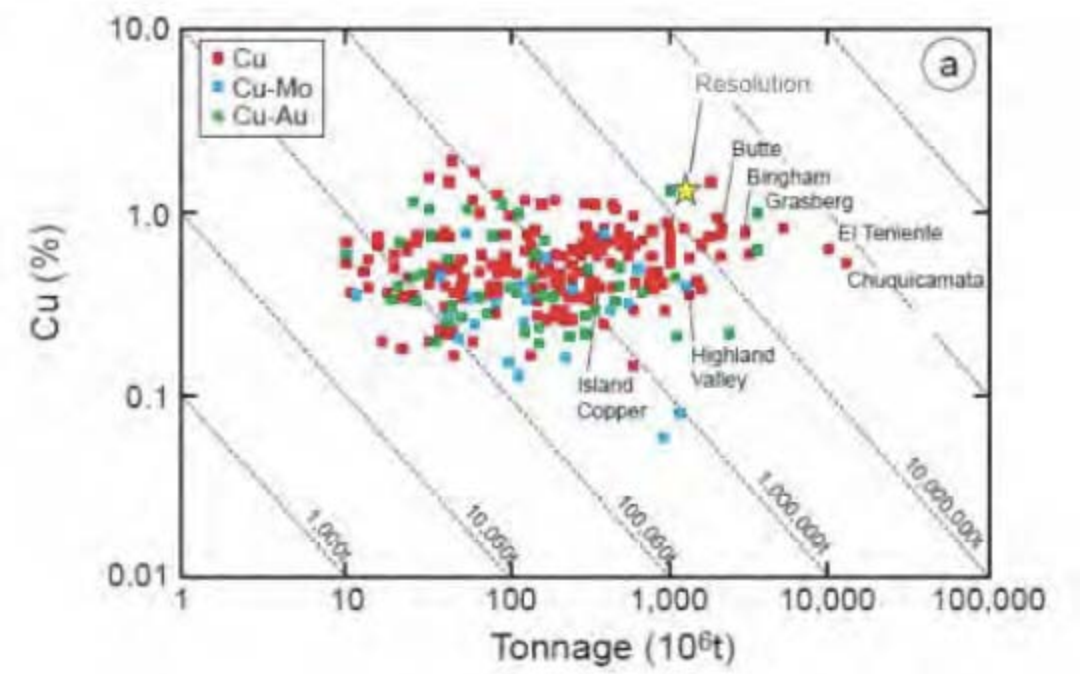

Figure 10: Grade and tonnage characteristics of the Resolution deposit compared to other porphyry-type
deposits world-wide, copper (top), molybdenum (bottom). Selected, noteworthy deposits are labeled. The
dashed diagonal lines represent the total contained metal. Modified from Seal (2012) and Sinclair (2007).

A similar grade analysis to that of Mudd et. al. can be seen in Figure 10, from Kloppenburg (2017), showing Resolution to be one of the highest grade copper porphyry deposits in the world.

Reclamation Financial Assurance

NEPA Section 102 (C) requires all agencies of the Federal Government to include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on:

(i) the environmental impact of the proposed action ...

For the purpose of this discussion focus on the words "*major Federal actions significantly affecting the quality of the human environment*". Although NEPA does not define "*the human environment*" it is clear that it is more than, but includes, the natural environment. NEPA directly

addresses economic considerations a number of times, so it can be argued that economic considerations, which are clearly addressed in most EISs in the context of jobs, taxes, and community impacts. If a financial surety is required by law, which is required in Arizona, the EIS should also consider the potential economic impacts on the mining company of obtaining a financial surety for closure and/or a catastrophic failure, as well as the potential impacts to the public should the financial surety be absent, or inadequate.

A financial surety for mine closure, and post-closure monitoring and maintenance, today typically runs in the tens to hundreds of millions of dollars. If perpetual water treatment is required, then the financial surety required typically doubles. If a company goes bankrupt during or after mining, the financial surety must be adequate to close the mine and perform post-closure monitoring and maintenance. If the financial surety is not adequate, then the public must either provide this money, or suffer the environmental damage associated with leaving the mine in its then-existing state.

It is not atypical that hundreds of millions of dollars are at stake with a closure financial surety. This is clearly a potential impact on the economic and/or natural human environment, and should be disclosed/evaluated in a project EIS, as National Environmental Policy Act (42 USC § 4332) dictates.

However, in the DEIS (2019) it is stated:

> *"The cost estimates for the reclamation financial assurances are based on the final design of the facility, would be developed after the NEPA process, and would not be finalized until the final GPO is approved."*

This is a failure to analyze a very significant potential impact to the public. In addition, it also means the public will have limited, or no, opportunity to comment on the size or adequacy of the financial surety.

Project Viability

A major concern of the Resolution Copper deposit relates to its characteristics and grade. For this to be true, figures for grade and tonnage have to be correct, crushing and grinding circuits have to be configured appropriately and metallurgical methods for metal recovery have to be determined correctly. Consulting groups to the Resolution Copper company have calculated figures for the grade and tonnage of the deposit and designed the engineering requirements for the mine. The reserve figures have not been quoted, commented on, criticized or questioned in the DEIS, and seem acceptable to the USFS. The reason for lack of comment on the reserves is unexplained. For review and approval of a mining project this seems to be a blatant omission. If mining went ahead based on inaccurate reserve figures and eventually had to be abandoned as

uneconomic, the environmental impact of an abandoned mine could be great and local life and business would have been disrupted, all for no gain.

The Concerned Citizens and Retired Miners Coalition, many of whom have mined at Oak Flat in the old Magma operations and also have experience working in the block cave operation at the San Manuel mine have long raised concerns about the ability to use block cave mining at Oak Flat. They report that it's likely that due to high temperatures, pressures and persistent wet conditions, and due to the nature of the ore body, that rather than "flow like sand in an hourglass" through the draws below the block cave operation, ore would not break up efficiently and plug up the draws. This would not only slow operations and cost more in resources and money, but would be very unsafe for mine workers. If enough of the draws plug, the entire operation could become unviable. These concerns were discussed in our scoping comments and are certainly known by the Forest Service, but were not discussed in the DEIS.

In order to clarify whether the deposit is viable or not, a new or supplemental DEIS must be prepared.

Wind Speeds

Some measures to control dust due to operations have been described in the DEIS but the dust hazard due to high winds during and after mining operations has not been commented on by the USFS and no responsibility is established for dust control after mine closure. Although the tailings piles would be covered, the summer winds, and especially those preceding storms, will certainly whip up dust from the tailings dump. Heavy summer rains will eventually cause gullying of waste piles, a process which will continually expose fresh dust to the wind, and also contribute sediment , some of which could be acidic, to the water course. Plant and other work sites, laid bare by mining operations, will also become a source of dust after mine closure.

The USFS needs to reassess the overall dust problem using wind speed measurements appropriate to each situation.

Fog Plumes

The Resolution Copper PLO talked about fog plumes being created in cold weather and rising hundreds of feet in the air from the shaft at Oak Flat. In our scoping comments we say:

The GPO says that fog plumes from the cooling towers and shafts would be at least 330 feet above the east plant site.

- *Is this a traffic hazard?*
- *What impact on flora and fauna?*
- *Would these plumes affect the cultural importance and uses of Oak Flat?*

There is no discussion of this issue at all in the DEIS. Not only should these issues have been addressed in the DEIS, there also should have been a discussion of the impact of 330' tall fog plumes in the visual resources section.

Air Blast

The DEIS must address employee safety. the DEIS says absolutely nothing about methods that will be used to prevent the occurrence of air blast.

Air blasts are well known as a hazard in block caving. The air blast and associated fatalities that occurred at the Northparkes Mine in Australia in November 1999 led to a number of lessons learned, recommendations, and procedures to help prevent air blast. Precautions, such as air gap monitoring and control, that must be followed to help prevent air blast, are well known and documented, for example, in the "Cave Mining Handbook."

There is no apparent reason for the TNF to have completely ignored the subject of air blast in the DEIS. Considering the size of the proposed mine, air blast prevention must be a major consideration. A new or supplemental DEIS must include air blast effects as a possible environmental impact, and that mandatory procedures to help prevent air blast must be specified in the DEIS as a mitigation. The new DEIS should also address in using the block cave method, what will prevent vacuum pockets from developing in the orebody, thereby collapsing and creating concussion cave ins? What measures will be taken to ensure the safety of miners?

Revegetation

The variability and unpredictability in the amount of precipitation in the Oak Flat area is likely to influence which species germinate and become established on site, irrespective of whatever seed mix is used. Under actual field conditions, only some of the species in the selected seed mix are likely to respond well during any seeding event. Thus, the plant mixture that becomes established in the field is likely to differ from that desired or planned. Continuing droughts are likely to lead

to a high probability that conditions will not provide for the appropriate selection to germinate and become established.

There appears to be no provision for irrigation of reseeded areas during the 20 years of planned mining and no provision for this after mine closure. However, assuming some irrigation during the early mine life, some plantings may be established after 20 years but the plantings of later years will not. Provision needs to be made to irrigate the reclaimed areas for a long period, for example 15-20 years after mine closure. Young plants will not survive without irrigation on dirt covered waste piles during long, hot, dry periods, which will occur yearly in this area. (*Witness the failure of the promised landscaping of the waste dumps north of the Duval Mine Road and east of La Canada. When the mine closed, the irrigation was turned off, and the new vegetation has since died.)*

Pipeline Safety, Maintenance, and Replacement

DEIS Section 3.10.1.1 makes a serious mistake in equating petroleum pipelines with concentrate and tailings pipelines envisioned in the DEIS. The DEIS says:

> *The concentrate and tailings pipelines are also potentially susceptible to failure. Failures can occur from pipe damage due to geotechnical hazards such as rockslides or ground subsidence, from hydrological hazards such as scour or erosion, seismic hazards, human interference, or even lightning. Failure of these types of pipelines are not generally tracked.*

While listing a good sample of external threats to concentrate and tailings pipelines, the DEIS fails entirely to account for internal causes of pipeline failure. Copper concentrate slurry and tailings slurry is essentially liquid sandpaper and all concentrate and tailings pipelines will need repair and replacement due to interior erosion, especially in pipeline bends and turns. While the HDPE plastic lining envisioned for these pipeline may retard the caustic or acidic effects of the slurried material, it will not withstand the abrasion of the slurry itself. While Resolution Copper may use chemical lubricants to lower abrasion of the HDPE liner, this would only slow the eventual need to repair and replace the pipeline. The amount of abrasion caused by the concentrate of tailings slurry is controlled by how coarse the material is, how fast it is moving, and how much pressure is in the line. The more pressure, the bigger the blowout.

It is inconceivable that the authors of the DEIS could not find figures of concentrate and tailings pipelines. Members of the Concerned Citizens and Retired Miners Coalition (who supplied much

of the information in this section and collectively have many dozens of years working in miners, including working on pipeline repairs and replacement crews) can among themselves point to many instances of pipeline failure just at the facilities they worked. The DEIS is wrong to have so seriously discounted the problem of pipeline failure.

As copper concentrate is a terribly toxic material, the safety measures for stopping concentrate pipeline leaks or breaks need to be substantially strengthened and revised. A copper concentrate pipeline failure would be problematic for the environment at any place, but especially when the pipeline crossed riparian areas.

Tailings pipeline

The tailings pipelines for this proposed project would be huge (up to 36" in diameter). A pipeline that large would be comprised of lengths of (in this case) steel pipeline not longer than what could be trucked to the site and joined with couplings. This would result in many hundreds of couplings for the longer routes envisioned in Alternative 5 and 6. Coupling points are more prone to abrasion. The north pipeline corridor route which is the preferred route, traverses very rough country with many changes in elevation and hairpin turns. This route would be much more prone to pipeline failure than other alternatives.

The DEIS is incorrect in assuming that, like a petroleum pipeline, a leak could be stopped simply by turning a valve. The pressure, volume, and pipeline size make that impossible. Instead, the shutdown procedure for repairing a tailings pipeline leak of this size is to first ramp down and finally shut off the flow of material at the West plant, allow the tailings slurry to drain out of the pipeline and then to blow out the line all before a repair can be made. This must be done in a very short time period or else the tailings would solidify in the pipeline (this is why it needs to be blown out). This results in a tremendous amount of toxic tailings on the ground as the volume of material in the pipeline has to be totally removed from the line. Only then can the pipelined be repaired. Once the repair is made, the line has to be chemically lubricated before tailings can then flow through the pipeline. If a rupture occurs in a sensitive area, like in a pipeline crossing of Ga'an Canyon, the result would be an environmental disaster.

In order to get quickly to the site of a pipeline rupture and to get replacement material and pipe to the rupture site requires well maintained access roads large enough to accommodate large 18 wheel semi-truck capable of carrying replacement pipe.

None of these environmental concerns were addressed in the DEIS. There is no assessment of

the effects on the environment from the chemical lubricant used in these pipelines and how that lubricant is disposed of. Would it end up permanently mixed with the toxic tailings? Why didn't the DEIS look at effects the lubricant would have on water quality?

A new or supplemental DEIS must be written that address these concerns.

Tailings Alternatives

Perpetual water treatment and other liabilities

Resolution Copper, if ever built, could become the largest copper producer in the United States and one of the largest in the world. The volumes of water needed are staggering, and so is the volume of potentially acid generating tailings and waste rock. The DEIS describes various methods of tailings disposal (segregating PAG and NPAG) and mentions rough timelines for tailings dewatering, yet makes no mention whatsoever of a timeline by which the mine, as a whole, could be considered stable and no longer require perpetual care. This is one of the biggest flaws of the entire DEIS; indeed, readers of it would not normally think of any of the alternatives as requiring care 1000, 2000, or even 10,000 years into the future, but this seems to be an inevitable reality under the current plan and alternatives.

At a minimum, the DEIS should have included detailed summaries for each alternative regarding the expected timeline until no care would be required. Water treatment liabilities would be the largest component of this, but it would also relate to erosion control and vegetative cover to the extent possible.

For water liabilities, the DEIS should have covered these items for each alternative:

1. After the end of production, what are the expected volumes of tailings seepage and any other effluent source requiring water treatment over time, modeled out to 5,000 years?

2. Using data from #1, calculate the approximate cost per year of maintaining such ongoing treatment using today's costs for the technology, material inputs (such as lime) and energy requirements. Provide the methodology and background data and citations that supported this calculation.

3. Provide an assessment of the availability to energy and material inputs required to

run these operations in perpetuity.

4. For ongoing consumptive water uses, namely dust suppression, calculate the amount of water that would be required to perform these functions, and for how long. How does the balance add up between effluent requiring treatment and water requirements?

The DEIS should also attempt to analyze any other activity for which the reclamation timeline could be ongoing, such as erosion control, re-seeding, wildlife management issues, dust suppression requirements, soil remediation, and monitoring of subsidence crater stability and propagation of the crater beyond its currently-anticipated extent. For all of these, cost estimates should be included to make sure future bonds are adequate.

Tailings Facility – Embankment Type

The Preferred Alternative, Alternative 6 (Skunk Camp)—North Option, would require a centerline sand dam for the NPAG tailings, and downstream sand dam construction for PAG tailings. The NPAG embankment would contain an underdrain system comprising sand and gravel blanket and finger drains (primarily along main drainages, with some extended beneath the NPAG beach) to maintain a low saturated surface in the tailings embankment and to intercept and direct seepage from the impoundment. The PAG cells would be behind (upstream) and ultimately covered by the NPAG tailings.

Construction Type

This is a safer approach to tailings disposal than the upstream dam with mixed NPAG and PAG tailings proposed by Resolution Copper. Centerline/downstream-type construction may be safer in terms of both potential static and seismic failures than upstream construction. However we ask that a 3rd party risk analysis be undertaken to justify centerline over downstream construction for all proposed tailings dams.

Wet versus Dry Closure

Dry closure is considered safer than wet closure, because with a wet closure where containment is lost the tailings usually flush from the breach and travel downgradient with considerable force and for a great distance. In the case of wet PAG tailings, if containment is lost then oxidation of this material can be rapid and widespread. The closure scheme proposed for Alternative 6 – Skunk Camp would have a drain system under the NPAG tailings that could be utilized to keep these tailings largely unsaturated. Although the ideal dry closure would be with dry tailings,

drained tailings is the next best choice.

And, although the two PAG impoundments would be wet, they are also totally contained behind and buried by the NPAG tailings. This provides an additional physical barrier to release in the event of a structural failure.

Breach Analysis

A breach analysis shows how far tailings could be released under several scenarios, including normal operating conditions, and during/after a severe storm event. A breach analysis for the Resolution alternatives has yet to be completed.

A breach analysis could/should have been done for the Preferred Alternative, Alternative 6 (Skunk Camp) – North Option. This is not a difficult analysis.

Seismic Risk

Use of the 1:10,000 year return period earthquake as the design earthquake for the tailings dams, as is done for the Preferred Alternative, is the appropriate choice for the design event. Too many agencies use a lesser earthquake as the design event for a structure that is meant to function in perpetuity, so it is good to see the US Forest Service require the appropriate design earthquake.

The seismic analysis for the EIS is largely based on a report by Wong et. al (2013). The Wong et. al (2013) report was focused on analyzing four specific sites that were under consideration at that time: the Far West Tailings Management Area: Far West 1 and Far West 2; the Near West Tailings Management Area; and, the Pinto Valley Operations (PVO) Tailings Management Area. The Proposed Alternative 6 (Skunk Camp) was not analyzed in this report.

The Preferred Alternative, Alternative 6 (Skunk Camp) – North Option, would occupy the upper portion of Dripping Spring Valley, the northeastern slopes and foothills of the Dripping Spring Mountains, and the southwestern foothills of the Pinal Mountains, including a 4-mile reach of Dripping Spring Wash, a 3.5-mile reach of Stone Cabin Wash, and a 4.8-mile reach of Skunk Camp Wash.

Cornwall, Banks, and Phillips (1971), map an extensive fault structure running the length of Dripping Spring Wash. This fault is not mentioned in the Wong et al (2013) report or the DEIS (2019). This fault most probably bisects the dams and impoundments, so should merit further investigation and discussion in the DEIS.

The DEIS does not specify the location of the 1:10,000 year event, or the assumed magnitude of this event. In the Wong et al report (2013) it is noted that the values calculated for the PGA are "significantly lower" than the values from the USGS Probabilistic Seismic Hazard Analyses (PSHA) and (USGS 2008). The USGS National Seismic Hazard Maps are typically used to

develop the Probabilistic Seismic Hazard Analyses (PSHA) for a mine location. The US Forest Service should require the use of the most conservative estimates for seismic events because of the extremely long time period for which tailings facilities are planned to function.

In addition, the USGS has updated its National Seismic Hazard Maps (2014) since the Wong et. al. report (2013) was written. At a minimum the seismic study needs to be updated to reflect current information, and to include an analysis of the Preferred Alternative site, which was not included in the 2013 report.

The EIS must use up to date information, make conservative assumptions about the size and location of the maximum credible earthquake, and must disclose the location and magnitude of the maximum credible earthquake used for the design earthquake for the tailings dam.

In light of several recent earthquakes near Agua Prieta, Sonora, Mexico, just south of the Arizona border, the seismic analysis should be updated to assess whether this is a problem that could migrate north.

Alternative 6 Tailings Pipeline – North Option

The tailings pipeline for the Preferred Alternative, Alternative 6 (Skunk Camp)—North Option, will run along and across several faults in the route. There is no seismic risk for the tailings pipeline in the DEIS or in the Failure Modes and Effects Analysis (KCB 2019).

Tailings pipeline failure during an earthquake should have been considered in the DEIS and FMEA. In addition, tailings pipeline failures are common events at large copper mines (Gestring 2019), and should have been addressed in the FMEA.

Tailings Disposal Facilities

The DEIS identifies tailings disposal facilities as tailings storage facilities. As all tailings management scenarios assume permanent disposal of tailings at the sites identified, the tailings location should be acknowledged to be tailings disposal facilities as relocation of the tailings to a second permanent site is not proposed. As disposal facilities tailings sites are proposals with irreversible and irretrievable commitments of resources.

As permanent waste disposal sites, tailings disposal facilities alternatives should be subject to analysis of potential tailings facility risks and impacts in the event of maximum probable events for precipitation, flood, and earthquakes for all potential tailings sites.

Failure to consider peak and maximum probable events result in the tailings facilities being unable to demonstrate safety and stability through out the long-term, multi-century period where the wastes will present potential risks to people and the environment.

Lack of Baseline data on most tailings alternatives

In preparation for this DEIS, the Forest Service and Resolution Copper went to a great deal of effort to conduct Baseline Characterization tests of the Near West tailings alternative. Indeed, the agency successfully defended its action in federal court, saying such testing is needed as part of its review of the main mine. As the Forest Service stated to the federal court:

> Before consummating the land exchange, the Forest Service must first prepare an environmental impact statement ("EIS") pursuant to the National Environmental Policy Act ("NEPA") that assesses the potential environmental impact of the land exchange, the Proposed Mine and MPO, and federal actions to authorize associated operations and facilities on land that will remain federally owned. *Id.* § 539p(c)(9)(B). **To prepare that EIS, the Forest Service must obtain baseline data on federal land in the Tonto National Forest that is not part of the land exchange.**

Federal Defendants' Memorandum in Support of Motion for Summary Judgment, Case 2:16-cv-03115-DGC Document 41 Filed 03/17/17, at p. 1 (emphasis added).

> In June 2013, Resolution submitted a Plan of Operations for the Baseline Project in an area of the Tonto National Forest located approximately one mile northwest of the town of Superior. AR17546. **The purpose of the Baseline Project is to gather additional hydrological and geotechnical data that will be used in a forthcoming EIS to determine if the site is suitable for a proposed tailings storage facility, one part of Resolution's Proposed Mine.** *Id.*

Id. at 2 (emphasis added). Despite the agency's stated position that such baseline geotechnical and other baseline information is needed to support review of a tailings location in the DEIS, such analysis was not done for the other tailings locations – especially for the agency's preferred location in Skunk Camp.

In addition, regarding the tests/analysis that was done for the proposed tailings location, we have asked the Forest Service more than once for the results of those tests and they have not been provided. Nor are they provided in this DEIS. For example, the agency does not explain the

likelihood that the tests showed that the water table was much higher and the ground was more fractured than anticipated. We do not know whether this is a factor in the choosing of the Skunk Camp alternative as the preferred alternative. This baseline characterization is a key piece of information to make decisions on the Near West alternative.

The Tonto National Forest did not obtain similar baseline characterization data for the other 3 tailings alternatives. It is especially troubling that the Forest Service would choose a preferred tailings alternative without this key piece of information.

Currently the Forest Service does not definitively know whether the Skunk Camp tailings alternative is physically viable, as it was required to do for the initial proposed location. What happens if the Forest Service does the baseline characterization at a later date and finds that for any number of reasons that would be answered by the baseline characterization, that the Skunk Camp site is not suitable? Or would the Forest Service simply pass the buck and approve that alternative and let another agency make that determination. NEPA requires a hard look at the project alternatives and not providing baseline characterization on all the alternatives violated NEPA. A new or supplemental DEIS must be written to answer these questions.

<u>The Forest Service Should Have Re-scoped for the Skunk Camp Alternative</u>

Because the Skunk Camp alternative was developed so late in the DEIS process, whether by design, political pressure to get it out, or for other reasons, there is a lot we do not know. Rather than rushing out this DEIS, the Forest Service should have reopened the process and rescoped the project to allow for input in the design and baseline conditions of what should have gone into this DEIS for the Skunk Camp Alternative as is required by the NEPA.

Missing Information

As discussed above, there is no information to indicate whether the Skunk Camp tailings alternative is a physically viable location.

There are other examples of baseline data that is missing.

- For example, noise and vibration monitoring was conducted before the Skunk Camp alternative was developed so data was extrapolated from the Peg Leg alternative. As Skunk camp is within a canyon rather than on a flatter surface, noise patterns coull be substantially different.

- The Forest Service was not able to gather baseline data on property values on Dripping Springs Road before his project was sprung on them out of the blue. Now homeowners and ranchers are severely hampered if they choose to sell to get away from the dust, noise, traffic and other disadvantages of living just minutes below a toxic waste dump. The Forest Service needs to determine property values at a level before the project was announced. As it is, the data in this DEIS about the loss of property values is skewed because there is none for Dripping Springs.

- There is evidence of volcanic activity near the Skunk Camp tailings alternative. Local residents point out unusual ground movement in the nearby Pinal mountains in the last 50 years and of a sulfur vent in a mine shaft near Dripping Springs.

- There is no baseline data to determine what will happen to the water table for homeowners and ranchers near the proposed facility. At least one neighbor reports that his well is only 57 feet deep and has good tasting clear water. As the tailings plan calls for pumpack well drilled down a hundred or more feet, could his well be dewatered? the entire flow along Dripping Springs wash would be disrupted by the tailings facility. Would that affect all the downstream neighbors? Oce the flow pattern in the aquifer is changed there is a likelihood that the taste and quality of neighboring wells could be affected. That information needs to be discussed in the new or supplemental DEIS.

- No adequate baseline air quality conditions in each of the tailings locations, especially Skunk Camp and along the pipeline corridor to Skunk Camp.

- No adequate analysis of baseline groundwater quantity and quality conditions at Skunk Camp or along the pipeline corridor. For baseline groundwater quality, the DEIS lists exactly one sample at an undefined location called "Skunk Camp Well." "Assumed concentrations are based on single sample collected on 9 November 2018 and are therefore approximate." DEIS at 416-17 (Table 3.7.2-20). The agency cannot credibly assert that such a single "approximate" sample qualifies as the needed representative baseline/background groundwater quality at the Skunk Camp site and pipeline corridor.

As the Ninth Circuit recently held, rejecting an agency's post-NEPA analysis of baseline conditions:

> Without establishing baseline conditions for the Obscure Routes, the Bureau could not have analyzed the environmental impacts of the Recreation Plan properly. *Great Basin [Resource Watch v. BLM],* 844 F.3d at 1101.

> At some point *after* the public comment period closed, the Bureau attached ground photographs for a few Obscure Routes to the forms; the photographs show details about vegetation and the condition of the routes themselves. Such late analysis, "conducted without any input from the public," impedes NEPA's goal of giving the public a role to play in the decisionmaking process and so "cannot cure deficiencies" in an EA. *Id*. at 1104.

Oregon Natural Desert Association v. Rose, 921 F.3d 1185, 1192 (9th Cir. 2019)(BLM EA violated NEPA for among other resources, failure to adequately analyze baseline conditions).

Courts specifically require detailed analysis of baseline/background conditions for groundwater quality and quality. "Ninth Circuit cases acknowledge the importance of obtaining baseline condition information before assessing the environmental impacts of a proposed project." Gifford Pinchot Task Force v. Perez, 2014 WL 3019165, *28 (D. Or. 2014) (USFS/BLM EA for mineral exploration project failed to obtain and analyze baseline water quality data in violation of NEPA). In Idaho Conservation League v. U.S. Forest Service, 2012 WL 3758161 (D. Idaho 2012), conservation groups challenged the Forest Service's approval of a hardrock mining exploration project, arguing the Forest Service's environmental review failed to provide any baseline information on groundwater. In response, the Forest Service argued detailed information on groundwater resources was unnecessary because, in its judgment, the mine exploration would have "no impact" on groundwater resources. The district court disagreed, and held that NEPA requires more than "conclusory assertions that an activity will have only an insignificant impact on the environment." Id. at *14 (*quoting* Ocean Advocates v. U.S. Army Corps of Eng'rs, 402 F.3d 846, 864 (9th Cir. 2005). Instead, the court required detailed baseline data, including "a baseline hydrogeologic study to examine the existing density and extent of bedrock fractures, the hydraulic conductivity of the local geologic formations, and [measures of] the local groundwater levels to estimate groundwater flow directions." *Id.* at *16. *See also* Shoshone-Bannock Tribes of Fort Hall Reservation v. U.S. Dept. of Interior, 2011 WL 1743656, at *10 (D. Idaho 2011) (rejecting agency analysis of impacts of mine on groundwater).

As the court detailed in Gifford Pinchot Task Force:

> While Alternative 3 requires sampling and monitoring before drilling, the failure to obtain onsite data before analyzing the environmental effects means that such analysis cannot possibly be based on all of the relevant information.
> …
> Furthermore, the 2012 EA does not explain why sampling at two discrete holes

> not newly drilled as part of the Project will provide accurate information about contamination to groundwater at the drill sites. The monitoring required as part of Alternative 3 fails to address the Project's impact to groundwater.

Gifford Pinchot, 2014 WL3019165, at *31. "Ninth Circuit cases acknowledge the importance of obtaining baseline condition information before assessing the environmental impacts of a proposed project." Id. at 28. This is required because:

> Without the baseline data, the agency cannot carefully consider information about significant environmental impacts and thus, the agency fails to consider an important aspect of the problem, resulting in an arbitrary and capricious decision. *Id.* Additionally, even if the mitigation measures may guarantee that the data will be collected in the future, the data is not available during the EIS process and is not available to the public for comment. *Id.* Thus, the process does not serve its larger information role and the public is deprived of the opportunity to play a role in the decision-making process. *Id.* Baseline information before approval is required so that the agency "can understand the adverse environment effects *ab initio*." *Id.*

Gifford Pinchot at *29, quoting N. Plains Resource Council, Inc. v. Surface Transp. Bd., 668 F.3d 1067, 1083-85 (9th Cir.2011).

> "Without establishing the baseline conditions ... there is simply no way to determine what effect the [action] will have on the environment, and consequently, no way to comply with NEPA." *Half Moon Bay Fisherman's Mktg. Ass'n. v. Carlucci,* 857 F.2d 505, 510 (9th Cir.1988); *see also N. Plains,* 668 F.3d at 1085 ("without [baseline] data, an agency cannot carefully consider information about significant environment impacts. Thus, the agency fails to consider an important aspect of the problem, resulting in an arbitrary and capricious decision.").

Gifford Pinchot at *27. "NEPA requires that the agency provide the data on which it bases its environmental analysis. Such analyses must occur before the proposed action is approved, not afterward." Northern Plains, 668 F.3d at 1083 (an agency's "plans to conduct surveys and studies as part of its post-approval mitigation measures," in the absence of baseline data, indicate failure to take the requisite "hard look" at environmental impacts).

In addition, the DEIS cannot rely on future mitigation and monitoring as a substitute for accurate baseline analysis. "[B]ecause NEPA aims "(1) to ensure that agencies carefully consider information about significant environmental impacts and (2) to guarantee relevant information is available to the public[,]" the "use of mitigation measures as a proxy for baseline data does not further either purpose." Gifford Pinchot at *29, quoting Northern Plains. "I reject Defendants' and Ascot's arguments that a baseline groundwater analysis is not required before the issuance of the EA because the sampling and monitoring are being used to confirm that no significant impacts are occurring rather than addressing an issue of insufficient data." Gifford Pinchot, at *31.

DEIS language discrepancy

Page 310 of the DEIS Chapter 3—Tailings Storage Facility—Alternatives 2 and 3—Near West, contains the following curious statement:

> *"The majority of the tailings storage facility site is underlain by rocks with little permeability, with no indication of a water We are doing it. LOL. within the upper 150 to 300 feet of ground surface (Montgomery and Associates Inc. 2017c)."*

Could you explain this statement? Who is doing what and what is worth laughing about?

Tailings Dam Safety

Rio Tinto standards and procedures require all its mines to conduct tailings and waste storage facility site risk assessments including risk hazard severity and tailings facility failure inundation zone identification and responses.

Rio Tinto requires its mines to comply with its "D5 "Standard…" and "Group Procedure for the Management of Tailings and Water Storage Facilities," among other mandatory guidelines. Rio Tinto's "D5 Standard for Management of Tailings and Water Storage Facilities" approved August 2015 (Document HSEC-B-23) is cited in the Resolution DEIS at *https://resolutioncopper.com/wp-content/uploads/2016/06/D05.-Management-of-tailings-and-water-facilities2015.pdf*. The more recently approved, currently applicable "D5 Group Procedures for Management of Tailings and Water Storage Facilities", Approved March 2017 (Document HSEC-C- 14) is currently posted at *https://www.riotinto.com/documents/RT_Management_tailings_water_storage_procedure.pdf*.

Among many other tailings facilities requirements identified in Rio Tinto mandatory tailings management standards and guidelines are a requirement for an Emergency Response Plan that, per pp. 15-16 of the Group Procedure, "must include:"

- "Response plans to triggers identified in the OMM manual related to uncontrolled release of tailings and/or water based on site observations (excessive seepage, cracking, settlement, loss of free board etc.) or an extreme event (large rainfall/flood event, large earthquake event etc.)

- Inundation map that identifies people, property, infrastructure and environment values at risk from a failure of the facility. The inundation map must be determined by a dam break analysis carried out by the Design Engineer,

- Sequence of response, notifications, role specifications and responsibilities of responders, both at site and in corporate Rio Tinto,

- A schedule of resources, mobile equipment, stockpiled materials, local contractors available to respond to an emergency,

- A community and government notification process with contact information. These must include local residents in the inundation area, police and emergency services, government agencies and departments with control over mining, environment and emergency services."

Projected tailings failure inundation zone typically affect lands and stream systems downgradient of tailings and waste disposal facilities, resulting projected impacts outside the disposal sites.

The Resolution Copper DEIS does not identify tailings facility risk assessments, dam hazard ratings, failure mode analyses or inundation zone identification for potential tailings dam failures. These analyses, required by Rio Tinto procedures should be provided to stakeholders for review and analysis prior to the publication of a revised or supplemental DEIS or Final EIS.

Evaluation of the Maximum Design Earthquake for the Tailings Storage Facilities for the Proposed Resolution Copper Mine, Arizona

(See Emerman's report with the same title in the Appendix)

Hydrologic and geologic expert, Dr. Steve Emerman, conducted an evaluation of the Maximum design earthquake for the tailings storage facilities for the proposed Resolution Copper Mine in Arizona. Four of the five alternatives (Peg Leg site, Skunk Camp site, and two at the Near West site) for the tailings storage facilities for the proposed Resolution Copper Mine, Arizona involve the storage of thickened tailings (50-70% solids), while one alternative (Silver King site) involves the storage of filtered tailings (86-89% solids). According to a wide range of dam safety standards, a dam for which the failure would result in the loss of human life should be designed to withstand the Maximum Credible Earthquake (MCE), the largest earthquake that is theoretically possible within a particular seismotectonic setting. Using a statistical model based on previous tailings dam failures, the runouts from the failures of the five alternatives would be in the range 200-370 miles. Although the flow potential of filtered tailings is less than that of thickened tailings, even if the failures of the dams for the filtered tailings caused only slumping of the tailings, they would travel at least 10,400 feet from the Silver King site, and would impact the town of Superior (population 2,837) at a minimum distance of 2,500 feet. The unincorporated area of Queen Valley (population 820) would be impacted by the failures of either of the Near West facilities (minimum distance 19,000 feet) or of the Silver King facility (minimum distance 8.2 miles). The town of Florence (population 26,074) would be impacted by the failures of the Peg Leg facility (minimum distance 10.3 miles), either of the Near West facilities (minimum distance 16.0 miles), or the Silver King facility (minimum distance 20.5 miles). The unincorporated area of Dripping Springs (population 235) would be impacted by the failure of the Skunk Camp facility (minimum distance 17,000 feet). Dripping Springs, Queen Valley and Superior are all well within what has been called the “self-rescue zone” in recent Brazilian legislation. On the above basis, the tailings storage facilities should be designed to withstand the Maximum Credible Earthquake, rather than the 5,000-year earthquake that was proposed by Rio Tinto. It is recommended that anyone interested in investing in the Resolution Copper Mine should enquire as to the additional cost of designing for the MCE.

The DEIS states that the design earthquake for the tailings dams will be the Maximum Credible Earthquake (MCE), instead of the 5000-year earthquake that was stated previously. This is an improvement and is consistent with dam safety law in Arizona. However, the DEIS now states, “Analysis indicates Maximum Credible Earthquake is equivalent to 10,000-year return period.” That statement is not supported anywhere. On the contrary, according to FEMA guidelines, even faults that have shown no motion for 100,000 years should be considered in the calculation of the MCE. In addition, nothing in the DEIS explains how the tailings dams will be built so that they will withstand the 10,000-year earthquake. For example, there is no seismic stability analysis of any of the proposed designs anywhere in the DEIS.

As part of the preparation of the Environmental Impact Statement (EIS), the U.S. Forest Service put forward five alternative plans for the tailings storage facilities for the proposed mine (USDA, 2017a-b). These alternatives have been summarized in five two-page "snapshots" (USDA, 2018a-e) and in a comparative matrix format by SWCA Environmental Consultants (2018). By EIS conventions, Alternative #1 is the "no-action" alternative. Alternative #2, the preferred alternative that was presented in the General Plan of Operations (Resolution Copper Mining, 2014a-c) involves storing tailings thickened into a slurry (65% solids for scavenger tailings, 50% solids for cleaner tailings) at the Near West site behind a 520-foot-high tailings dam (see Fig. 10). Alternatives #2 and #3 are nearly spatially coincident at the Near West site, but Alternative #3 extends slightly farther in the northeast direction (see Fig. 10). Alternative #3 involves slightly thicker scavenger tailings (70% solids) and a slightly lower dam (510 feet). Alternative #4 would involve the storage of filtered tailings (86-89% solids) at the Silver King site to a height of 1,040 feet (see Fig. 10, Table 8). The dam for the Silver King site would be a "structural zone" of tailings built around the perimeter (SWCA Consultants, 2018) and would be the tallest tailings dam ever constructed. (The current tallest tailings dam in the world is the 650-foot-high Quillayes Dam at the Los Pelambres Mine in Chile (Campaña et al., 2015). Alternative #5 involves the storage of thickened tailings (60% solids for scavenger tailings, 50% solids for cleaner tailings) behind a 310-foot-high tailings dam at the Peg Leg site (see Fig. 10, Table 8). The final Alternative #6 involves the storage of similarly thickened tailings (60% solids for scavenger tailings, 50% solids for cleaner tailings) behind a 490-foot-high tailings dam at the Skunk Camp site (see Fig.10, Table 8). The total volumes of stored tailings have been predicted as 1315.45 million cubic yards for the sites storing thickened tailings and 1188.98 million cubic yards for the site storing filtered tailings (see Table 8; USDA, 2017b).

The most important aspect of the design of the tailings dam, or any other component of a tailings storage facility, is the choice of the correct safety criteria, one of which is the Maximum Design Earthquake (MDE). According to Rio Tinto, the tailings storage facilities will be designed to withstand an earthquake with a return period of 5,000 years, corresponding to an earthquake with an annual exceedance probability of 0.02%, or a 1% probability of exceedance in 50 years (Resolution Copper Mining, 2014a,c). That choice of the 5,000-year earthquake has never been justified in any document produced by Rio Tinto.

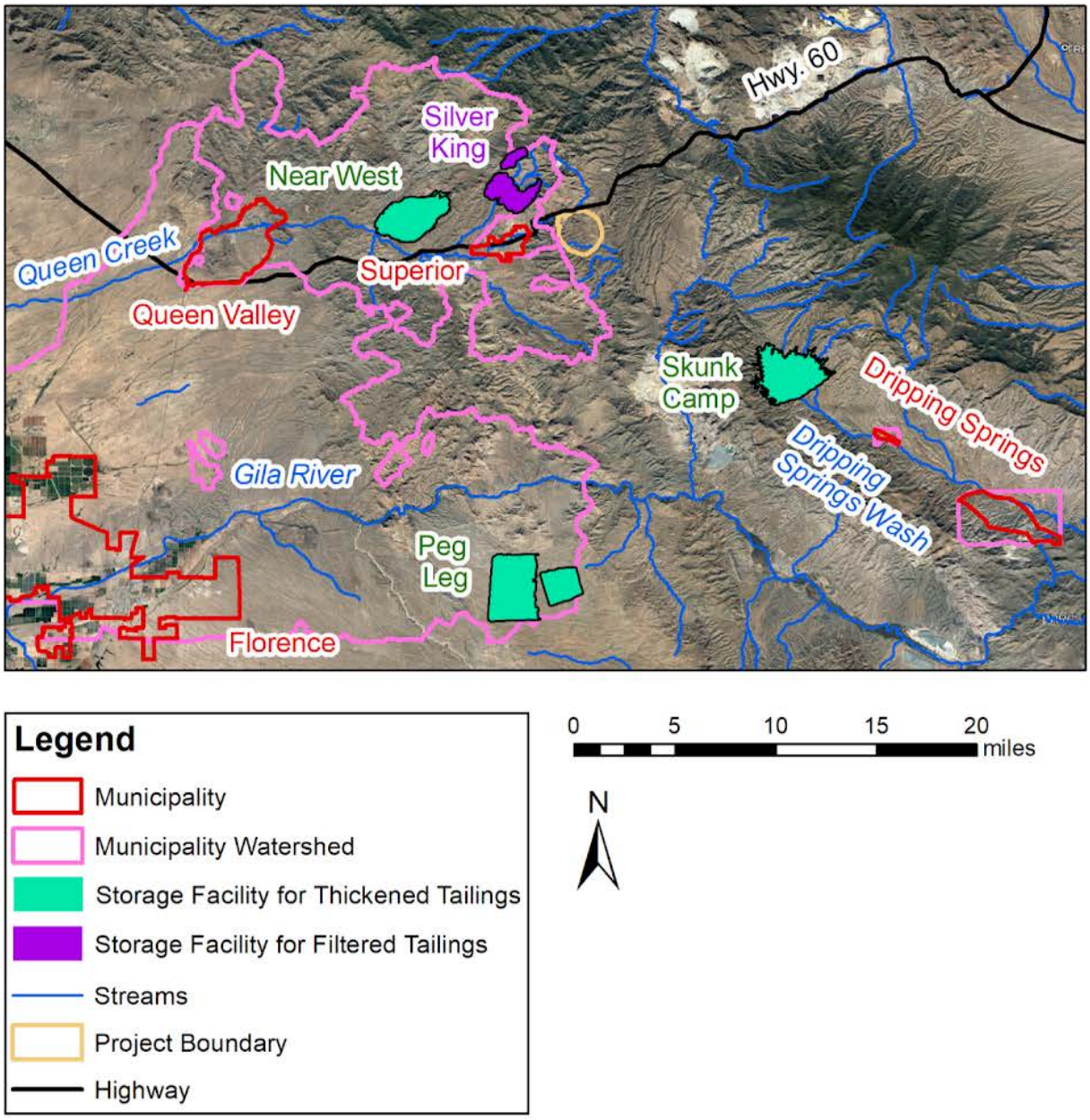

Figure 10 (Emerman): Out of the five alternatives for the tailings storage facilities for the proposed Resolution Copper Mine, four would store thickened tailings, while one would store filtered tailings. Two alternatives at the Near West site are nearly spatially coincident, with the alternative with thickest tailings being slightly larger. Failure of the Silver King facility would impact the town of Superior (population 2,837). The unincorporated area of Queen Valley (population 820) would be impacted by the failures of the Silver King or either of the Near West facilities. The town of Florence (population 26,074) would be impacted by the failures of the Peg Leg, Silver King, or either of the Near West facilities. The unincorporated area of Dripping

Springs (population 235) would be impacted by the failure of the Skunk Camp facility. On the above basis, the tailings storage facilities should be designed to withstand the Maximum Credible Earthquake, rather than the 5000-year earthquake, as proposed by Rio Tinto. Background combines Google Earth imagery from December 6, 2014, January 13, 2018, and April 6, 2018.

A common choice for the seismic design criterion, According to Emerman, is the Maximum Credible Earthquake (MCE), defined as "the largest earthquake magnitude that could occur along a recognized fault or within a particular seismotectonic province or source area under the current tectonic framework" (FEMA, 2005). According to the U.S. Army Corps of Engineers, "for critical features, the MDE is the same as the MCE" (USACE, 2016). In a similar way, according to the Federal Emergency Management Agency, "for high-hazard potential dams, the MDE usually is equated with the controlling MCE" (FEMA, 2005). The same federal agency has clarified that "dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life" (FEMA, 2013). Perhaps most relevant are the recommendations of the Arizona Department of Environmental Quality (n.d.), which states "where human life is potentially threatened, the maximum credible earthquake (MCE) should be used."

Table 8. Predicted Runout following Tailings Dam Failure

Alternative	Name	Tailings Type	Impounded Volume[1] (million yd^3)	Dam Height[2] (ft)	Spill Volume[3] (million yd^3)	Runout[3] (mi)
2	Near West	Thickened	1315.45	520	309.1	266.7
3	Near West	Thickened	1315.45	510	309.1	263.9
4	Silver King	Filtered	1188.98	1040	280.8	370.3
5	Peg Leg	Thickened	1315.45	310	309.1	201.2
6	Skunk Camp	Thickened	1315.45	490	309.1	258.2

[1]Impounded volumes from USDA (2017b).
[2]Dam heights from SWCA Environmental Consultants (2018).
[3]Spill volume and runout calculated from statistical model in Larrauri and Lall (2018).

The MCE is simply the largest earthquake that is theoretically possible at a given location, with no defined return period or probability of occurrence (USACE, 2016). However, some insight

into the difference between the 5,000-year earthquake and the MCE can be gained by considering the guidelines of the Canadian Dam Association (2013). These guidelines classify dams into five categories, based upon the consequences of failure. The three dam classes with the highest failure consequences are high, very high and extreme, corresponding to loss of life of 10 or fewer persons, 100 or fewer persons, and more than 100 persons, respectively (Canadian Dam Association, 2013). These guidelines use two approaches for determining the safety criteria for dam design. Using a risk-informed approach, dams in the very high- and extreme-consequence categories should be designed to withstand a 10,000-year event. Using a standards-based approach, dams in the extreme-consequence category should be designed to withstand either the MCE or the 10,000-year earthquake (Canadian Dam Association, 2013). The above suggests an equivalence between the MCE and the 10,000-year earthquake, although the same guidelines emphasize that the MCE has no associated return period (Canadian Dam Association, 2013). On the other hand, in the context of discussing criteria for determining the MCE at a particular location, FEMA (2005) states, "For high-hazard potential dams, movement of faults within the range of 35,000 to 100,000 years BP is considered recent enough to warrant an 'active' or 'capable' classification." In summary, it is important to note that the MCE can be much stronger than the 5,000-year earthquake and can be as rare as a 100,000-year earthquake, with a corresponding annual exceedance probability of 0.001%.

One of the objectives of Emerman's study (2018b, Evaluation of the Maximum Design Earthquake for the Tailings Storage Facilities for the Proposed Resolution Copper Mine, Arizona) was to answer the following question: Is the ability to withstand the 5000-year earthquake the appropriate design criterion for the tailings storage facilities at the proposed Resolution Copper Mine? Based on the discussion above, the question is equivalent to the following: Would the failure of the tailings dams at the Resolution Copper Mine result in the probable loss of at least one human life? Although Emerman's study was prepared at the request of the Arizona Mining Reform Coalition, the intended audience is individuals or companies who might wish to invest in the copper project or the companies managing the copper project. For context, Resolution Copper Mining is owned 55% by Resolution Copper, a Rio Tinto subsidiary, and 45% by BHP Copper, a BHP-Billiton subsidiary (Rio Tinto, 2018). It might be assumed that the possible failure of a tailings dam and the resulting loss of human life are more of a human rights issue than a financial issue. However, for the purpose of this report, it will be assumed that Rio Tinto would not actually construct tailings dams that would endanger human life, so that the issue is whether Rio Tinto, at this point, has correctly taken into account the real cost of constructing and maintaining tailings storage facilities at the appropriate safety level. Previous reports concerning the financial viability of the Resolution Copper Mine include evaluations of the impact of the discovery of geothermal water on the mining project (Emerman, 2018a, Potential impact of geothermal water on the financial success of the Resolution Copper Mine,

Arizona: Report to Arizona Mining Reform Coalition), the projected electricity and water consumption of the project (Emerman, 2019, Projected consumption of electricity and water by the proposed Resolution Copper mine, Arizona: Report to Arizona Mining Reform Coalition, 13 p), and the impact of the land subsidence that would be caused by the project on the sacred lands of the Apache.

Predicted runouts due to failure of the tailings dams at each of the five alternative tailings storage facilities range from 201 miles (Peg Leg site) to 370 miles (Silver King site; see Table 8, Predicted Runout). Although the predicted runouts may seem surprisingly large, it should be noted that, compared to past tailings dam failures, the impounded volumes and dam heights are "off the charts." For the Resolution Copper Mine, the impounded volumes are either 1315.45 million cubic yards for thickened tailings or 1188.98 million cubic yards for filtered tailings (USDA, 2019b; see Table 8). By contrast, the largest volume of impounded tailings at any tailings dam that has failed thus far was 97 million cubic yards at the Mount Polley Mine in British Columbia that failed in 2014 (Larrauri and Lall, 2018). Moreover, the tallest tailings dam that has failed thus far was the 295-foot-high Fundão Dam at the Samarco Mine in Brazil that failed in 2015 (Larrauri and Lall, 2018), which was not as tall as any of the proposed tailings dams for the Resolution Copper Mine (see Table 8). Predicted spill volumes, which depend only upon the impounded volume are either 309.1 million cubic yards for thickened tailings or 280.8 million cubic yards for filtered tailings (see Table 8). Again, by contrast, the largest tailings spill that has occurred thus far was 42 million cubic yards from the failure of the Fundão Dam (Larrauri and Lall, 2018).

The important point is that tailings dam failures could have very wide-ranging impacts, extending over hundreds of miles, and that the previously-mentioned local population centers are simply the "front line" of affected populations. It could be argued that the statistical model based upon past tailings dams failures does not apply to the Silver King site, which will store filtered tailings. Based upon their lower water content, filtered tailings will have much less ability to mobilize into a flow slide than more conventional unthickened or thickened tailings. Moreover, none of the data points used by Laurarri and Lall (2018) seem to have involved dams that stored filtered tailings. However, a collapse of filtered tailings could potentially evolve into a flow slide if the tailings mixed with enough water following collapse, and the Silver King site sits on the flow path of King Wash, a tributary of Queen Creek (see Fig. 10). Even in the best-case scenario, a failure of the tailings dam at the Silver King site would result in the slump of the filtered tailings that would extend for a distance of roughly ten times the dam height or 10,400 feet (Klohn Crippen Berger, 2017).

All of the local population centers include at least one proposed tailings dam in its watershed, so

that the failure of each of the five alternatives has the potential to result in the loss of human life. It has already been shown that the predicted runouts are so large that the ability of a tailings spill to reach a local population center is not a factor. The watershed of Superior includes the Silver King site at a minimum distance of 2500 feet (see Fig. 10). Even a slump of filtered tailings with no added water would nearly cover the entire town of Superior. The unincorporated area of Queen Valley would be impacted by the failures of either of the Near West facilities (minimum distance 19,000 feet) or of the Silver King facility (minimum distance 8.2 miles; see Fig. 10). The town of Florence would be impacted by the failures of the Peg Leg facility (minimum distance 10.3 miles), either of the Near West facilities (minimum distance 16.0 miles), or the Silver King facility (minimum distance 20.5 miles; see Fig. 10). Based on the DEMs, the watershed of Dripping Springs does not include the Skunk Camp facility. However, Dripping Springs sits on the bank of Dripping Springs Wash, which would be quite likely to overflow following a tailings spill from the Skunk Camp site, a minimum distance of 17,000 feet from Dripping Springs (see Fig. 10). It should be noted that, based upon the populations of Superior, Queen Valley, Florence, and Dripping Springs, all of the proposed tailings dams should be placed into the extreme-consequence category (more than 100 persons at risk), using the classification system of the Canadian Dam Association (2013).

Following the failure of the tailings dam at the Córrego do Feijão Mine in Brazil on January 25, 2019, which resulted in 308 people missing or confirmed dead, the new Brazilian mining regulations and legislation introduced the concept of "zonas de autossalvamento," which are literally the "self-rescue zones" or the zones in which no rescue is possible (Agência Nacional de Mineração [National Mining Agency], 2019; Assembleia Legislativa de Minas Gerais [Legislative Assembly of Minas Gerais], 2019). This "self-rescue zone" has been defined as either 10 kilometers (6.2 miles) along the course of the valley or the portion of the valley that can be reached by the tailings flow within 30 minutes, whichever is greater (Assembleia Legislativa de Minas Gerais, 2019). In the Brazilian state of Minas Gerais, it is currently illegal to construct a tailings dam where there is a population residing in the "self-rescue zone" (Assembleia Legislativa de Minas Gerais, 2019). It should be noted that the town of Superior and the unincorporated areas of Dripping Springs and Queen Valley are all well within this "self-rescue zone." Although of course the U.S. Forest Service would not be bound by any legislation passed in Brazil, the proposal for a mining project in Arizona that would be illegal in a developing country should be a cause for pause and reflection.

At this point, it is appropriate to ask how quickly the local population centers could be overrun by mine tailings following the failure of a tailings dam. There have not been many measurements of the velocities of tailings flow slides, but they have ranged from 20-160 km/h (12-100 mph) (Jeyapalan, 1981). (The lower limit of 20 km/h apparently accounts for the equivalence between

10 km and 30 minutes in the Brazilian legislation.) According to Petley (2019), the tailings flow slide following the recent failure of the dam at the Córrego do Feijão Mine accelerated to 120 km/h (75 mph) and then slowed to 66 km/h (41 mph). Using the most conservative value of 12 mph and the above minimum distances between local population centers and tailings storage facilities, the tailings flood would arrive at Superior in 2.4 minutes, at Dripping Springs in 16 minutes, at Queen Valley in 18 minutes, and at Florence in 51.5 minutes.

It should now be abundantly clear that, due to the probable loss of human life that would result from failure of the tailings dams, the Maximum Credible Earthquake (MCE), and not the 5000-year earthquake, is the appropriate design criterion for the proposed tailings storage facilities. The only remaining question is the additional cost of construction and operation of the facilities that would be necessary to accommodate the strengthened safety standard. The higher safety standard is not a minor change. Based on calculations presented in Table 3 of Appendix I in Resolution Copper Mining (2014c), at the Near West site, the predicted acceleration that would result from a 10,000-year earthquake is considerably greater (factor of 1.16-1.34 over the range 0.01-10 seconds for periodicity of seismic shaking) than what would result from a 5000-year earthquake (see Fig. Emerman, “At the Near West Site”) In fact, the predicted accelerations show no signs of approaching an asymptotic limit as the earthquake return period is increased from 100 years to 10,000 years (see Fig. Emerman, “At the Near West Site”)

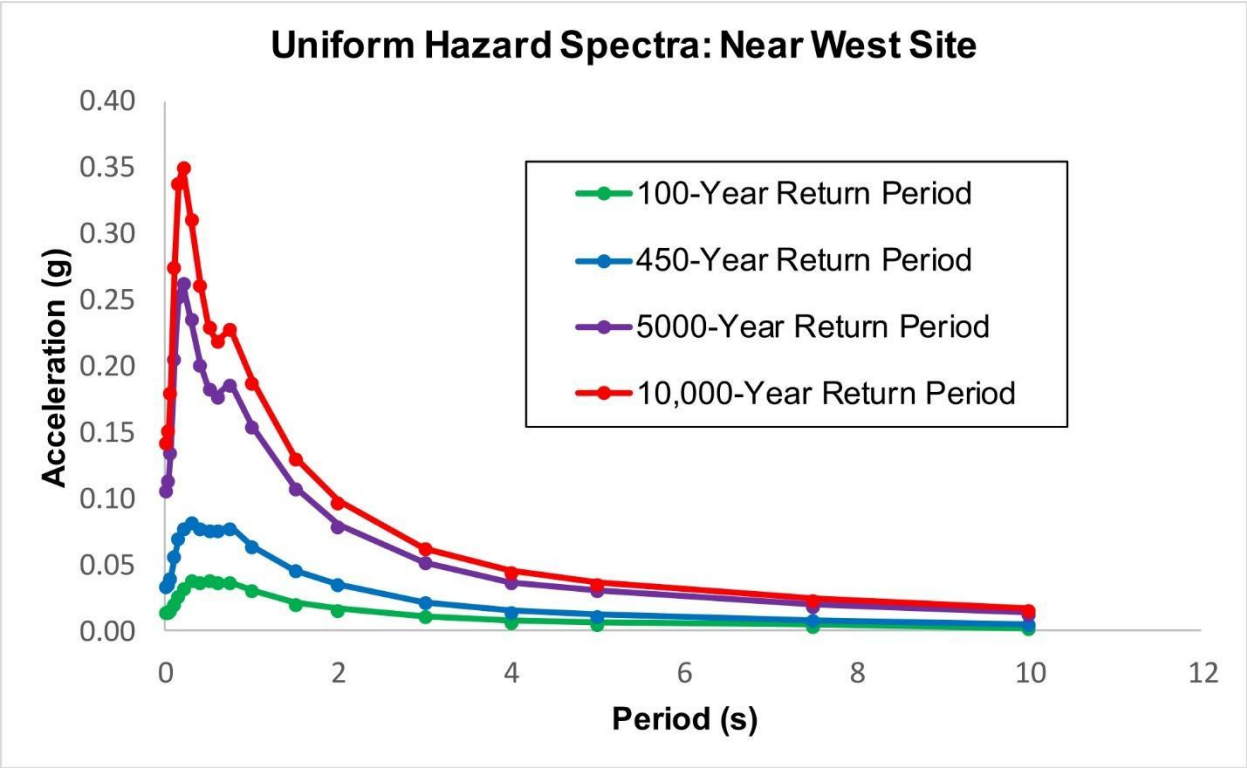

Figure 11 Emerman, "At the Near West Site": At the Near West site, the predicted acceleration that would result from a 10,000-year earthquake is considerably greater (factor of 1.16-1.34) than what would result from a 5,000-year earthquake. Graph created from calculations in Table 3 of Appendix I in Resolution Copper Mining (2014c).

The additional costs should be considered in light of the common causes of failures of tailings dams during earthquakes. Most failures are a result of some form of liquefaction of either the foundation, the tailings dam, or the tailings stored behind the dam. Under normal circumstances, although there is water in the pores between the solid particles within the soil, tailings or tailings dam, the particles are touching one another, so that the overlying load is carried by the solid particles (and partially by the water). However, during seismic shaking, the particles can separate, so that they are no longer touching one another, and all of the load is carried by the interstitial water. Since water has no shear strength, the soil or the mass of tailings and water behaves as if it were a liquid. Regardless of the method of dam construction, the foundation could be potentially liquefiable during an earthquake. If that is the case, the foundation might require appropriate compaction prior to dam construction, or the liquefiable foundation material might need to be removed and replaced with more appropriate material, or it might be necessary to choose a different site.

Aside from the foundation, the potential for liquefaction for each alternative, and the cost of

preventing liquefaction are a function of the proposed methods of dam construction. According to SWCA Environmental Consultants (2018), the current plans are for dam construction using the modified centerline method for both alternatives at the Near West site and for the use of the true centerline method at the Peg Leg and Skunk Campsites. In all cases, the dams would be constructed out of the coarser (sand-sized) fraction of the same tailings that would be confined behind the dam. The important difference is that, in the modified centerline method, the tailings dam is partially underlain by the softer, uncompacted tailings that are confined by the dam (Haile and Brouwer, 1994). The result is that the dam could fall into the liquefied tailings below, even if the dam maintained its own structural integrity. For both types of construction, seismic liquefaction would need to be avoided by maintaining a sufficiently low water table, both within the dam and the tailings pile. This would involve the installation and maintenance of appropriate internal drainage systems. In addition, there would be a need for appropriate operational procedures that would avoid mixing of sands and finer-sized particles (called slimes) within the tailings pile in order to keep the permeability of the sands high enough so that water could escape. Moreover, the rate of addition of new tailings to the facility would have to be sufficiently slow so as to allow enough time for dewatering and consolidation of tailings. Finally, the likelihood of all forms of liquefaction failure could be reduced by decreasing the outward slope of the dam, which requires more construction material. Although the plan is to construct the dam out of the tailings themselves (SWCA Environmental Consultants, 2018), if there were insufficient coarser tailings for this purpose, it would be necessary to purchase or quarry construction material, thus further increasing the cost.

The additional cost of strengthening safety standards also applies to the dam at the Silver King site that would store only filtered tailings, especially considering that, at 1,040 feet, this would be the tallest tailings dam ever built by an extra 390 feet. In the matrix of alternatives, SWCA Environmental Consultants (2018) wrote in the category "Tailings Embankment" for the Silver King site, "None. Structural zone of filtered tailings built around perimeter." This is simply a choice of vocabulary, since a wall of filtered tailings that is intended to confine other filtered tailings still has the same safety function of a dam. Although liquefaction is much less likely for filtered tailings, it is still necessary to prevent slumping of the dam during an earthquake, which would require reducing the outward slope of the structural zone of filtered tailings, thus requiring additional construction material. Moreover, infrastructure is required to prevent the addition of water to the tailings pile, such as appropriate upstream diversions and dams, and this infrastructure must also be able to withstand the MCE (since its failure could result in the failure of the tailings dam).

It is impossible to estimate the additional cost of strengthening safety standards for the proposed tailings storage facilities without further information. In fact, none of the documents that have

been made available by Rio Tinto have provided any information about the costs of construction and operation of the proposed tailings storage facilities, even under the weaker safety standard.

The conclusions of Emerman's report (see Appendix, Evaluation of the Maximum Design Earthquake for the Tailings Storage Facilities for the Proposed Resolution Copper Mine, Arizona) can be summarized as follows:

- Using a statistical model based on previous tailings dam failures, the predicted runouts from the failures of the five alternative tailings storage facilities would be in the range 200-370 miles.
- Although the flow potential of filtered tailings is less than that of thickened tailings, even if the failures of the dam for the filtered tailings (Silver King site) caused only slumping of the tailings, they would travel at least 10,400 feet, and would impact the town of Superior (population 2,837) at a minimum distance of 2,500 feet.
- The unincorporated area of Queen Valley (population 820) would be impacted by the failures of either of the Near West facilities (minimum distance 19,000 feet) or of the Silver King facility (minimum distance 8.2 miles).
- The town of Florence (population 26,074) would be impacted by the failures of the Peg Leg facility (minimum distance 10.3 miles), either of the Near West facilities (minimum distance 16.0 miles), or Silver King facility (minimum distance 20.5 miles).
- The unincorporated area of Dripping Springs (population 235) would be impacted by the failure of the Skunk Camp facility (minimum distance 17,000 feet).
- Dripping Springs, Queen Valley and Superior are all well within what has been called the "self-rescue zone" (where no rescue is possible) in recent Brazilian legislation.
- What is the response of Rio Tinto to recent Brazilian legislation that forbids the construction of tailings dams where there is a population residing within 10 kilometers (6.2 miles) downslope from the dam?
- What would be the additional cost of constructing and operating tailings storage facilities to meet the safety standard of the Maximum Credible Earthquake, as opposed to the 5,000-year earthquake?

Effects of tailings dam failure on downstream water users

Did the Forest Service consult with SCIP and other irrigation user groups regarding the potential for major water quality issues to their water supply in the event of a Tailings Storage Facility

failure and if not, why not?

Why didn't the Forest Service adequately consider the financial and societal hardships to the public if Queen Creek, Dripping Springs, or the Gila River were to be contaminated by Resolution Copper from chronic pollution or from the catastrophic collapse of the Tailings Storage Facility?

Land Subsidence at Oak Flat

Mining is predicted to result in a "*Large, visible crater with cave angles of 70 to 78 degrees and with a depth between approximately 800 and 1,115 feet at the end of mine life ... the fracture limit is estimated to extend to within approximately 1,115 feet (340 m) from Apache Leap, and to approximately 3,445 feet (1,050 m) from Devil's Canyon. The fracture limit area is roughly 1.8 miles in diameter*." (DEIS 2019).

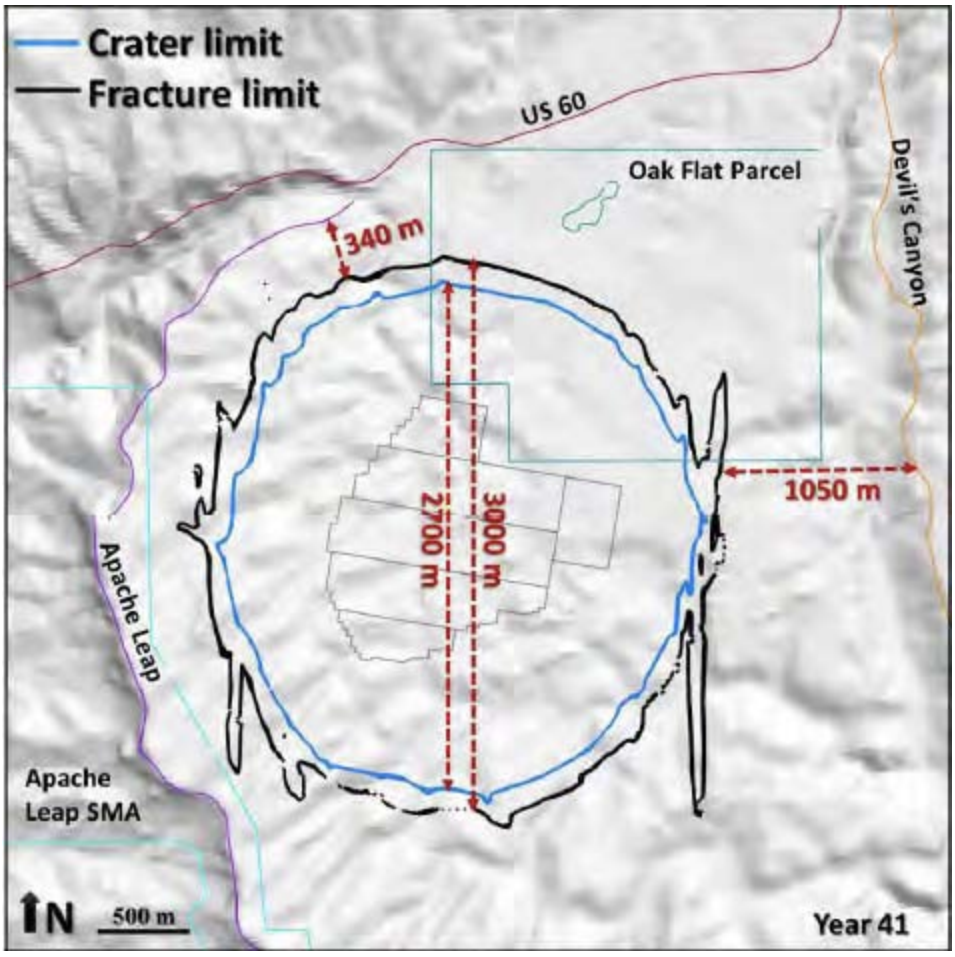

Figure 12 (DEIS 2019) Predicted crater (blue) and fracture limits (black) at the end of mine life.

It should be noted that if the subsidence angle turns out to be less than the 70 to 78 degrees predicted, especially after mining ceases, the fracture zone shown in Figure 16 (DEIS 2019) would move closer to Apache Leap. Any mining of a deeper resource, if done by block caving, the only method considered by Resolution Copper, the fracture zone would likely also widen. As a result, a significant part of the deeper resource would need to be sterilized to protect Apache Leap. With underground backfill this significant part of the resource could be mined. Underground mining with backfill was inappropriately eliminated from consideration as an alternative because the impacts that could be avoided were not given proper consideration. In addition, the Forest Service expert undervalued the orebody, and dry tailings for backfill is technically feasible as the Forest Service approval of Rosemont clearly demonstrates.

Values Lost Due to Subsidence (DEIS 2019)

The environmental and social values lost due to subsidence are listed in the DEIS. These include:

"The subsidence area (approximately 1,560 acres of NFS lands, prior to the land exchange) would be lost for public access in perpetuity. Based on current knowledge, the steep and unstable slopes of the subsidence area are projected to be unsafe for future public access." Tribal Values and Concerns

"Development of the Resolution Copper Mine would directly and permanently damage the NRHP-listed Chí'chil Biłdagoteel Historic District TCP. Other large-scale mine development along with smaller transportation, utility, and private land development projects in the greater Superior region may also affect places and resources of value to Native Americans, including historical and ceremonial sites and culturally valued landforms and features. Dewatering or direct disturbance would impact between 14 and 16 groundwater dependent ecosystems, mostly sacred springs. While mitigation would replace water, impacts would remain to the natural setting of these places.

Burials are likely to be impacted; the numbers and locations of burials would not be known until such sites are detected as a result of mine-related activities.

Under this or any action alternative, one or more Emory oak groves at Oak Flat, used by tribal members for acorn collecting, would likely be lost. Other unspecified mineral- and/or plant-collecting locations would also likely be affected; historically, medicinal and other plants are frequently gathered near springs and seeps, so drawdown of water at these locations may also adversely affect plant availability." Area of Watershed Lost

Queens Creek 1.76 square miles

Devils Canyon 0.94 square miles Water Resources: Groundwater Quantity and Groundwater-Dependent Ecosystems

"When block-caving occurs, groundwater impacts expand to overlying aquifers and two more groundwater-dependent ecosystems (springs) are anticipated to be impacted. ... Groundwater supplies in Superior and Top-of-the-World could be impacted by groundwater drawdown but would be replaced through mitigation." "After closure, the reflooded block-cave zone is anticipated to have poor water quality (above Arizona water standards)." Water Resources: Surface Water Quantity

"There would be a reduction in average annual runoff due to the subsidence crater capturing precipitation, amounting to 3.5% at the mouth of Devil's Canyon, and 3.5% in Queen Creek at Whitlow Ranch Dam." Queen Creek and Tributaries

Queen Creek above Superior: *"Reduction in surface runoff volume due to subsidence is estimated to be 18.6% at Magma Avenue Bridge (see Section 3.7.3, Surface Water Quantity). Reduction in runoff volume could reduce amount of water temporarily stored in shallow alluvium or fracture networks. Impacts above Superior could include a reduction or loss of spring/stream flow, increased mortality or reduction in extent or health of riparian vegetation, and reduction in the quality or quantity of aquatic habitat from loss of flowing water, adjacent vegetation, or standing pools."*

Queen Creek below Superior: *"Reduction in surface runoff volume due to subsidence is estimated to range from 13.4% reduction at Boyce Thompson Arboretum to 3.5% reduction at Whitlow Ranch Dam. Channel largely ephemeral and habitat is generally xeroriparian in nature, accustomed to ephemeral, periodic flows. Impacts on this type of vegetation would be unlikely due to surface flow reductions of this magnitude."* Devil's Canyon

"Reduction in surface runoff volume due to subsidence ranges from 5.6% reduction at DC8.1C to 3.5% reduction at confluence with Mineral Creek (see Section 3.7.3, Surface Water Quantity). During critical dry season (May/June), percent reductions are approximately the same. Flow reductions could contribute to a reduction in the extent and health of riparian vegetation and aquatic habitat." Rancho Rio Canyon

"A portion of the Rancho Rio Canyon watershed is within the subsidence area, and a reduction in surface water volume is anticipated." Springs in the Queen Creek Basin:

"Under the proposed action, drawdown continues to propagate well beyond 200 years. The modeled groundwater level trends generally suggest maximum drawdown does not occur until

600 to 800 years after the end of mining at the distant spring locations (Morey 2018c).” Longer Term Modeled Impacts – Water Supplies

“The predicted groundwater trends suggest that the impacts shown ... for Top-of-the-World are likely the maximum impacts expected (Morey 2018c). However, the groundwater trends for wells in Superior ... suggest that maximum drawdown would not occur until roughly 600 years after the end of mining. Impacts on groundwater supplies relying on the regional deep groundwater system near Superior may continue to worsen beyond the results report(ed) ...” Recreation

“All public access would be eliminated on 4,933 acres. Rock climbing opportunities at Euro Dog Valley, Oak Flat, and other portions of the mine area would be lost under all action alternatives but would be partially mitigated by new climbing area(s) set aside by Resolution Copper.”

“The land exchange would have significant effects on recreation. The Oak Flat Federal Parcel would leave Forest Service jurisdiction, and with it myriad recreational opportunities currently available and used by the public. The Oak Flat bouldering area offers freestanding bounders and small cliff-lined canyons with over 1,000 documented boulder routes and problems. The area has held various bouldering and climbing competitions as recently as 2016 and the Phoenix Bouldering Contests and Phoenix Boulder Blasts through 2004; all climbing and bouldering areas would be lost when the Oak Flat Federal Parcel transfers out of Federal ownership. Additional recreational activities that would be lost include camping at the Oak Flat Campground, picnicking, and nature viewing. The campground currently provides approximately 20 campsites and a large stand of native oak trees. It also is boasted as an important birding destination with approximately 183 different species reported by birders.”

This is an impressive list of predicted impacts, yet the DEIS treats these predictions as a fait accompli. These are, however, preventable losses. For the operators of a large, rich, ore body to take into account a multitude of significant environmental and social resource losses that can be prevented by conducting responsible mining instead of maximizing economic profit, which will have little long-term benefit in the area of the mine, is not too much for a responsible land manager, like the US Forest Service, to require.

Evaluation of Predictions of Land Subsidence due to Panel Caving at the Resolution Copper Mine, Arizona

(See Emerman’s full report in the Appendix with the same title)

Hydrologic and geologic expert, Dr. Steve Emerman conducted a study into land subsidence due to panel caving at the proposed mine site. The Resolution Copper Mine that is being proposed would process up to 150,000 metric tons of ore per day from an ore body at a depth of

5,000-7,000 feet. The mining would be carried out using block caving, a type of underground mining that involves controlled cave-ins of overlying rock. Panel caving, the particular variation of block caving that would be used at the Resolution Copper Mine, divides the ore body into smaller panels that are mined sequentially. Land subsidence is a typical consequence of block caving. Rio Tinto has predicted that the maximum depth of the crater will be 984 feet, but that the subsidence zone will reach only 1,500 feet from the sacred escarpment of Apache Leap. Rio Tinto has provided a description of the types of data used to predict subsidence, but not the actual data or the details of the modeling. The only exception is a map of the geological faults, which are the most important structures that transmit deformation. In that case, it can be shown from satellite imagery and aerial photography that the West Boundary Fault, which connects the footprint of the ore body with Apache Leap, was mapped in the wrong location with an offset of 2000 feet. Rio Tinto has described an extensive program of subsidence monitoring that relies on the assumption that "subsidence is a slow and gradual process that is predicted…and controlled." However, unanticipated subsidence occurs in 20% of block caving projects and the manual relied upon by Rio Tinto emphasizes the known risks of rapid subsidence and rockbursts. No error bounds have been provided on the limits of the subsidence zone. However, based upon the uncertainty in the prediction of maximum crater depth (coefficient of variation = 20%), the probability that the subsidence zone will reach Apache Leap is 5.3%, not taking into account any incorrect data used by Rio Tinto. By any standards, this is regarded as an unacceptable risk for the destruction of irreplaceable cultural and religious heritage.

Emerman notes in his study of the evaluation of predictions of land subsidence due to panel caving at the proposed RCM that the DEIS estimates for the proposed Resolution Copper Mine a maximum crater depth of 800-1,115 feet with closest approach to Apache Leap of 1,115 feet. The previous estimates were maximum crater depth of 656-984 feet with closest approach to Apache Leap of 1,500 feet. There is no explanation as to why these two estimates have changed. There is still no estimate of the uncertainty in the closest approach to Apache Leap. There is also no explanation as to the statistical interpretation of a range of 800-1,115 feet for the maximum crater depth. A possible interpretation is 800-1,115 feet means (957.5 ± 157.5) feet, where the uncertainty is the standard deviation. In this case, the coefficient of variation would be 16.4%.

Since the distance from the center of the ore body to the eastern edge of Apache Leap is 6,150 feet, the predicted distance from the center of the ore body to the outer limit of the subsidence zone in the direction of Apache Leap is 5,035 feet. Assuming the same coefficient of variation of 16.4%, the standard deviation of that prediction is 828 feet. Then assuming that the population of predictions of the distance of the outer edge of the subsidence zone from the center of the ore body follows a normal distribution with mean equal to 5,035 feet and standard deviation equal to 828 feet, the probability that the outer limit of the subsidence zone will extend onto Apache Leap

or beyond is 8.9%. This is considerably higher than the probability of 5.3% that was calculated based upon the previous information.

The porphyry copper deposit occurs 5,000-7,000 feet beneath the surface and has an inferred resource of 1790 million tons with a copper grade of 1.47% and molybdenum grade of 0.037% (Houston et al., 2010; Cherry, 2011; Hehnke et al., 2012). The ore processing rate is predicted to be 120,000 metric tons per day with a maximum processing rate of 150,000 metric tons per day. Process improvements over the anticipated 40-year life of the project could increase the ore processing rate by up to 25%, for a maximum throughput of 187,500 metric tons per day (Resolution Copper Mining, 2014a-c).

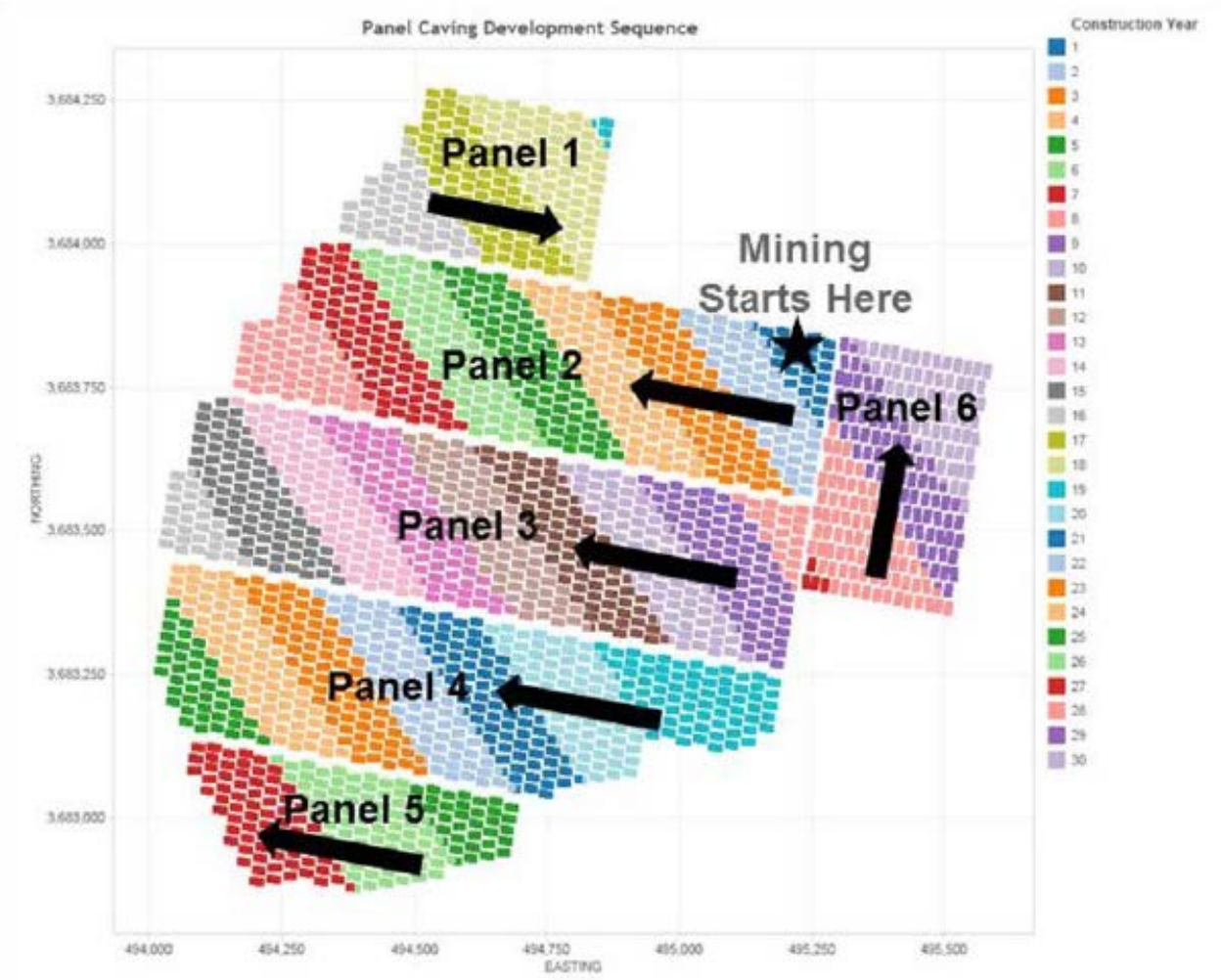

Figure 13 Emerman, "Block Caving," Block caving is a type of underground mining that involves controlled cave-ins of overlying rock. Panel caving, the variation of block caving that is

planned at Resolution Copper Mine, involves dividing the ore body into smaller panels that are mined sequentially. Land subsidence is a typical consequence of block caving. Figure from Resolution Copper Mining (2014a).

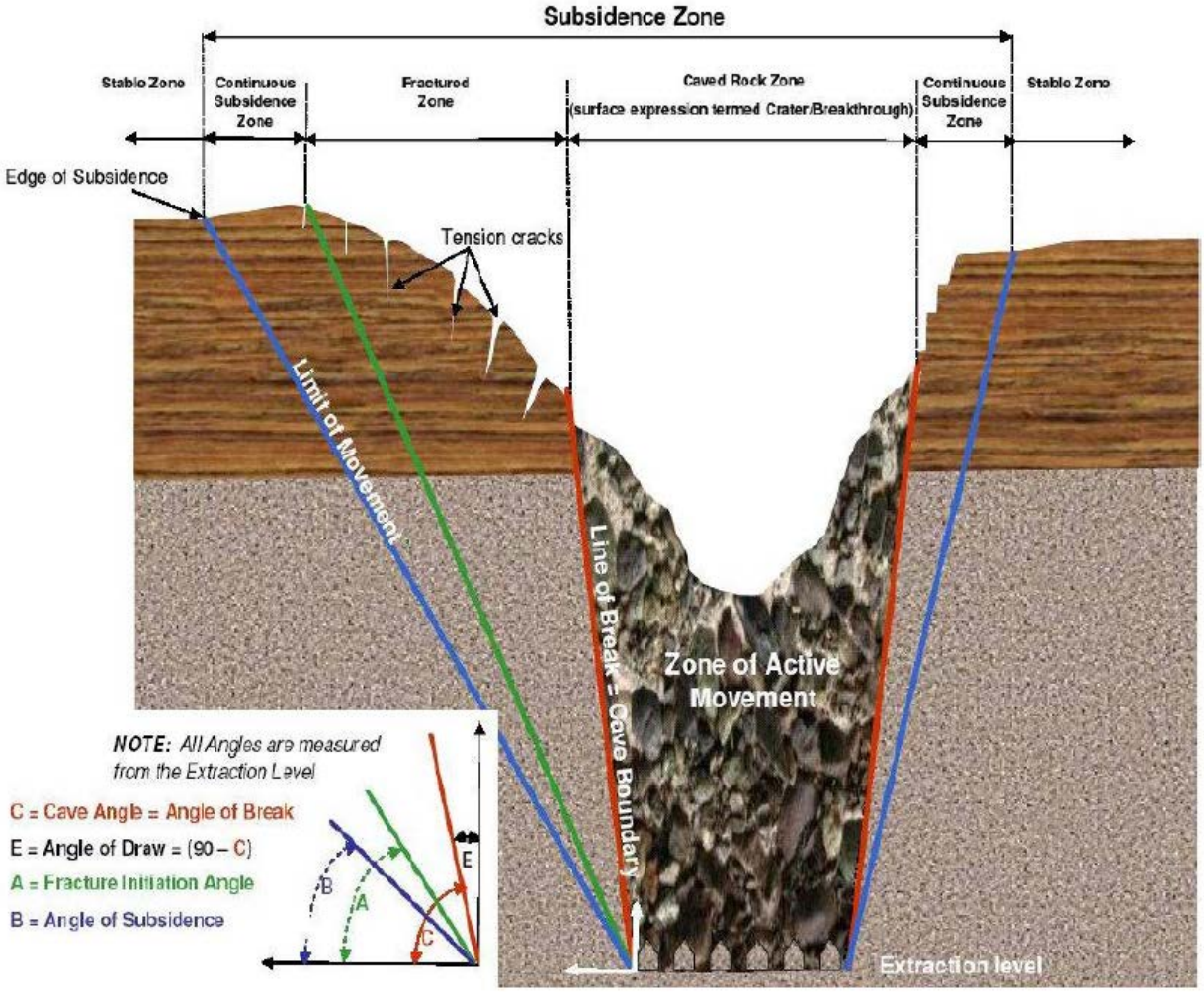

Figure 14 Emerman, "The Subsidence Zone," The subsidence zone can be divided into the caved rock zone, the fractured zone and the continuous subsidence zone. The caved rock zone is the zone of greatest vertical displacement and consists of fragmented rocks of all sizes. The fractured zone is the zone where visible deformation can be seen on the surface, including cracks and slumps. In the continuous subsidence zone, deformation can be detected only by high-resolution monitoring equipment. The region outside of the subsidence zone is called the stable zone. Figure from Resolution Copper Mining (2014c).

According to the proposal, mining will be carried out using block caving, a type of

underground mining that involves controlled cave-ins of overlying rock (Resolution Copper Mining, 2014a,c). Panel caving, the variation of block caving that is planned at Resolution Copper Mine, involves dividing the ore body into smaller panels that are mined sequentially (see Fig. Emerman, "Block Caving" above) As expected, land subsidence is a typical consequence of block caving. Since the overlying rock increases in volume from its in situ state as it collapses (a process called bulking or swelling), the land subsidence should be smaller than the thickness of the ore body that is mined. Rio Tinto earlier predicted that the maximum land subsidence in the center of the crater that would form over the ore body would be 656-984 feet (Resolution Copper Mining, 2014a), but the DEIS now estimates it at 800-1115 feet with no explanation as to the source of these numbers or their variance.

An important consideration is the lateral extent of the region that will be affected by land subsidence. The block caving vocabulary varies somewhat, but Fig. Emerman, "The Subsidence Zone" above explains the terminology used by Rio Tinto (Resolution Copper Mining, 2014c). The subsidence zone can be divided into the caved rock zone, the fractured zone and the continuous subsidence zone. The caved rock zone is the zone of greatest vertical displacement and consists of fragmented rocks of all sizes from boulders to clay-sized particles. The fractured zone is the zone where visible deformation can be seen on the surface, including cracks and slumps. In the continuous subsidence zone, deformation can be detected only by high-resolution monitoring equipment. The region outside of the subsidence zone is called the stable zone.

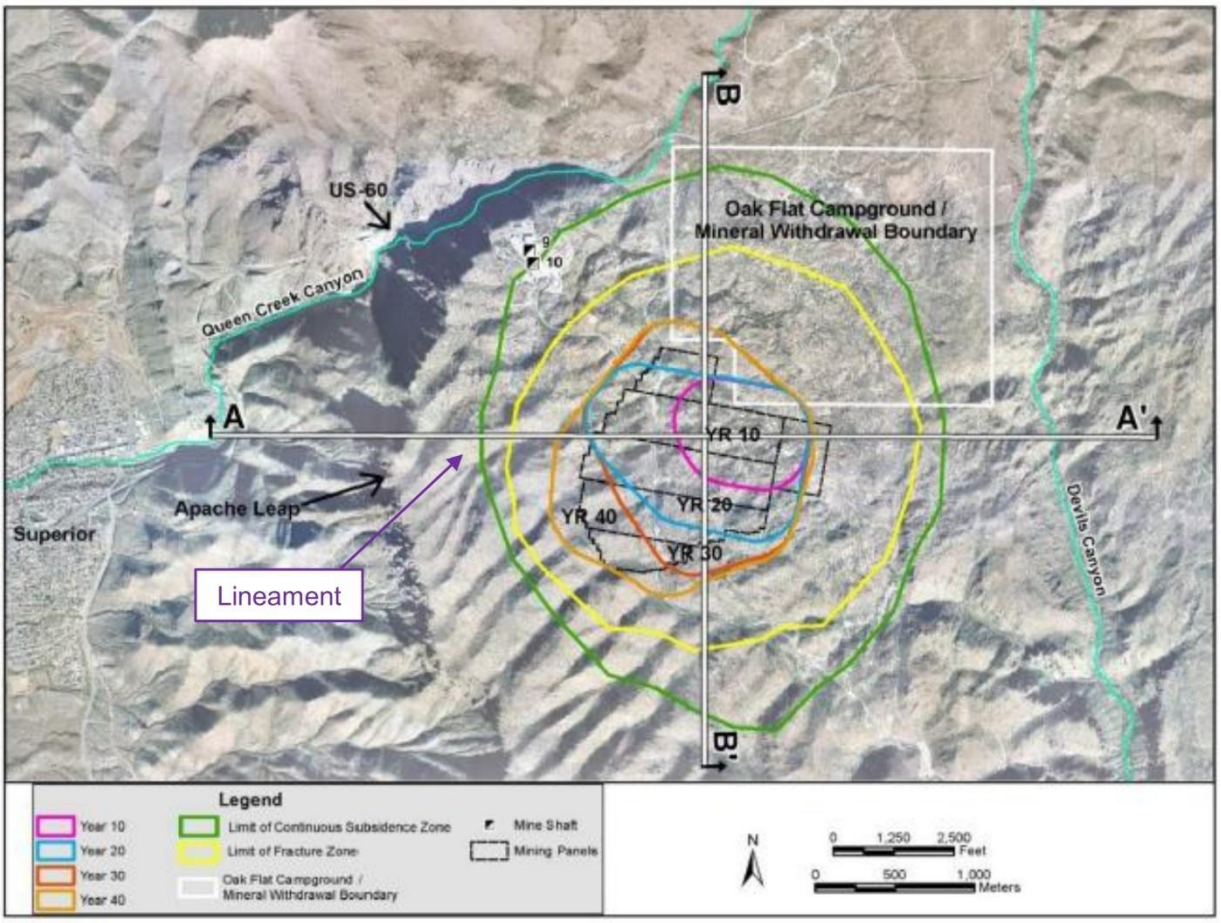

Figure 15 Emerman, "According to Modeling," According to modeling by Rio Tinto (Resolution Copper Mining, 2014a-c), the sacred escarpment of Apache Leap will be more than 1500 feet outside of the subsidence zone even after 40 years of panel cave mining. Fig. Emerman, "According to Modeling-b" shows a cross-section along line AA'. The contours marked by years indicate the limits of the caved rock zone after 10, 20, 30 and 40 years of mining. The lineament shown in Figs. 7a-b can be seen to intersect the caved rock zone in the above figure. Figure modified from Resolution Copper Mining (2014a).

The most important prediction is the probability that the subsidence zone will extend to the sacred escarpment of Apache Leap (see Fig. Emerman, "According to Modeling, a-b"). Apache Leap will remain within the Tonto National Forest and is not a part of the proposed land exchange with Rio Tinto. According to the modeling carried out by the consultants for Rio Tinto, the approach of the outer limit of the subsidence zone to Apache Leap at the end of the 40-year mining project will be more than 1500 feet (Resolution Copper Mining, 2014a,c; USDA Tonto National Forest, 2019a). The data that were input into the models came from surface mapping, core samples, and high-resolution photography from the No. 10 Shaft, the primary access shaft

that was drilled to a depth of 6943 feet (Resolution Copper Mining, 2014c; Resolution Copper, 2018b). Data from the drill core samples included observations regarding major structures, total core recovery, artificial breaks, rock quality designation, solid core recovery, solid length, minor-defects, cemented joints, and open joints. Rock strength testing was also carried out on the drill core samples (Resolution Copper Mining, 2014c). The cave angle (see Fig. Emerman, "The Subsidence Zone") was predicted using an empirical method developed by Laubscher (2000). The complete subsidence response to panel caving was predicted by Itasca Consulting Group using the FLAC3D (Fast Lagrangian Analysis of Continua) numerical modeling package and by Beck Engineering using a coupled DFE-NCA (Discontinuum Finite Element – Newtonian Cellular Automata) code (Resolution Copper Mining, 2014c).

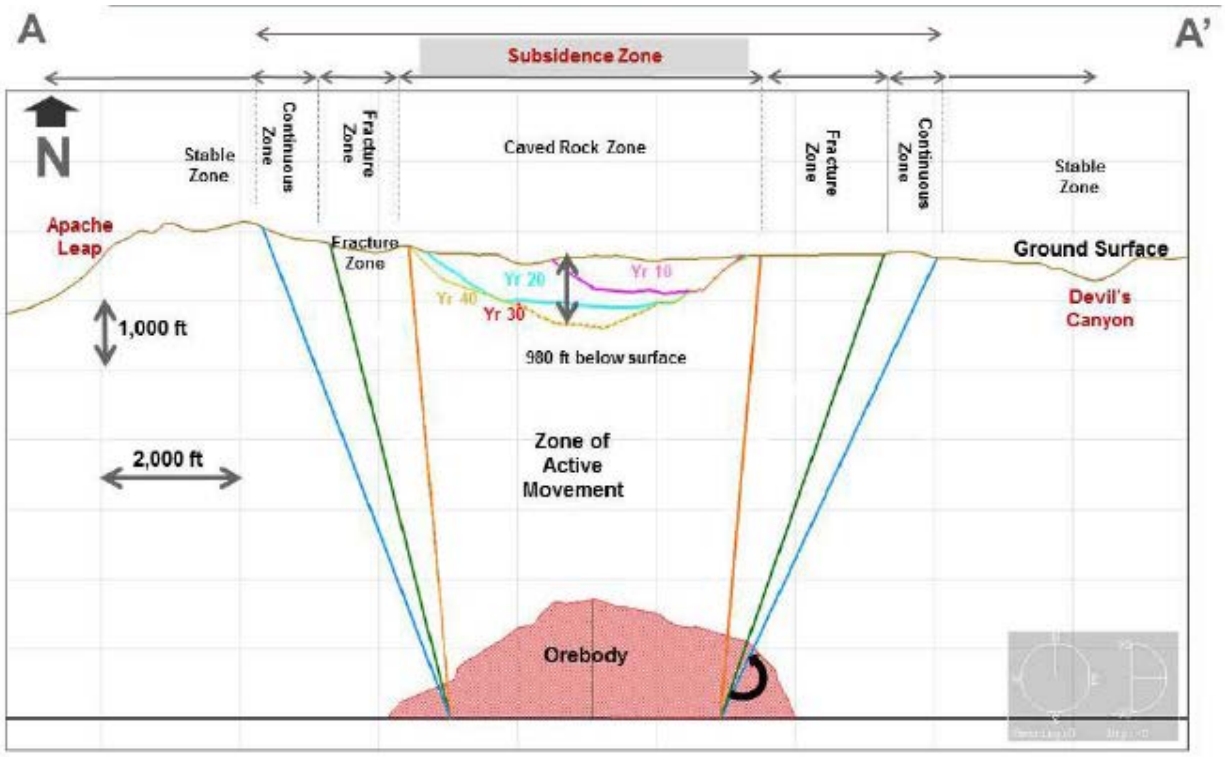

Figure 16 Emerman, "Sacred Escarpment" According to modeling by Rio Tinto (Resolution Copper Mining, 2014a-c), the sacred escarpment of Apache Leap will be more than 1500 feet outside of the subsidence zone even after 40 years of panel cave mining. The same modeling shows that the maximum subsidence in the caved rock zone could be 984 feet. This figure, Emerman, "Sacred Escarpment," shows a map view. Figure from Resolution Copper Mining (2014a).

The proposal also describes an extensive program of subsidence monitoring before, during and

after the life of the mining project. The pre-mining monitoring involves baseline studies using terrestrial LIDAR scans and digital tilt meters. The monitoring during the mining project would include the use of extensometers, survey prisms, crack displacement monitors, aerial photography, interferometry synthetic aperture radar (INSAR), and a microseismic monitoring system. Post-mining monitoring would continue for at least 15 years after the cessation of mining under the assumption that the crater would reach equilibrium within five years after mining. The post-mining monitoring would be extended if the monitoring data were still showing movement at the end of 15 years.

One of the objectives of Emerman's studies was to address the following question: Has Rio Tinto correctly predicted the land subsidence that would result from panel caving at the proposed Resolution Copper Mine? Although Emerman's studies were prepared at the request of the Arizona Mining Reform Coalition, the intended audience is individuals or companies who might wish to invest in the copper project or the companies managing the copper project. For context, Resolution Copper Mining is owned 55% by Resolution Copper, a Rio Tinto subsidiary, and 45% by BHP Copper, a BHP-Billiton subsidiary (Rio Tinto, 2018). It might be assumed that the possible destruction of Apache Leap is more of a religious than a financial issue. However, anyone who honors the spiritual significance of Apache Leap has already made up his or her mind on this issue, just as all Jews and Moslems would be in full agreement on the wisdom of underground copper mining within a mile of the Western Wall and the Temple Mount in Jerusalem. On that basis, this study is aimed at those who would be concerned about the financial and reputational losses that could result from any adverse impact of the Resolution Copper Mine on Apache Leap. Previous reports concerning the financial viability of the Resolution Copper Mine include an evaluation of the impact of the discovery of geothermal water on the mining project (Emerman, 2018, Potential Impact of Geothermal Water on the Financial Success …) and the projected electricity and water consumption of the project (Emerman, 2019).

The actual data that were used in the subsidence modeling are not presented in any documents that have been provided by Rio Tinto. The only information that has been provided are the types of data and, in some cases, statistical summaries of the data, such as the distribution of micro-defect frequencies in each geotechnical domain (Resolution Copper Mining, 2014c). On that basis, there is no way for anyone not affiliated with Rio Tinto to repeat the subsidence modeling or to carry out his or her own subsidence modeling. It is not even possible to predict the cave angle using the empirical method of Laubscher (2000), which would not require any numerical simulation.

Even the description of the data is inadequate for assessing the validity of the subsidence modeling. The most important information that is missing are the numbers of drill cores and the

depths of the drill cores. Clearly, a valid subsidence model requires an adequate number and distribution of samples, which cannot be assessed. The geotechnical properties of the deepest layers (or geotechnical domains) can have a great influence on the extent of the subsidence zone on the surface (see Fig. Emerman, "The Subsidence Zone"). However, there is no information as to how many or whether any of the drill cores penetrated as deeply as the No. 10 Shaft (the 6943-foot deep primary access shaft).

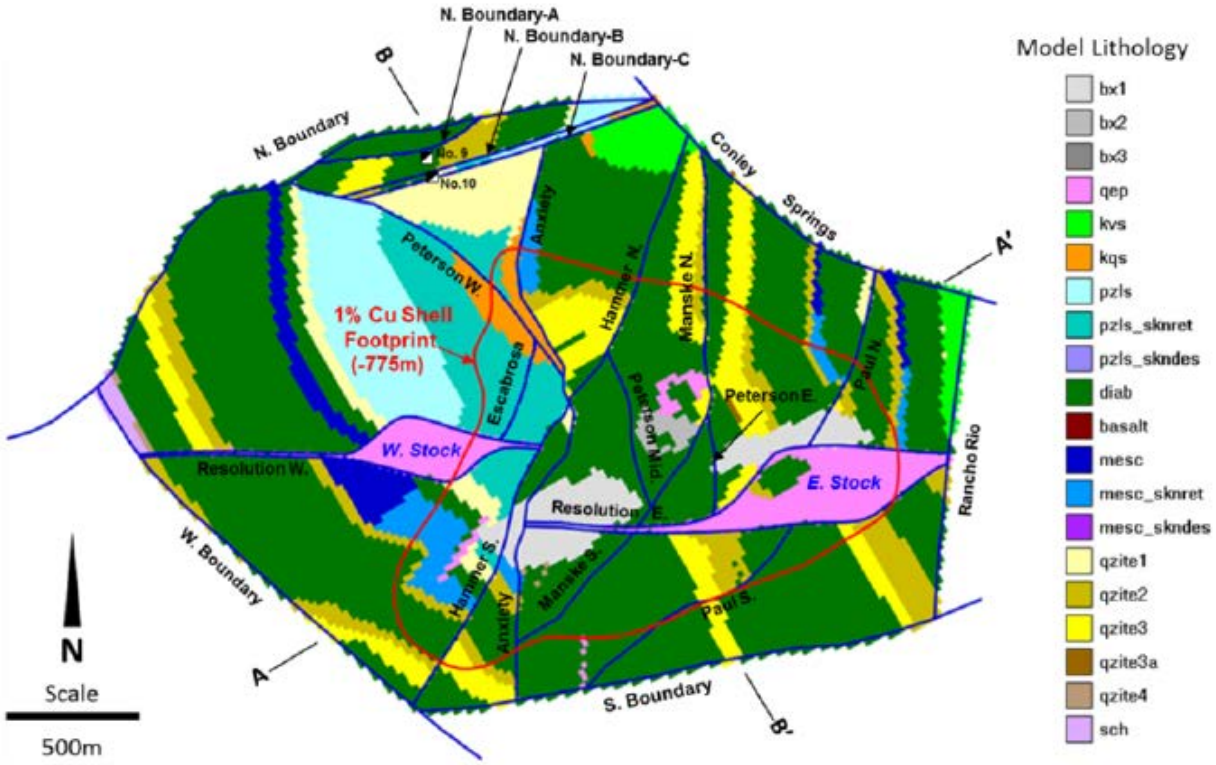

Figure 17 Emerman, "The Most Important": The most important structural controls on land subsidence caused by block caving are the locations and physical properties of geological faults. The above map shows the mapped faults that were used in the modeling (see Figs. 4a-b). For predicting the impact of panel caving on Apache Leap, the mapping of the West Boundary Fault is the most important since it connects the mining area with Apache Leap (see Emerman, "The West Boundary-A"). The above fault map can be located spatially by comparing the position of the footprint of the 1% Cu shell in Figs. 5 and 6. Figure from Resolution Copper Mining (2014c).

The only exception to the above-mentioned lack of input data is the map of the geological faults that were used in the subsidence modeling (see Fig. Emerman, "The Most Important"). The faults and other zones of weakness should be the primary control on the surface expression of

subsidence. In particular, the primary control on the ability of the panel caving to transmit deformation to Apache Leap should be any faults that connect Apache Leap to the surface footprint of the panel caving area. From this perspective, the most important fault is the West Boundary Fault (see Fig. Emerman, "The Most Important").The fault map is difficult to interpret because it does not include any geographical information (see Fig. Emerman, "The Most Important").However, the fault map does include the outline of the 1% Cu shell (footprint of the volume within which the ore has a grade of greater than 1% copper), so that it can be aligned with the geological map from Resolution Copper Mining (2014c) that also includes the 1% Cu shell, as well as the footprint of the mining project area and other geographical information (See Fig. Emerman, "Since the Above").

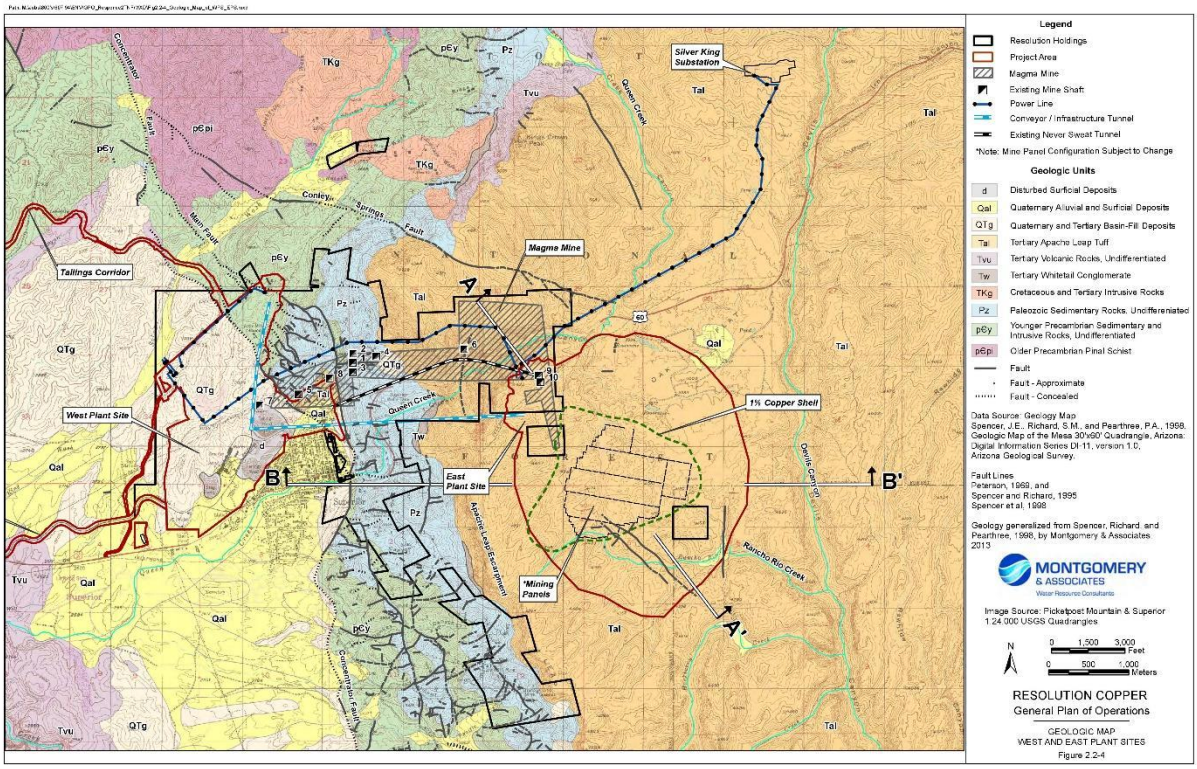

Figure 18 Emerman, "Since the Above": Since the above map includes both the footprint of the 1% Cu shell as well as other geographical information, it can be used to spatially locate the fault map in Fig. Emerman, "The Most Important." Figure from Resolution Copper Mining (2014b).

The superposition of the West Boundary Fault (as mapped in Fig. Emerman, "The Most Important") onto a Google Earth image (a seamless integration of aerial photography and satellite imagery) shows a pronounced surface feature (labeled as a lineament) that is subparallel to the West Boundary Fault and offset from the fault by about 2000 feet (see Figs. Emerman,

“The West Boundary-A & -B” The lineament should not strictly be assumed to be a fault, but a fracture trace, that is a linear feature that is visible from aerial photography or satellite imagery (Fetter, 2001). (Lineaments are fracture traces that are longer than 1500 meters.) Lineaments may be surface expressions of deep-seated zones of structural weakness, such as geological faults, but that must be verified by surface or subsurface mapping. However, the nearly-parallel orientations of the West Boundary Fault and the lineament are certainly suggestive that the West Boundary Fault has been incorrectly mapped, and there is no other mapped fault that could be correspond to the lineament (Figs. Emerman, “The Most Important” & “The West Boundary-B” Unlike the mapped West Boundary Fault, the lineament intersects the caved rock zone (Fig. 4a), so that there is potential for deformation to be transmitted from the caved rock zone to Apache Leap if the lineament is indeed a plane of structural weakness, such as a fault. On this basis, there could have been an underestimation of the extent of the subsidence zone.

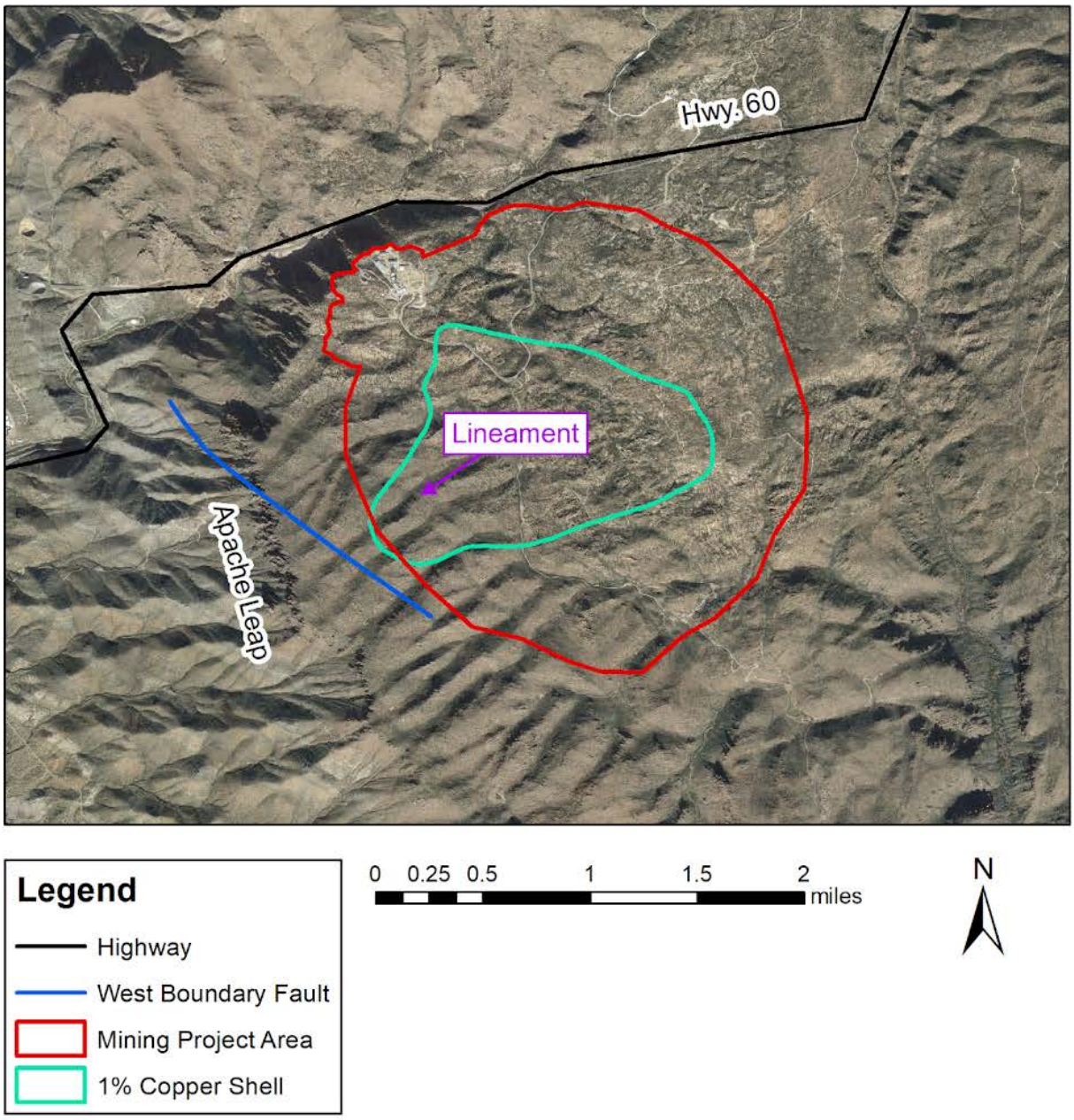

Figure 19 Emerman, "The West Boundary-A": The West Boundary Fault (see Emerman, "The Most Important") is subparallel to and offset by 2000 feet from a pronounced lineament that is visible from aerial photography and satellite imagery. The lineament does not correspond to any other mapped fault that was used in the subsidence modeling (see (see Emerman, "The Most Important") which suggests that not all geological faults have been correctly mapped. The faults and other zones of weakness that connect Apache Leap with the mining area are the most important in predicting the impact of the subsidence caused by panel caving on Apache Leap. The lineament has been traced in Fig. Emerman, "The West Boundary-B" Outlines of the mining

project area and the footprint of the 1% Cu shell are from Fig. 6. Google Earth imagery is from December 6, 2014.

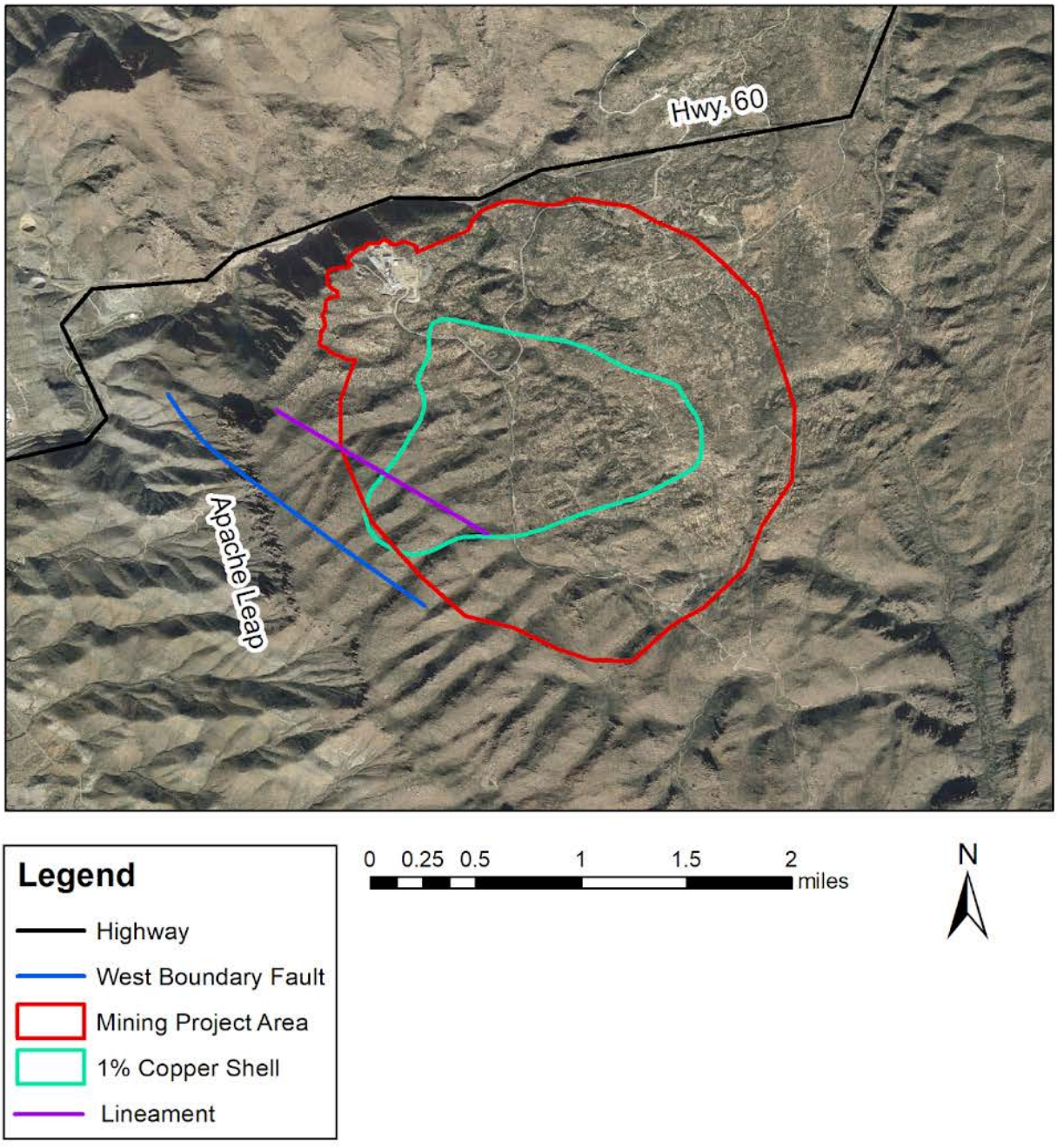

Figure 20 Emerman, "The West Boundary-B" : The West Boundary Fault (see also Emerman, "The Most Important" above) is subparallel to and offset by 2000 feet from a pronounced lineament that is visible from aerial photography and satellite imagery. The lineament does not correspond to any other mapped fault that was used in the subsidence modeling (see (see Emerman, "The Most Important"), which suggests that not all geological faults have been correctly mapped. The faults and other zones of weakness that connect Apache Leap with the mining area are the most important in predicting the impact of the subsidence caused by panel caving on Apache Leap. The lineament without the trace on top can be seen in Fig. Emerman, "The West Boundary-A" Outlines of the mining project area and the footprint of the 1% Cu shell are from Fig. Emerman, "Since the Above." Google Earth imagery is from December 6, 2014.

Even if all of the input data were adequate, it would be difficult to assess the validity of the subsidence modeling since no details have been provided, except for the names of the consulting companies and their numerical codes. Not even the titles or the lengths of the consulting reports have been provided (Resolution Copper Mining, 2014c). The subsidence modeling was presumably carried out by competent engineers and computer programmers. However, I am very sorry to have to point out that Rio Tinto has a history of claiming that the reports from their consultants said the exact opposite of what they actually said. A particular example was documented by Emerman (2018, Evaluation of a Buffer Zone at an Ilmenite Mine …), based upon a comparison of a consulting report to Rio Tinto with Rio Tinto's summary of the report.

The General Plan of Operations (Resolution Copper Mining, 2014a-c) does present an extensive program of subsidence monitoring, using a wide variety of instrumentation. However, the primary issue is not Rio Tinto's ability to document subsidence, but their ability to take appropriate action in response to unanticipated subsidence. A comprehensive database of subsidence caused by block caving reported that unanticipated subsidence has occurred in 20% of block caving projects with most of the anomalies being related to geological faults (Tetra Tech, Inc. and R Squared, Inc., 2006; Woo et al., 2013). The connection between observation and action is based on the explicit assumption that "Subsidence is a slow and gradual process that is predicted, closely monitored, and controlled" (Resolution Copper Mining, 2014a) and that "Subsidence is a rather slow and continuous process, and as such there would be time to apply an adaptive monitoring plan if required" (Resolution Copper Mining, 2014c). With regard to the latter quote, note that "monitoring" is not the same concept as "action."

Blodgett and Kuipers (2002) have documented numerous case studies of block caving projects at which land subsidence was both unanticipated and rapid. For example, at the Henderson Molybdenum Mine in Colorado, "The cave zone appeared on the surface as a steep-walled cavity…Although surface survey data revealed the development of a slight depression over the

production area, a surface inspection by geologists three days before breaching resulted in no evidence of impending glory-hole development. Geologic factors such as rock contacts and alteration-zone boundaries had little influence on the location of the initial glory hole [mining excavation that breaches the surface]" (Blodgett and Kuipers, 2002). At the Miami Copper Mine in Arizona, "the average daily rate of subsidence was at least 2.4 feet (Blodgett and Kuipers, 2002). Finally, at the Athens Iron Mine in Michigan, "At 5 am…block 2, which was 250 feet thick, 350 feet wide, and 600 feet long, caved to the surface through 1900 feet of jasper (gossans cap). The mined-out area that collapsed was only one-tenth the thickness of the jasper cap. The cave-in occurred during a shift change and no injuries were reported. Immediate inspection revealed no evidence of inundation by water or sand, no crushing of drifts or workings, and no signs of an air blast" (Blodgett and Kuipers, 2002).

Rio Tinto seems to rely heavily on A Practical Manual on Block Caving (Laubscher, 2000), since this is the only reference on block caving that is cited in the General Plan of Operations (Resolution Copper Mining, 2014c). In fact, the manual has even been posted on the website that reports progress toward completion of the Environmental Impact Statement (USDA Tonto National Forest, 2019b). This same manual repeatedly draws attention to the dangers of both rapid subsidence and rockbursts. Some examples of the discussion of rapid subsidence are "Lateral extension or subsidence caving as it was previously described, occurs when adjacent mining has removed the lateral restraint on the block being caved. This can result in rapid propagation of the cave with limited bulking…. There can be a rapid propagation of the cave with massive wedge failures if a well developed relaxation zone has formed ahead of the cave front" (Laubscher, 2000). Some examples of discussion of the related problem of rockbursts are "The potential effects of a block cave on installations located in the peripheries of the block include…shear displacements on faults and shear zones. These could produce rockbursts…Cave mining of deep, hard rock orebodies, involving removal of large volumes of rock, will inevitably lead to the generation of mining-induced seismicity, which may lead to rockbursts…. The location of the source of the seismicity and the location of the rockburst damage may or may not be coincident. In the larger magnitude events, the separation of the two locations may be hundreds of meters…. Rockbursts have become a major problem on block caving mines in competent rock, where the regional principal stress is > 35 MPa" (Laubscher, 2000).

If subsidence is sufficiently slow (as opposed to the rapid subsidence described above), it may be possible to take appropriate corrective action in terms of the planning for the next steps of panel caving. For example, Rio Tinto has emphasized that they will "start mining at a point far away from Apache Leap. The easement will allow many years to gather technical information to reassess the cave and subsidence angles" (Resolution Copper Mining, 2014c). (The preceding quote seems to be contradicted by Fig. Emerman, "Block Caving" which shows the initiation of

panel caving at the western edge of the mining project area, the edge closest to Apache Leap.) However, it is difficult to understand the purpose of the post-mining monitoring, at which point it will no longer be possible to correct the procedures of panel cave mining. This disconnect between observations and subsequent preplanned actions should be regarded as a misuse of the Observational Method, which is used implicitly throughout the General Plan of Operations (Resolution Copper Mining, 2014a-c). The Observational Method was both reviewed and critiqued by Independent Expert Engineering Investigation and Review Panel (2015), who investigated the causes of the 2014 tailings dam failure at the Mount Polley Mine in British Columbia. According to Expert Engineering Investigation and Review Panel (2015), the Observational Method "uses observed performance from instrumentation data for implementing preplanned design features or actions in response." However, the Observational Method is not simply a license to figure things out later. Expert Engineering Investigation and Review Panel (2015) concluded "the Observational Method is useless without a way to respond to the observations."

The predictions of the limits of the caved rock, fractured and continuous subsidence zones contain no uncertainties or error bounds of any kind (see Figs. 4a-b). Presumably, all predictions are simply the best estimates and not the worst-case scenarios. The only exception to the lack of error bounds in subsidence predictions are the predicted maximum depth of the crater above the ore body.

Rio Tinto's General Plan of Operations originally stated, "The depth of the crater has been estimated from numerical simulations and also from experience at other operations. As part of the Second International Caving Study a database of bulking factors was developed to assist in the estimation of bulking from the caving process. Based on this work the average life of mine bulking factor for Resolution Copper is expected to range between 8 and 12 percent. If these values are used to estimate the potential crater depth, the maximum depth is projected to range between 656 and 984 ft in depth. Numerical simulations both completed by Beck Engineering and Itasca Consulting also estimate that the crater depth could have a maximum value ranging from 656 to 984 ft" (Resolution Copper Mining, 2014c). The DEIS now estimates a maximum crater depth of 800-1115 feet with closest approach to Apache Leap of 1115 feet. The previous estimates were maximum crater depth of 656-984 feet with closest approach to Apache Leap of 1500 feet. There is no explanation as to why these two estimates have changed.

It is surprising that the empirical method and the numerical simulations carried out by two different consulting companies using different numerical methodologies all arrived at the exact same range of depths. However, the earlier range of depths from the General Plan of Operations (Resolution Copper Mining, 2014c) could be re-expressed as a predicted depth of 820 ± 164 feet.

If the uncertainty (164 feet) is assumed to be the standard deviation (although that is not clear from the text), then the coefficient of variation (ratio of standard deviation to mean) of the predicted maximum depth is 20%. In the absence of other information, the same coefficient of variation could be assumed to apply to other aspects of the subsidence predictions.

Based on the uncertainty in the maximum crater depth, the uncertainty in the prediction of the approach of the subsidence zone to Apache Leap can also be assessed. Based on Fig. Emerman, "Sacred Escarpment" the predicted distance from the center of the ore body to the outer limit of the subsidence zone in the direction of Apache Leap is 4650 feet. Assuming a coefficient of variation of 20%, the standard deviation of that prediction is 930 feet. Since the closest approach of the subsidence zone to Apache Leap is 1500 feet (Resolution Copper Mining, 2014a,c; USDA Tonto National Forest, 2019a), the distance between the eastern edge of Apache Leap and the center of the ore body is 6150 feet. Then assuming that the population of predictions of the distance of the outer edge of the subsidence zone from the center of the ore body follows a normal distribution with mean equal to 4650 feet and standard deviation equal to 930 feet, the probability that the outer limit of the subsidence zone will extend onto Apache Leap or beyond is 5.3%.

The same logic can be used to estimate the probability that the eastern edge of Apache Leap is actually in the fracture zone of visible cracks and slumps (see Fig. Emerman, "The Subsidence Zone"). Based on measurements on Fig. Emerman, "Sacred Escarpment" the outer limit of the fracture zone from the center of the ore body is 3650 feet. Continuing the assumption that the coefficient of variation is 20%, the standard deviation of the prediction of the outer limit of the fracture zone is 508 feet. On the above basis, the probability that the outer limit of the fracture zone will extend onto Apache Leap or beyond is 0.03%.

A useful framework for discussing acceptable probabilities for destroying cultural and religious sites is found in the Dam Safety Guidelines of the Canadian Dam Association (2013). These guidelines explicitly include "cultural losses" with the explanation that "social impacts, such as damage to irreplaceable historic and cultural features that cannot be evaluated in economic terms, should be considered on a site-specific basis. Separate assessments should be made of potential damage to sites of cultural and historic value, taking into account the feasibility and practicality of restoration or compensation" (Canadian Dam Association, 2013). The Dam Safety Guidelines then classify dams into five categories, based upon the consequences of dam failure. In terms of cultural losses, a high-consequence dam corresponds to "restoration or compensation in kind highly possible," a very high-consequence dam corresponds to "restoration or compensation in kind possible but impractical," and an extreme-consequence dam corresponds to "restoration or compensation in kind impossible" (Canadian Dam Association, 2013). It should

be clear that any mining infrastructure, for which the failure would result in the destruction of a landscape feature with profound spiritual significance, should be placed in the strictest category of "extreme consequences."

Having established that panel caving in the vicinity of an irreplaceable site of cultural and religious significance is an "extreme-consequence" activity, acceptable probabilities for the occurrence of those consequences can be considered. According to Canadian Dam Association (2013), dams whose failures would have either very high or extreme consequences should be designed to withstand 10,000-year events (such as the 10,000-year flood or the 10,000-year earthquake). These events have an annual exceedance probability of 0.01%. On this basis, probabilities that Apache Leap will be within the continuous subsidence zone or the fracture zone of 5.3% and 0.3%, respectively, should be regarded as completely unacceptable risks. Even a dam in the low-consequence category, defined as "no long-term [cultural loss]" should be able to withstand a 100-year event, corresponding to an annual exceedance probability of 1%.

The conclusions of the study entitled, Evaluation of Predictions of Land Subsidence due to Panel Caving at the Resolution Copper Mine, Arizona, can be summarized as follows:

- The predictions of land subsidence due to panel caving at the proposed Resolution Copper Mine cannot be verified because Rio Tinto has provided neither the data, the details of the modeling, nor the reports from the consultants.
- The only exception to the lack of data is the map of geological faults, which is inconsistent with the aerial photography and satellite imagery that show a pronounced lineament nearly parallel to and offset by 2000 feet from the mapped West Boundary Fault. This lineament would most likely be the zone of structural weakness that would transmit deformation from the caved rock zone to the sacred escarpment of Apache Leap.
- The subsidence monitoring program proposed by Rio Tinto explicitly assumes that subsidence will be slow, predictable and controlled, which is inconsistent with the past history of block caving and authoritative manuals on block caving.
- Rio Tinto has provided no error bounds on the predictions of the lateral extent of the subsidence zone.
- Based on the range in predictions of the maximum depth of the subsidence crater, the probability that the subsidence zone would reach Apache Leap can be estimated as 5.3%. This probability is about 500 times greater than what would be generally regarded as an unacceptable risk for the loss of irreplaceable cultural and religious heritage.

It is recommended that potential investors in the Resolution Copper Mine seek clarification from Rio Tinto on the following questions:

- Why has Rio Tinto not provided the reports on subsidence modeling from their consultants?
- Why does Rio Tinto not recognize the pronounced lineament that connects Apache Leap with the caved rock zone as a geological fault or zone of structural weakness?
- Why does Rio Tinto believe that rapid subsidence and rockbursts cannot occur, in opposition to the block caving manual that they rely upon?
- Why has Rio Tinto not provided any error bounds on their predictions of the lateral extent of land subsidence?

Subsidence analysis

Rio Tinto is a primary partner in Oyu Tolgoi, LLC, the operator of the Oyu Tolgoi mine being developed in southern Mongolia. Underground mine operations at Oyu Tolgoi are being planned as a block cave mine.

An announcement during the first half of 2019 of "ground instability problems" at the Oyu Tolgoi site encountered during construction of the underground mine and associated infrastructure are correlated with a severe drop in the share price of Turquoise Hill Resources, Rio Tinto's corporate partner in Rio Tinto's majority ownership share in the OT project.

The relatively undefined "ground instability problems" are severe enough to result in projection of a two-three year delay in underground mine ore production and a projected $1-2 billion dollar expense to address the "ground instability problems."

As Resolution is proposed as a block cave mine, an analysis of the implications of the Oyu Tolgoi ground instability problem should be incorporated into a revised or supplemental DEIS and FEIS for the Resolution project to verify that the ground instability problem that RTZ's Oyu Tolgoi geoanalysts failed to identify until after significant construction had begun at OT.

Ground water impact due to block cave subsidence and fracturing

While Fig 3.7-1.6 P. 308 359/1338 shows the Apache Leap Tuff (Tal) groundwater level prior to mine operation, the DEIS fails to illustrate the impact of the block cave subsidence zone on the Tal groundwater system. As the block cave mine will cause large, permanent collapse and fracture zone in the Tal and underlying geologic structures down to the ore zone, all groundwater

in the Tal, and underlying geologic structure affected by block cave mine subsidence and fracturing will permanently drain to the mine eliminating flows through the Tal to any of the groundwater discharge points, along with eliminating surface flows in the Oak Flat and Devil's Canyon stream systems.

The DEIS should be revised to illustrate and describe the irreversible and irretrievable damage to surface water and groundwater current stored in or flowing on the Tal and other subsided or fractured geological structure likely to be affected by the proposed operation of the block cave mine.

Visual Resources

All alternatives with the exception of the No Action Alternative will have a significant, irreversible, and unmitigable negative impact on visual resources. The DEIS fails to consider the visual impacts of the fog plumes, the subsidence area, and severity of the impacts from the various tailings locations on the visual resources of the area. While there is mining in the region, the area around Oak Flat is still a place of beauty that is used by hikers, campers, climbers, birdwatchers, and more.

As noted above, the DEIS fails to consider and analyze the impacts to recreation from this visual blight. People going to Picketpost Mountain, the Boyce Thompson Arboretum State Park, the southeastern portion of the Superstition Wilderness Area, and the White Canyon Wilderness Area, among other important recreational areas, will be assaulted by this industrialization of the landscape. Many of these areas would suffer visual impacts from tailings pile locations, making them less attractive for those seeking to get away from development and blight and to enjoy the beauty of the Arizona landscape. This visual blight will be compounded by dust and haze associated with the mining activities.

Visual impacts of subsidence area

The DEIS fails to adequately consider and evaluate the visual impacts of the subsidence area, an area that will likely be devoid of vegetation once the land has subsided and that will not receive any reclamation activities due to safety issues. It is difficult to imagine a situation where this large of an area dropping by 1000 feet and losing vegetation would not have a significant visual impact.

Visual impacts from areas with no vegetation

The DEIS fails to adequately analyze or recognize the visual impacts of areas that will be denuded of vegetation, as well as the massive tailings piles. One need only visit a mining site that has been "reclaimed" to see the longstanding blight that is created by a mine such as this, and on a scale beyond what has been seen in Arizona.

Visual impacts of Fog Plumes

The Resolution Copper PLO talked about fog plumes being created in cold weather and rising hundreds of feet in the air from the shaft at Oak Flat. In our spacing comments we note:

The GPO says that fog plumes from the cooling towers and shafts would be at least 330 feet above the east plant site.

- *Is this a traffic hazard?*
- *What impact on flora and fauna?*
- *Would these plumes affect the cultural importance and uses of Oak Flat?*

There is no discussion of this issue at all in the DEIS. Not only should these issues have been addressed in the DEIS, there also should have been a discussion of the impact of 330' tall fog plumes in the visual resources section.

Visual impacts from Light

Please see the section below on Light and Noise for more detailed comments on the visual impacts of light. The preferred alternative will have a significant impact on dark skies as the "Lighting at the East Plant Site, West Plant Site, and tailings facility would be visible and noticeable at night from the town of Superior, U.S. 60, Boyce Thompson Arboretum, the Arizona Trail, and the surrounding national forest landscape (see Alternative 2, "Dark Skies," in section 3.11.4.1)." (DEIS pg. 120).

General comments

There are two substantial areas of concern: (1) missing or incomplete information and/or analyses, in particular, the selected viewing points are not sufficiently representative, and additional viewing points must be incorporated into the analyses and evaluation of impacts to

visual resources; and (2) errors in the use of panoramic photographs to illustrate "representative viewpoints", which result in reducing the apparent degree of visibility of the proposed project and thus reducing the level of impact. Both of these issues must be addressed in a revised or supplemental DEIS.

Light and Noise Pollution

Although the DEIS discussed and even followed some of our scoping comments related to noise, a lot is missing and/or is unsatisfactory.

In general the "background" noise monitoring was conducted improperly. Only a total of 15 monitoring stations were used to determine background noise levels. Monitoring was only done at some locations once over the course of a week in June of either 2015 or 2016. In addition, some locations also monitored for an additional week in November. As there was no discussion of why those dates were chosen, we wonder whether the were selected to skew the data. For Example, June was used to monitor for "summer" conditions, but as June is still moderate enough for outdoor recreation and other activities, perhaps July or August would be a better time period. For "winter" monitoring, January or February would be better than November, which is still a shoulder month. In any case, the monitoring periods were too short and should have been conducted either continuously or at least in each month over the course of a year to get a more representative sample.

We also question why the monitoring at Oak Flat was done so close to the East Plant facility and to several drilling rigs operating in that area. There were certainly other areas at Oak Flat that would have given a more representative sampling of background noise.

Section 4.1 of the GPO states that the noise levels at the mine site currently meet county standards and that additional monitoring will be conducted as the project proceeds. The current noise levels may include contributions from RCM's pre-mining activities, and thus would not accurately represent the ambient noise level. That data should be obtained by ceasing RCM's operations long enough to measure the ambient noise levels. Section 4.13.8 of the GPO discusses some measures that will be taken to protect workers and the town of Superior from noise. It also states that noise surveys will be completed during the NEPA process. Assuming that the NEPA process is the development of the EIS, then the results of these surveys must be referenced in the Draft EIS. The GPO has very little to say about artificial lighting.

The EIS must provide quantitative predictions of noise and artificial light levels in areas and points surrounding the proposed mining operation. This would include:

- Identification of key observation points, including but not limited to the town of Superior, Queen Valley, US Highway 60, the southern edges of the Superstition Wilderness Area, Boyce Thompson Arboretum, occupied buildings, and other points determined by the Forest Service.

- Identification of key sources of noise and light pollution, including but not limited to mine facilities at EPS, WPS, TSF and Tailings Corridor, Filter Plant and Loadout Facility, Queen Valley Pump Station, Wells along the MAARCO Corridor, the rail line southwest of the Loadout Facility, transportation, and other sources determined by the Forest Service.

- For each of the above sources, the predicted noise and light levels at each of the key observation points.

- For each of the above sources, predicted contours of sound level covering areas where the sound level is greater than 50 dBA.

- For each of the above observation points, the EIS must state the predicted impact of the mine-produced light or noise on the usual activities conducted at that site.

- The above should be done for each phase of the mining operation, including Construction/Development, Mining/Ore Processing, Closure and Post-Closure.

- The "No Action" alternative states that there would be continued noise from the East Plant site. It is unclear in the DEIS whether this skews the noise study done for Oak Flat. (The assumption that water pumping would occur from the #9 and #10 shafts under the no action alternative, thereby skewing water balance calculation give us reason to believe that the same was done for noise calculations.) The No Action alternative should have used a scenario of no noise coming from the East Plant site for baseline in the DEIS.

- A new or supplemental DEIS must be written that include actual baseline noise data for Skunk Camp instead of extrapolating data from the Peg Leg alternative.

- Who chose monitoring dates and placement of monitoring devices? Are they truly representative?

- The DEIS should have included an analysis of recourse for people at Dripping Springs that are more sensitive to noise. Does the Forest Service assume that if they don't like it they can move, or will you develop plans (that are available for public comment before finalization) calling for more serious noise reduction around homes and ranches?

- The DEIS should have included a discussion of powerline noise on recreation.

- The EIS must state the impacts of noise, vibration, and artificial light on plants and animals normally inhabiting the surrounding areas. This must consider distinct species, such as bats, that may be sensitive to certain combinations of light and sound.

- To assure a complete evaluation of impacts, the Forest Service must first characterize the vibration and sound produced by block/panel caving, possibly by reviewing data from mines already in operation, possibly by computer simulation.

- If the above studies reveal particular observation points or plants and animals with unique responses to vibration, sound, or light, then, where possible, the EIS must specify mitigations, including sound barriers, mufflers, light hoods or screens, and spectrally controlled LED lighting.

- The EIS must establish procedures enabling entities affected by noise, light, or loss of scenic value to submit complaints, and for mitigating actions to be taken in response to those complaints.

- The DEIS should analyze the effects of light and noise pollution from the mining operation, and include alternatives to reduce these impacts. These include using cutting edge LED technology and generally reducing the amount of outdoor lighting to protect the night sky viewsheds and reduce impacts to nearby observatories, campgrounds, outdoor education centers, and residents of Superior and outlying residential areas such as Queen Valley.

Livestock and Grazing

Impacts on Ranching

The analysis of impacts on livestock grazing in the DEIS is too narrow, both in terms of factors

considered and the geographic area of analysis. It is not clear how or why the USFS determined that these impacts would not be "significant" and should this statement be carried forward, the evidence for this assertion must be made clear. The spatial scope of analyses of these impacts must be expanded to consider effects on nearby allotments and private sector ranching, water quantity and quality as it would likely affect ranches, and the impacts of toxic material and dust residues on forage and in water. In addition, the analysis must address the potential of effects to the health of livestock and on the health of humans consuming beef subjected to toxics that may be emitted in one form or another from the proposed copper mine. The assertion in the DEIS that adequate information was found to analyze the effects of the proposed mine on livestock grazing is undercut by the incomplete analysis presented.

Incomplete and Missing Information

A revised analysis of impacts on ranching should be based on objective, long-term research on livestock raised and grazed in pastures under use or lease by copper mine companies that contain tailings and waste rock. Based on that research, the DEIS should analyze alternative designated zones of safety for ranches and neighboring allotments in close proximity that could be impacted by fine particulate airborne dust particles that could have toxic residues affecting soil, air, water, grass, seeds, livestock feed, animal hair and buildings, taking into account the high winds in the affected area of southern Arizona.

The DEIS contains no discussion of the impact of loss of grazing land to the local and regional economies. There is likely to be a negative economic impact due to the loss of public land for grazing from the East Plant, and the tailings location. In addition, livestock grazing could be disrupted from increased activities along the MARRCO corridor and the pipeline corridor which both would have much more human and mechanical activity. These impacts should be considered in a new DEIS.

This analysis should also take into account the effects on the social and economic effects of the impacts of the proposed mine on affected ranches, along with the cumulative effects of other proposed and current operating mines and other present and reasonably foreseeable actions affecting local ranching.

Livestock and Rangelands

(1) Livestock grazing and selenium toxicity: The DEIS discusses impacts on livestock grazing, but omits a very important impact:

toxicity of Resolution Copper emissions to livestock, in particular from selenium. Further, the DEIS omits citations of two relevant laws and regulations: the Toxic Substances Control Act (TSCA) and the Clean Air Act.

(a) Exposure to selenium toxicity occurs through several routes: (1) airborne emission of selenium compounds which are deposited on plants can be absorbed directly by the plants. The plants can absorb both gaseous and particulate selenium compounds directly from air. (2) The deposition of selenium compounds on soils, and incorporation into the soil around plants allows the root systems of plants to absorb selenium from the soil. (3) Plants can absorb selenium directly from the aquatic environment. In general, plants can accumulate selenium preferentially to many other elements which accompany it in particulate and aerosol emissions. The exposure of animals to the selenium toxicity occurs through consumption of the plants, and through inhalation of particulate matter and aerosol materials which contain selenium compounds.

(b) The median concentration of selenium in the source mineral material for the mine is 12 mg/kg. The average processing of mineral material each year over a 20 year period of time translates into a potential release and emission of up to 382 tons/year of elemental selenium. Even if only 2% of the available selenium is somehow released to the environment, it exceeds the toxic and hazardous air pollution threshold. Given the volatility of many selenium compounds, this probability is likely to be significant.

(c) The toxicity of selenium compounds to grazing and farm animals occurs at microgram levels. The classic diseases of blind staggers and alkali disease were recognized in 1930's as associated with selenium toxicity. And in the 1950's the teratogenic properties of selenium to poultry

were documented. The malformation of horses was recognized as early as Marco Polo's travels to the orient, although the cause was unknown for some 500 years except that horses consumed some contaminated grasses.

(2) Management priorities among multiple uses of rangeland: The DEIS indicates that the USFS manages livestock in a manner compatible with multiple use designations of the rangeland according to USFS protocols and guidelines. What the DEIS does not state is the relative priority of livestock management compared to other uses. In multi-use environments there is often a tension or conflict among certain uses, and the priority of which use is granted greater protection relative to another is clearly stated and known. Where does livestock grazing fit in all of this?

(3) Possible secondary toxicity exposure to manganese: A possible second toxicity problem for livestock occurs because of manganese emissions. Manganese is a neurotoxin, but it has been shown in a few instances to be associated with a toxic smoke syndrome of cattle and other livestock. The median manganese content of the source material is 800 mg/kg more than 2½ times that of the basic copper to be extracted. That represents a potential 25,000+ tons/yr of materials, and if only 0.1% of this material is released it exceeds the thresholds for all toxic and hazardous air pollutants combined.

(4) Effectiveness of chemical monitoring for rangeland ecosystems: The DEIS does not include toxicity issues with respect to rangeland management in the monitoring plan. Thus, the monitoring plan is deficient to protect grazing animals. Chemical monitoring to protect ecosystems needs to include (a) sampling of grazing vegetation with chemical analysis to determine whether the vegetation has accumulated or is in the process of accumulating toxic elements, (b) analysis to assess whether a gradient of accumulation can be traced back to the mine operations, and (c) measures to show specific thresholds of data which trigger mitigation and remediation. Further, this type of

monitoring becomes very important in determining problems occurring during revegetation and post mine closure because it may show that the landscape has become sufficiently poisoned so that it cannot support revegetation efforts.

(5) Ecosystem Measurements: Although the DEIS mentions that rangeland management seeks to protect ecosystems and provide for ecological diversity, none of the monitoring methods given, nor the objectives and impacts cited are associated with ecosystem measurements with respect to the livestock concerns. For example, how will rangeland ecological diversity be measured and reported?

Socioeconomics

Deficiencies in the Socioeconomic Section of the Resolution Copper Project and Land Exchange Draft Environmental Impact Statement

Comments Prepared for
the
San Carlos Apache Tribe

By

Power Consulting Incorporated
Missoula, Montana

11/4/2019

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This is an executive summary of a longer set of comments submitted by Power Consulting Inc. that are appended to these summary comments. Since this is an executive summary, the entirety of the analysis carried out and the data sources used are not presented here. See the Appendix to these summary comments where we provide the full analysis and extensive references that support this summary.

Executive Summary

Draft Environmental Impact Statement (DEIS) Deficiency No. 1: Resolution Copper Mine (RCM) Project Impacts on Recreation and Amenity-Supported Economic Vitality

The DEIS estimates in quantitative detail, often expressed in dollar terms, the projected socioeconomic "benefits" to the local and regional economies associated with the construction, operation, and reclamation of the proposed RCM project. However, when it comes to discussing the socioeconomic costs that would be associated with the project, the DEIS asserts that the negative socioeconomic impacts of the RCM project are mostly difficult or impossible to quantify, especially in monetary terms. The DEIS quantifies only a tiny part of the potential negative impacts on what the DEIS labels the "nature-based tourism economy," namely the reduction in hunter spending in the local economy or the reduction in revenue to the state of Arizona because of reduced sale of hunting permits. Both of these are only tiny fractions of the damage to the "nature-based tourism economy" that will be caused by RCM. In addition, "nature-based tourism" is only a part of the overall value of the environmental services provided to residents, not visitors ("tourists"), by the natural landscapes that will be threatened by the RCM. Both the impact on residents and visitors are important components of the economic base supporting local economic vitality. High quality of life is not a benefit only enjoyed by visitors nor is it only visitors to whom recreational opportunities are important.

This imbalance in the treatment of the commercial "benefits" of the RCM and the commercial and non-commercial costs associated with the RCM distorts the socioeconomic analysis provided in the DEIS in a way that exaggerates the benefits and understates the costs. It represents a "thumb on the scales" in the evaluation of the positive and negative impacts of the proposed mine.

The well-being of residents may be directly improved by natural services provided by the natural environment: clean air and water, scenic beauty, open-space, wildlife habitat, recreational opportunities, etc. Many of these natural environmental services are not commercial products but, rather, flow from high quality natural environments and are available to all residents or visitors to such areas without any commercial transaction. The availability of these natural environmental services in particular areas, however, trigger behaviors of commercial significance as people seek access to high quality natural services or flee areas where natural environments have been degraded.

The DEIS and studies it cites documents the large positive socioeconomic impacts of "Travel and Tourism" on Pinal County where the RCM project would be located and adjacent areas. In particular the DEIS documents the high level of visitor spending, the large number of jobs associated with that spending, the huge flow of visitors to the Tonto National Forest and the high spending levels of the visiting parties. The Tonto National Forest is identified as one of the most heavily used National Forests for motorized recreation. Wildlife viewing, by itself, contributes substantially to Pinal County's economy. (Appendix D, Deficiency No. 1, Sections 1 and 2)

The DEIS in its conclusions to the Socioeconomic section (3.13) states that while there may be some permanent losses of jobs and income associated with recreation and amenity-supported economic vitality, the losses are not quantified and are discussed in qualitative terms:

> "Loss of jobs in the local tourism and outdoor recreation industries cannot be avoided or fully mitigated. Likewise, loss in property values for property close to the mine would constitute an impact that cannot be avoided or fully mitigated."
>
> ……..
>
> "Some changes in the nature of the surrounding natural setting and landscape would be permanent, including the tailings storage facility and the subsidence area. The action alternatives would therefore potentially cause irreversible impacts on the affected area with regard to changes in the local landscape,

community values, and quality of life." [38]

As indicated by the summary statements quoted above, the DEIS *does* recognize that the construction and operation of the RCM will damage the natural landscapes on which the recreational economy depends and, for that reason, will have negative impacts on an important part of the local and regional economy. The DEIS, however, does not quantify those negative RCM impacts in the same way it quantifies the positive RCM socioeconomic impacts. As a result, the RCM's negative socioeconomic impacts, the "costs" are understated and the positive impacts, the "benefits" are overstated.

DEIS Deficiency No. 2: The Socioeconomic Section of the DEIS Exaggerates the Positive Impacts of the RCM

RCM will provide little or no financial improvement in the Superior area and will undermine the quality of life and economic future of the area. Superior will face a serious net loss and any gain will flow quickly to the large urban areas of the state. Although the DEIS provides a socioeconomic analysis that appears to suggest significant positive economic impacts in the Superior area, that analysis does not provide an accurate and balanced look at the socioeconomic impacts associated with the RCM. The socioeconomic analysis in the DEIS does *not* focus on Superior or the Copper Triangle. Instead it focuses on a study area that is dominated by the state's two largest metropolitan areas, Phoenix and Tucson. See Appendix D, Deficiency No. 2, Sections 1 and 2.

This is important because the town of Superior has 2,999 residents and the counties of Maricopa and Pima have a combined 5.5 million people. When impact analysis is done, as it was in this RCM DEIS, economic models like IMPLAN are used to measure the impact of the mine on the economies that surround the mine. Clearly the town of Superior does not have the same ability to supply the mine and the mine workers with the same breadth of goods and services as the metropolitan areas of Phoenix and Tucson can. For example, when we look at Table 3.13.4-1 in the DEIS (p. 649), we can see that 91 percent of the secondary labor income will go to areas outside of the town of Superior and 86 percent of secondary jobs will go to workers outside of the town of Superior. The reality of the proposed mine is that most of the people that will see a benefit from the mine will not be from Superior, and in large part cannot live in Superior, but will carry the vast majority of wealth that is created at the RCM out of Superior. Although all of the workers will be using many of the municipal services of Superior, they will be taking the money that they get as a mine worker back outside of the local area to spend.

[38] DEIS p. 657

In addition, residents of Superior and surrounding areas who own residential property will see the value of that property decline if they live in the vicinity of whatever site is chosen for the tailings storage facility. This unfortunate reality is shown in the DEIS in Table 3.13.4-5 (page 655). In this table, it is clear that all property that is within a 5-mile radius of the proposed tailings storage facilities will suffer permanent loss of value. For three of the five action alternatives this loss of property value conservatively ranges between a little more than $3 million to a little less than $5.5 million dollars.

It is very unlikely that the increased property values and increased housing in Superior which might result because of the proposed mine will bring an increase in property taxes for the Town. In fact, the opposite is likely to be true. What we do know is that there will be an increase in the services that Superior will have to provide because of the proposed mine and it associated activities. The increased services are currently estimated to cost Superior almost $1 million per year.

One might assume that the town of Superior would simply be able to tap into the massive revenue stream that is predicted to come from the proposed mine in the form of various different taxes. The problem is that most of the taxes that are collected will be distributed to the cities and counties of Arizona based on population. The Town of Superior has just under 3,000 people while the state's population is estimated at about 7 million people.

Superior is projected to receive only a tiny portion of the total estimated taxes the RCM project would pay. The combination of the different taxes could bring the Town of Superior revenues of about $341,000 a year from "an average of between $88 and $113 million per year" (DEIS p. 650) in taxes collected from the proposed mine. As a result, there will be a shortfall that will have to be picked up by the citizens of Superior of $659,000 difference between the $1 million per year cost of services. See Appendix, Deficiency No. 2, Sections 3 and 4.

The BBC research reported in the "Socioeconomic Effect Technical Report" laid the basis for the DEIS socioeconomic analysis. When critically analyzed, that BBC report establishes that few mine employees will live in Superior, providing little increase to Superior's tax base, while increasing the costs of municipal services. See Appendix D, Deficiency No. 2, Sections 1 and 2.

DEIS Deficiency No. 3: The Socioeconomic Impacts of the Resolution Copper Mine's High Demand for Water

The DEIS does not discuss the socioeconomic impacts of the large quantities of water that will have to be imported to operate the RCM, process the ore, and transport the tailings to storage areas. This leads to an understatement of the socioeconomic disruption, i.e. costs associated with the RCM.

The proposed Resolution Copper Mine (RCM) will require large quantities of "fresh" water to be imported for the mining operation. The DEIS estimates that for the Preferred Action, (Alternative 6), approximately 550,000 acre-feet of water will have to be delivered for the mining operations during the 40-year life of the mine. An acre-foot of water is approximately the amount of water that three average Phoenix metro households use in a year. The amount of water needed under the DEIS Preferred Action for the life of the mine would provide water for 1.66 million average households in the Phoenix area for a year or 166,000 households for ten years. See Appendix D, Deficiency No. 3, Section 1.

In the context of regional water shortages and reductions in CAP access, it is misleading for the DEIS to mention without comment that RCM Project will "use water…directly from the Central Arizona Project (CAP) canal". DEIS, page ES-3.

The efforts by RCM to physically procure a very large amount of additional water for a new use will unavoidably drive up the price of Arizona water as well as ensure that some users will have to give up water they have used in the past. Those people are very likely to be those that cannot afford an increase in the price of water and are already the most economically stressed. The Bureau of Reclamation has announced the reduction in allocations of Colorado River water to Arizona for 2020 because of low water levels in Lake Mead. This mandated reduction of Arizona's share of CAP water will only make RCM's procurement of water more challenging. See Appendix D, Deficiency No. 3, Section 2.

A pair of recent studies by Arizona State University concluded that the average real impact of CAP water to Arizona was about $40,000-$50,000 per acre-foot. At that rate, the loss of 15,000 af per year of water would lead to a loss of $600 to $750 million per year. Cumulatively, over a forty-year period, i.e. the life of RCM, the lost economic activity due to the reduction in CAP water available for use would be $24 to $30 billion. See Appendix D, Deficiency No.3, Section 3.

Water supply in Arizona and the Lower Colorado Basin states is out of balance with water demand and has been for a relatively long time. Adjustments will have to be made. The physical reality of the shortage of water cannot be ignored. It is unlikely that the adjustment will be smooth. Different water users' water rights have different priorities, so the impact of adjustment will fall unevenly on different individuals and organizations. In most rural areas, agriculture is not just another type of industry where workers can earn a living. It is also a way of life that is considered important to maintain and support. It has roots in the history and culture of the region. Its loss can contribute to the depopulation of rural areas and the loss of local schools and communities. Alternatively, the availability of the land can encourage ongoing ex-urban sprawl and loss of historical and cultural roots. (See Appendix D, Deficiency No. 3, Section 3.)

DEIS Deficiency No. 4: The Socioeconomic Analysis in the DEIS *Assumes* the RCM Will Have Almost Perfectly Stable Positive Impacts on Employment and Payroll.

One important explanation for the poor economic performance of local economies specializing in metal mining - despite the very high wage characteristics of that industry - is the instability of employment and income associated with mineral development activity.

Arizona has had over a century of economic history with copper mining. During that time, the demands for American copper has constantly fluctuated. Over the last 110 years, at least seven major booms followed by busts occurred in which copper production fell by as much as 75 percent and most recently fell by 54 percent from 1998-2011. Those "busts" almost always involved declines of 25% to 33% or more in copper production. With those declines in copper production, of course, came declines in employment, payrolls, mine purchases of supplies, and payments of state and local taxes.

The source of these declines in American copper production was the constant fluctuation in the price of copper that regularly changed the profitability of existing copper operations. These repeated fluctuations in the demand for and the price of copper led to ongoing fluctuations in copper industry employment, payroll, supply and equipment purchases, and tax payments. Analysts have come to call this irregular but ongoing instability in the economic impact of metal mining on local communities a *"flicker" effec*t. Arizona copper industry employment over the last forty-six years dramatically demonstrates this volatility in copper industry employment. Employment regularly increases by 5,000 to 15,000 jobs and then tumbles downward in the same dramatic way.

These periodic booms and busts in copper production and employment have disruptive impacts

on the communities in the vicinity of the copper mines. This volatility prevents the high wages associated with copper mining from having a reliable positive impact on local economic vitality and stability. The DEIS recognizes this: The "overview" of the socioeconomics section (3.13) ends with the statement that "Historically, mining in Arizona has followed a 'boom and bust cycle, which potentially leads to great economic uncertainty." (DEIS p. 640) See. Appendix D, Deficiency No. 4, Section 1.

The DEIS, however, does not incorporate these important economic characteristics of copper mining into its analysis of socioeconomic impacts. It depicts the socioeconomic impacts associated with additional copper mining as large, stable, and positive which ignores a century of Arizona copper mining experience.

Despite the DEIS recognizing the past volatility of Arizona copper mining, the DEIS assumes that the RCM Project will operate with perfectly stable employment and payrolls. See Appendix Deficiency No. 4, Section 2. The DEIS asserts that RCM will be able to continue operating even when international copper prices tumble downward. In projecting likely economic impacts associated with a proposed copper mine, fluctuations in production and employment similar to the historic record need to be incorporated into the projected impacts. Accurately projecting operating costs decades into the future before a mine is constructed and brought into operation is very difficult. As both the slow downs on Rio Tinto's Oyu Tolgoi copper mine in Mongolia and the unexpected large volume of water in the No. 10 shaft show, the actual costs being incurred can be quite different than the General Operating Plan projected. See Appendix D, Deficiency No. 4, Section 4.

The DEIS ignores these risks and changes in mining plans and costs while confidently projecting quite low mine production costs that are expected to last for decades. This may cheer investors, but such overly optimistic projections do not support good decision making by the public and public land managers.

DEIS Deficiency No. 5: Social Costs Associated with Mining

The DEIS does not discuss the social disruption associated with 1,500 mining jobs being filled by in-commuting workers arriving in or leaving from Superior every day of the year. Such flows of workers into and out of small communities are known to be associated with significant social costs that undermine quality of life in small communities in the vicinity of the industrial facilities such as mines in small towns and rural areas.

Not all changes that come with mining can be quantified in the same way. Some things are easy to quantify, such as the direct payments to the miners or the direct employment of the miners at the mine site. These jobs and payroll are generally the first things that are touted when a new mine is proposed in a local area. What may not be as clear are the costs to the local town of having a large, predominantly male, transient, and high paid work force come to town and then leave 365 days a year. The DEIS has not looked at some of the darker costs associated with mining towns. Some of those costs are associated with a transient work force that is not invested in the local community, increased calls to the local police, increased alcoholism, increased drug use, prostitution and trafficking, and increased domestic violence and abuse. In the Appendix, Deficiency No. 5, we provide a review of the literature that has linked mining to many of these social maladies that are often completely left out of the discussion of the potential costs to the local communities closest to the mine. Those costs are not considered and certainly not quantified in the DEIS.

One should not be shocked by these findings of significant social costs associated with mines in rural areas. A large group of single, transient, males who work long hours out of sync with the local standard workday and workweek, who have a large amount of money to spend and long blocks of idle time, can be expected to be difficult to integrate into a small community. BBC Research & Consulting, who prepared the "Socioeconomic Effects Technical Report" that was the basis of the socioeconomic impact section of the DEIS, characterized the current RCM workforce in the following way: "Currently, Superior is primarily attracting the mining "transient" population, largely consisting of unmarried skilled trades workers on 3-to-4-year shifts." (BBC, Section I, Page 14.)

According to the DEIS, RCM will create about 1,500-1,600 jobs in Superior. BBC estimates that limited housing in Superior would initially lead only 10 percent of the RCM workers to choose to live in Superior. For the Town of Superior this would be a very large impact. The total workforce in Superior now is about 1,200. The number of workers in Superior would more than double from about 1,200 to about 2,800 as a result of the RCM. But the vast majority of these new workers would commute in and out of Superior each and every day as RCM schedules workers to operate mine and mine facilities 24 hours a day, 365 days a year.

One study seeking to understand the level of substance abuse in resource-based communities, focused on the undermining of community structure and fragmentation of the populations in small mining communities:

> "Specifically, the linkages between social structure, community fragmentation, and family

> dysfunction offer a way of understanding differential resistance and susceptibility to substance abuse. Five thematic areas were linked to susceptibility in this study: (1) an economy based on multiple divergent sectors, which gives rise to income disparity and social inequality; (2) a highly transient population, which results in social distancing and lack of social support; (3) shift work, which prevents opportunities for consistent and productive family and community relationships; (4) high incomes, which lead to material competition and financial stress; and (5) a culture of entitlement, which produces certain expectations and perceived privileges among some workers and their families."[39]

Mining communities are likely to have all of these characteristics which at least partially explains the social costs associated with large inflows of miners into small towns and rural areas. The DEIS ignores these social costs while emphasizing the social benefits of additional high-paid jobs

Energy Impacts

No environmental analysis has been done on the two 230kV transmission line corridors that will run across USFS land. SRP and Resolution Copper are planning for major new 230kV and 69kV transmission lines and power substations for this mine project. In the Federal Register dated March 18, 2016, under "Nature of Decisions to be Made" the Forest Service contemplates issuing a special use permit or these activities. It is unclear from this language whether the Forest Service intends to exempt the power lines and substations from full EIS analysis and instead only require the special use permit alone. If so, this is improper, as the construction of these transmission lines and substations constitute major environmental actions by themselves and are also connected actions directly related to the overall mine project. The cumulative impacts from these facilities must all be fully reviewed in the revised DEIS for public review.

This is clearly evidenced by the Resolution mining plan of operation dedicating an entire section to the provision of power for the project (section 3.5.1., in the version of the mining plan currently appearing on the Forest Service website) and also evidenced in Section 3003 of the 2015 National Defense Authorization Act, specifically stating that "approvals for the construction of associated power" must be included in the EIS:

"ENVIRONMENTAL ANALYSIS. — Prior to conveying Federal land under this section, the Secretary shall prepare a single environmental impact statement under the National

[39] Parkins, J. (2011). Linking social structure, fragmentation, and substance abuse in a resource-based community. *Community work and family*. 2011.

Environmental Policy Act of 1969 (42 U.S.C. 4321 et 25 seq.), which shall be used as the basis for all decisions under Federal law related to the proposed mine and the Resolution mine plan of operations and any related major Federal actions significantly affecting the quality of the human environment, including the granting of any permits, rights-of-way, or approvals for the construction of associated power, water, transportation, processing, tailings, waste disposal, or other ancillary facilities."

New 230kV transmission lines from the existing 115kV substation to the mine will have to be run through a new corridor or right-of-way through the Tonto National Forest and cannot be run through the existing power line right-of-way. That is because the existing 115kV lines will also need to remain in place. The Forest Service therefore must study all environmental issues associated with allowing a new power line corridor. These issues include possible impacts on existing wildlife, air and water quality, among others. The environmental impacts associated with the new, larger 230kV substation also need to be carefully studied by a full EIS.

In a similar way, the new 69kV transmission line along the MARRCO corridor and new 69kV substation near the load out facility also need to be thoroughly studied for potential impacts to wildlife, air and water quality issues and other possible environmental impacts. This aspect of the mine project deserves a full EIS treatment.

Projected Consumption of Electricity and Water by the Proposed Resolution Copper Mine, Arizona

(See Emerman's full report in the Appendix with the same title)

The DEIS now estimates total electricity consumption at 250-280 MW, whereas no studies provided estimates, except for the study done by hydrologic and geologic expert, Dr. Steve Emerman. The DEIS references Garrett, 2019, "Process Memorandum to File—Power Requirements of Mine, Mine Facilities, and Alternative Tailings Storage Facilities," which gives maximum electricity consumption of 6.45 MW for dewatering and 6 MW for refrigeration. None of these estimates are accompanied by any explanation.

It has been quite surprising that the 2395 pages of the General Plan of Operations (Resolution Copper Mining, 2014a-c) do not include any estimate of total power requirements or any source of power (besides emergency power) except for the local grid of the Salt River Project. A previous report (Emerman, 2018) provided some insight as to why this lack of projected electricity consumption could be a concern for investors. In 2007 drilling began for the 6943-foot-deep, 28-foot-diameter No. 10 shaft, which was intended for both exploration and as

the primary access point for the underground mine (E&MJ, 2014). However, in December 2012, geothermal water at a temperature of 170°F began entering the shaft at a rate of 460 gallons per minute (gpm). According to Tom Goodell, general manager – shaft development for Resolution Copper, "Productivity flattened out at 6500 feet…The consultants told us that we would have little or no water below 4000 feet…They kind of missed that call. We hit it all in one spot and it was quite dramatic" (E&MJ, 2014). The Arizona Daily Star confirmed, "Shaft-sinking equipment had reached a depth of about 6,500 feet when water from an underground aquifer began rushing in. The miners were prepared to handle 80 gallons per minute, which is what core samples from 30 feet away predicted" (Bregel, 2016). The result of the unexpected discovery was a two-year delay in drilling for the installation of upgraded pumping, refrigeration and ventilation equipment. The shaft was completed in 2014 and is now the deepest single-lift shaft in the U.S. (EM&J, 2014; Resolution Copper, 2018c). Later reports indicated that the entry rate of geothermal water into the No. 10 shaft had increased by over a factor of three to 1400 gpm and that the temperature of the geothermal water was 180°F (Bregel, 2016; Phillips, 2016).

Neither the existence of the geothermal water, nor the additional costs associated with geothermal water, are mentioned anywhere in the General Plan of Operations (Resolution Copper Mining, 2014a-c). The geothermal water is not even mentioned in any of the discussions of regional hydrology or the potential impacts of mining upon groundwater. This is again surprising, since the document states a publication date of May 9, 2016 (title page) with an initial submittal date of November 2013 and a revision date of September 23, 2014 (page ii). The additional costs include the electricity required to dewater, refrigerate, and ventilate the mine. (Additional ventilation would be required due to the gases exsolving from the geothermal water.) An additional cost unrelated to consumption of electricity would be the cost of replacing mine equipment that is subject to corrosion by the persistent saturated atmosphere. The report by Bloomberg Businessweek (Phillips, 2016) emphasized that the latter is a real concern. According to the report, "Steaming hot water pours off the rocks…It's like standing in a tropical rainstorm. A digital hydrometer on the wall registers 100 percent humidity" (Phillips, 2016).

Emerman (2018) calculated an additional power requirement of 24 MW solely for the additional mine dewatering and refrigeration that would result from the geothermal water under a best-case scenario. The best-case scenario was based upon the following assumptions:

- The flow of geothermal water into the No. 10 shaft has achieved a steady-state.
- The aquifer has uniform transmissivity (product of aquifer thickness and hydraulic conductivity).
- The recharge rate of the aquifer does not exceed 0.1 inches per year.
- All mine dewatering can be carried out through a single vertical pipe.

- The mine can be refrigerated with maximum theoretical efficiency.

The worst-case scenario is a more difficult question, since worst cases tend to be unbounded. Of the five assumptions that led to the best-case estimate, the violation of the second assumption (uniform aquifer transmissivity) would have the greatest consequences. Aquifer thickness can vary somewhat, but hydraulic conductivities of fractured crystalline rock can vary by four orders of magnitude (Charbeneau, 2000). The real worst-case scenario is that, as the underground mine expands, it encounters increasingly fractured rock.

Emerman (2018) estimated the power requirement for the additional mine dewatering and refrigeration under the worst-case scenario simply by multiplying the best-case scenario by a factor of two orders of magnitude to obtain 2400 MW. Another approach is to note that, if the hydraulic conductivity increases by two orders of magnitude, then the entry rate for geothermal water could increase from the 3800 gpm that would occur from expanding the mine with uniform hydraulic conductivity up to 380,000 gpm. At such high flow rates, the head loss becomes very sensitive to the diameter of pipes through which the geothermal water is pumped to the surface. The problem can be avoided by assuming pipes with infinite diameter (zero head loss), which would result in a power requirement under the "minimum" worst-case scenario of 1650 MW (500 MW for dewatering and 1150 MW for refrigeration).

A still earlier study that was funded by Rio Tinto (Bluhm et al., 2013) proposed a design for 140 MW of refrigeration capacity for the Resolution Copper Mine. This refrigeration capacity was intended to be sufficient to accommodate the heat load of 32 MW that would be generated by mobile and static equipment, as well as the heat flow of 30 MW from the broken rock in the underground mine. It is important to note that the heat flow of 30 MW assumed a dry mine and did not take into account the additional heat that would be exhausted from geothermal water entering the mine, which would be proportional to the flow rate of the water. Moreover, the ventilation capacity proposed by Bluhm et al. (2013) was designed to handle only dust and not gases exsolving from geothermal water. The ventilation capacity was expressed as a flow rate (3000 m3/s) without a corresponding power requirement. However, the ventilation power requirement can be estimated using the formula for ideal power consumption for a fan without losses

$$P=q\,\Delta p \quad (1)$$

where P is the power requirement, q is the airflow and Δp is the pressure increase in the fan. Although Bluhm et al. (2013) did not state a design fan pressure, typical underground mines require airflows at pressures of 2-3 kPa, along with more typical airflows of 200-300 m3/s

(AusIMM, 2012). Using Eq. (1) with a pressure of 2.5 kPa and airflow of 3000 m3/s results in a ventilation power requirement of 7.5 MW.

Failure to Fully Analyze Impacts from Water Use and Consumption

The DEIS fails to analyze the direct, indirect, and cumulative impacts from using all of the water for the mine. There is little to no analysis of the impacts from removing the needed water from the various sources across Arizona.

> The estimated total quantity of external water needed for the life of the mine (construction through closure and reclamation) is substantial and varies by alternative (180,000 to 590,000 acre-feet). Resolution Copper proposes to use water either directly from the Central Arizona Project (CAP) canal and/or groundwater pumped from the East Salt River valley. Over the past decade, Resolution Copper has obtained banked water credits for recharging aquifers in central Arizona; the groundwater pumped would be recovery of those banked water credits, or groundwater use authorized by the State of Arizona under a mineral extraction withdrawal permit.

DEIS at ES-3.

> The estimated total quantity of external water needed for the life of the mine (construction through closure and reclamation) varies between alternatives. Resolution Copper proposes to use water either directly from the CAP canal or through wells along the MARRCO corridor in the East Salt River Valley. The water pumped is either considered banked CAP water, or water authorized by the State of Arizona to be pumped under a mineral extraction withdrawal permit, or a Type II non−irrigation grandfathered right. Regardless of the authority for obtaining the water, the water is pumped from the same wells. Currently, Resolution Copper has acquired approximately 313,000 acre-feet of renewable long-term storage credits within the Phoenix and Pinal Active Management Areas (AMAs). These include credits for CAP water banked at the NMIDD, Hohokam Irrigation Drainage District, and Roosevelt Water Conservation District groundwater savings facilities, credits for CAP water directly recharged at the Tonopah Desert Recharge Project, and purchase of renewable long-term storage credits from the Gila River Water Storage LLC. Resolution Copper has also applied for an additional 2,238 acre-feet per year allocation of CAP Non-Indian

> Agricultural water from the U.S. Department of the Interior Bureau of Reclamation; this application is not yet approved.

DEIS at 59. At the outset, the "either/or" and "and/or" aspect of the water sources is unacceptable from a NEPA and public review standpoint. Resolution and the USFS have had years to develop and review this project and the DEIS must determine the sources of the water and not rely on vague assertions of possible sources.

For all of the potential sources, the DEIS fails to analyze the environmental, economic, cultural/historical, and other impacts from removing this water. The DEIS also fails to analyze the baseline conditions of the areas that will suffer such massive water withdrawals. The DEIS' brief mention of the groundwater removal (DEIS at 341-342) does not contain any details of the impacts from this water withdrawal on the source areas. This is despite the DEIS' acknowledgement hat "Loss of this water from the East Salt River valley aquifer is an irretrievable impact; the use of this water would be lost during the life of the mine." DEIS at 345.

For example, the DEIS does some analysis of the impacts from the water withdrawal/loss at/near the mine site (albeit inadequately as shown herein), yet no analysis was done regarding the similar loss of Groundwater Dependent Ecosystems (GDEs), wildlife habitat, etc., for the massive quantities of water removed from further-away areas.

The fact that Resolution may have water rights to this water does not satisfy the USFS/Corps' duty to fully review all of these impacts – as both connected actions under NEPA and as unavoidable cumulative impacts under NEPA.

Regarding the CAP water alone, the DEIS admits (DEIS at 59) that Resolution does not have the required approvals from the Bureau of Reclamation (BOR), especially since the BOR never analyzed the environmental and other impacts from removing, transporting, and delivering this water to Resolution. Indeed, the BOR suspended its review of the Draft Environmental Assessment (DEA) for the Recommendation for the Reallocation of Non-Indian Agriculture Water within the Central Arizona Project (CAP) System in accordance with the Arizona Water Settlements Act of 2004. *See* August 16, 2016 letter from BOR to Terry Rambler, Chairman of the San Carlos Apache Tribe.

Regarding the Resolution Mine, ADWR recommends, and BOR had proposed to authorize, 2,238 AFA (acre-feet annually) to be delivered and used by the Mine as part of its proposed operations. DEA at 14 (Table 1). None of the impacts to environmental, cultural, historical, and other resources caused by the proposed Mine have been reviewed, at all, by BOR or its DEA.

The same is true for the other activities/projects proposed to receive and use the proposed Allocations listed in DEA Table 1. The failure to analyze these impacts, as well as the failure to fully review the impacts from the removal of water from the Colorado River and construction of all the delivery infrastructure, violates NEPA and other laws/regulations/policies noted herein.

The DEA asserts that the Resolution Mine is not dependent on using the CAP allocation proposed by BOR in this case. DEA at 16-17. That is wrong. As admitted in the DEA, Resolution requires significant amounts of CAP water to support its mine operations near Superior, Arizona. In Resolution's Application to ADWR for the NIA reallocation, dated June 14, 2013, Resolution specifically explains that the NIA reallocation will be used for its mine operations at Superior, because (according to Resolution) it became apparent early on that "the bedrock in the vicinity of the mine was not going to be an efficient or sustainable source of water to supply the Project's water needs." Application at 4. In fact, Resolution makes clear in its Application that, in terms of priority, the first water supply it intends to rely on to operate the Mine is CAP water, including the proposed CAP reallocation. *See* Table 5.1, Application at 12. Thus, the significant impacts of the Mine must be evaluated as a connected action in the context of the proposed reallocation of CAP water to Resolution.

Moreover, in Resolution's own General Plan of Operations (GPO), submitted to the Tonto National Forest Service in November 2013, as amended, Resolution estimates it will need at least 500,000 acre-feet of water for the life of its Mine. *See* General Mining Plan of Operations (GPO) at 174. The GPO specifically sites to its current request for a reallocation of CAP NIA water as a critically needed source of water for its Mine. *Id.* at 173-174.

In examining the scope of the federal action under 40 C.F.R. § 1508.25, all "connected actions" must be considered under NEPA. This is because NEPA requires that the sum of all related components making up a "larger" action be evaluated together. It is unacceptable to divide a large action into a series of smaller actions or to not consider the proposed action in context with other actions taking place, called "connected actions." Here, there can be no doubt that (a) the Mine project justifies and is the exclusive reason for Resolution's request for a reallocation of CAP NIA Water; (b) it is both unreasonable and unwise for Resolution to develop its Mine without having secured the water supplies it needs for the Mine, which includes the CAP NIA reallocation; (c) the Mine undoubtedly triggers the request for reallocation to BOR; and (d) Resolution's acquisition of CAP NIA is committed solely to the use of the Mine. It is therefore a connected action that must be fully reviewed in the revised DEIS.

In addition, regardless of whether the Mine and other projects/activities are "connected actions," NEPA and other laws require the agencies to review the indirect and cumulative impacts from these projects/activities.

Potential Impact of Geothermal Water on the Financial Success of the Resolution Copper Mine, Arizona

(See Emerman's full report in the Appendix with the same title)

Hydrologic and geologic expert, Dr. Steve Emerman evaluated the ability of Rio Tinto to profitably operate the mine, regardless of the social and environmental impact of the mine. The objective was addressed by considering unanticipated costs, in particular, the encounter of geothermal water (180°F) in a 6943-foot-deep exploratory shaft at a flow rate of 1400 gallons per minute (gpm). The additional costs of mine dewatering and refrigeration were estimated using all best-case scenarios. The Thiem Equation for steady-state groundwater flow was used to estimate an entry rate for geothermal water of 3800 gpm for the completed mine. The Hazen-Williams Equation for pipe flow was then used to estimate a power requirement of 12 megawatts (MW) for dewatering. The theoretical maximum coefficient of performance for exchange of heat between the surface and the geothermal water was used to estimate a power requirement for refrigeration of another 12 MW. The minimum total power requirement for mine dewatering and refrigeration of 24 MW is equivalent to the average power requirement of 20,000 U.S. households. The worst-case scenario is difficult to estimate, but if more highly fractured rock is encountered during construction of the underground mine, the additional power requirements could easily be 100 times greater. Additional costs of ventilation, due to gases exsolving from the geothermal water, and corrosion of mine equipment, due to the persistent saturated atmosphere, were not considered. The most disturbing issue is the failure of the General Plan of Operations to estimate the total power requirements of the proposed copper mine or to seek any source for power besides the local grid of the Salt River Project.

The most significant unanticipated costs thus far have been the costs associated with the unexpected discovery of geothermal water at the location of the proposed underground mine. In 2007 drilling began for the 6943-foot-deep, 28-foot-diameter No. 10 shaft, which was intended for both exploration and as the primary access point for the underground mine (E&MJ, 2014). According to a summary of a presentation by Tom Goodell, general manager – shaft development for Resolution Copper, "Productivity flattened out at 6500 feet. The reason: hot water. 'In late December [2012], we hit a lot of water,' Goodell said. 'We are pumping 460 gpm [gallons per minute]…The consultants told us that we would have little or no water below 4000 feet…They kind of missed that call. We hit it all in one spot and it was quite dramatic'" (E&MJ,

2014; see Fig. 2). The summary continued, “The other wrinkle is that the water coming out of the ground at shaft bottom is as high as 170°F (77°C)” (E&MJ, 2014). The result of the unexpected discovery was a two-year delay in drilling for the installation of upgraded pumping, refrigeration and ventilation equipment (see Fig. 2). The shaft was completed in 2014 and is now the deepest single-lift shaft in the U.S. (EM&J, 2014; Resolution Copper, 2018c).

Later reports indicated that the entry rate of geothermal water into the No. 10 shaft had increased by over a factor of three to 1400 gpm. According to a report in Bloomberg Businessweek, “A 6-foot-tall submersible pump in 20 feet of water beneath the shaft fills a dumpster-size tank. From the tank, two large pumps each shoot 700 gallons per minute up to the surface” (Phillips, 2016). The existence of two pumps (although not the discharge rate of each pump) was confirmed by the Arizona Daily Star, “Two huge water pumps send water out of the cave” (Bregel, 2016). The report by Bloomberg Businessweek also stated, “Without the elaborate refrigeration system that pumps chilled air down No. 10, the bottom of the mine would be 180°F, far too hot for a human to withstand” (Phillips, 2016). In the analysis of this study, the temperature of the geothermal water will be assumed to be 180°F, although it is not clear that this temperature actually increased since the previous report (E&MJ, 2014).

A study was conducted by hydrologic and geologic expert, Dr. Steve Emerman (see Emerman, Potential Impact of Geothermal Water on the Financial Success of the Resolution Copper Mine, Arizona), to determine the potential impact of geothermal water on the financial success of the Resolution Copper Mine, Arizona. Based on the unanticipated discovery of geothermal water, the first question regarding significant unanticipated costs can now be subdivided into two questions:

1. What will be the additional cost of mine dewatering once the underground mine has been completed?
2. What will be the additional cost of mine refrigeration once the underground mine has been completed?

Both of the above questions were addressed assuming a best-case scenario at every step of the analysis, so that the absolute minimum additional costs were estimated. It should be pointed out that two more additional costs are difficult to estimate and could be quite large. These additional costs are the costs of ventilation, due to gases exsolving from the geothermal water, and the cost of corrosion of mine equipment, due to the persistent saturated atmosphere. The report by Bloomberg Businessweek (Phillips, 2016) emphasized that the latter is a real concern. According to the report, “Steaming hot water pours off the rocks…It’s like standing in a tropical rainstorm. A digital hydrometer on the wall registers 100 percent humidity” (Phillips, 2016).

The best-case scenario resulting in an additional power requirement of 24 MW due to the unexpected encounter with geothermal water can now be reconsidered. That best-case scenario was based on the following assumptions:

- The flow of geothermal water into the No. 10 shaft has achieved a steady-state.
- The aquifer has uniform transmissivity.
- The recharge rate of the aquifer does not exceed 0.1 inches per year.
- All mine dewatering can be carried out through a single vertical pipe.
- The mine can be refrigerated with maximum theoretical efficiency.

According to common sense, no one would budget for a best-case scenario. It is probably more appropriate to double the cost of the best-case scenario and assume that an extra 48 MW (approximate power usage by 40,000 U.S. households) will be required for mine dewatering and refrigeration. It should be recalled that no attempt has been made to estimate the additional costs of increased ventilation to remove exsolving gases from the geothermal water or the corrosion of mine equipment due to the persistent saturated atmosphere.

The worst-case scenario is a more difficult question, since worst cases tend to be unbounded. Of the five assumptions that led to the best-case estimate, the violation of the second assumption (uniform aquifer transmissivity) would have the greatest consequences. The assumption of uniform transmissivity (product of aquifer thickness and hydraulic conductivity) is an assumption behind the Thiem Equation (Fetter, 2001). Aquifer thickness can vary somewhat, but hydraulic conductivities of fractured crystalline rock can vary by four orders of magnitude (Charbeneau, 2000). The real worst-case scenario is that, as the underground mine expands, it encounters increasingly fractured rock. If the hydraulic conductivity increases by only two orders of magnitude, then both the dewatering power and the refrigeration power could be multiplied by approximately 100, for a total power requirement closer to 2400 MW.

The original objectives of this study can also now be reconsidered. With regard to the first objective, it could be asked whether the encounter with geothermal water still constitutes an "unanticipated cost." According to the E&MJ (2014) article, it was certainly unanticipated at the end of 2012. The Arizona Daily Star article confirmed, "Shaft-sinking equipment had reached a depth of about 6,500 feet when water from an underground aquifer began rushing in. The miners were prepared to handle 80 gallons per minute, which is what core samples from 30 feet away predicted…It took a year for workers to figure out how to pump out that much water and install the air-conditioning system that lets humans work in such hot conditions" (Bregel, 2016). It is confusing that nowhere in the initial three-volume General Plan of Operations (Resolution Copper Mining, 2014a-c) or the four-volume DEIS is there any mention of the geothermal water

and how that will affect the power requirements of the project. Therefore, it could be said that the additional costs associated with geothermal water have not yet moved into the category of "anticipated costs." It should also be emphasized that the significant difference in the flow rate of geothermal water over a distance of only 30 feet (Bregel, 2016) is consistent with a strong spatial variability in aquifer fracturing, as mentioned above.

The second objective was to consider whether the four-volume DEIS adequately addressed all of the anticipated costs. On this basis, it would be tempting to ask how the additional power requirements associated with the encounter with geothermal water compare with the total power requirements of the copper project. It is shocking that the DEIS does not include any estimate of total power requirements or any source of power (besides emergency power) except for the local grid of the Salt River Project. It is difficult to remain objective about this when even a business plan for a one-man machine shop would estimate power requirements and would assure the bank that an adequate source of power was available. The obvious unanswered and pressing questions are:

1. What are the total power requirements of the Resolution Copper Mine?

2. How will the consumption of that power affect the other consumers of power from the Salt River Project?

Also important for consideration conclusions that Emerman's study of the potential impact of geothermal water on the financial success of the proposed Resolution Copper Mine, Arizona posed. The chief conclusions of this study can be summarized as follows:

- Under the best-case scenario, the completed underground mine will encounter geothermal water at a flow rate of 3800 gpm.
- Under the best-case scenario, the additional power requirements for mine dewatering and refrigeration will be 24 MW.
- The worst-case scenario is difficult to estimate, but if more highly fractured rock is encountered during construction of the underground mine, the additional power requirements could easily be 100 times greater.
- The above estimates do not include the additional costs of ventilation, due to gases exsolving from the geothermal water, and corrosion of mine equipment, due to the persistent saturated atmosphere.
- The most disturbing issue is the failure of the General Plan of Operations to estimate the total power requirements of the copper mine or to seek any source for power besides the local grid of the Salt River Project

Alternatives Energy Production for Proposed Project

The DEIS does not discuss significant alternatives for energy supply that need to be identified and analyzed, The following outline some possibilities:

(1) On-site alternative energy sources.
(2) Buried transmission lines.
(3) Requiring Resolution Copper to source from offsite alternative energy projects.
(4) Requiring significant energy saving techniques for the proposed project.

Transportation Analysis

The DEIS discussion is incomplete and inadequate regarding transportation. Traffic impacts are incomplete and were created with unsupported assumptions, improper methodology, and inaccurate data. The analysis also suffers significantly from technical errors, overly narrow bounds of analysis and failure to identify appropriate mitigation. Further, there is new information that needs to be analyzed and incorporated into a revised or supplemental DEIS.

Finally, as discussed below, the identification and analysis of mitigation measures is quite inadequate.

Incorrect Information

The traffic impact reports that are the basis of much of the analysis in the DEIS show increased traffic from the mine will cause level of service Hwy 60 to approach unacceptable values during peak travel times. Several incorrect assumptions are made to reduce Resolution Copper's traffic impact with no supporting documentation justifying these assumptions. Incorrect methodology was used to generate the traffic impact reports. Two-way, two-lane highway segment methodology was used when the roadway conditions mandate the directional methodology must be used. There is also evidence of incomplete LOS worksheets. No input data is documented; there is incorrect site information, and incorrect lane width and shoulder width used to determine adjusting values.

The DEIS incorrectly bases its traffic counts on only two studies (both done by Resolution Copper) on a Friday in 2015 (between 7 am and 10 pm) and presumably also on a Friday during the same hours of the day in November of 2018 (this was supposed to cover winter visitor traffic). No explanation was given as to why the sample is so small or why only those days were used. To begin with summer traffic begins well before 7 am and winter visitors have not all yet arrived in November. Why were these studies done 3 and 4 years ago? It is unclear if the DEIS's multiplier rate for traffic increase of 2% per year was added to make those old studies more relevant. Also, since the Skunk Camp tailings alternative was not made public until 2017 at the earliest, does the Resolution Copper study claim to have surveyed the intersection of Highway 777 and Dripping Springs Road in 2015? These studies need to be redone in a new or supplemental DEIS by an independent agency.

Why does the DEIS assume that construction would begin in 2022 when Resolution Copper publically maintains that construction would begin much later as would presumably production? Is that because by "assuming" the earlier dates you would show less impact form traffic related to the project?

Missing or Incomplete Information

Oversized loads are not documented. Peak construction supply shipments must be documented and applied to the traffic impact reports.

Socio-economic impacts are incomplete. Additional public cost of road improvements and ongoing maintenance to roads that will be used to transport product and supplies to and from the mine must be documented. A 200%-400% increase in traffic accidents and a 600% increase in fatalities will increase emergency personnel and equipment costs to respond to the increased number of accidents.

The DEIS completely fails to analyze the transportation impact of moly concentrate from the West plant site (presumably via tractor trailer) and for copper concentrate from the loadout facility by rail.

The DEIS must analyze transportation impacts (including greenhouse gas emissions, carbon footprint, and air quality) for the entire "chain of custody" from the origination of materials and supplies used to construct the project, to materials and supplies used during the mining period and closure, and for the entire transportation of concentrate from the mine operations to the final processing facility. This must be analyzed in a new or supplemental DEIS with a new

corresponding public comment period.

The DEIS completely misses any analysis of the impact of increased traffic from Highway 77 north to Highway 60 including Globe, Miami, the San Carlos Apache Reservation, and south along Highway 77 through Winkleman, Mammoth, Oracle, Catalina, Oro Valley, and Tucson.

Although the DEIS states that Section 3.13 talks about the cost to repair roads due to increased traffic from the proposed mine project there is only one small paragraph that mentions a figure for road repair within the town of Superior. This is laughably pathetic. A new or supplemental DEIS must analyze the cost of damage to all highways affected by the proposed mine project including, but not limited to Highways 60, 77, 79, 177, 70, and many smaller roads.

There is no discussion in the DEIS about impacts to the safety of OHV users from increased mine traffic on Forest roads that would not be destroyed by the proposed mine project. In particular, the traffic safety impacts along the pipeline and powerline corridors for all the tailings alternatives is completely missing. There must be one discussion/analysis for impacts during construction, but also conflicts between OHV and other recreation uses from mining maintenance vehicles during the life of the project.

In a section titled aptly "Unavoidable Adverse Impacts," meaning, we suppose that there is an acceptable loss of life or limb from the proposed project, "Increased traffic associated with mine workers commuting and truck traffic to and from the mine are expected to result in impacts that cannot be avoided or fully mitigated, including increased traffic congestion and increased risk of traffic accidents." It goes on to say that "The only applicant-committed environmental protection measure that would alleviate impacts on LOS would be the addition of turn lanes at the SR 177/U.S. 60 intersection." A new or supplemental DEIS must include mitigation measures to decrease mine related traffic accidents to current levels.

A new or supplemental DEIS must fully study not only increased traffic accidents due to the proposed project because the current DEIS does not once mention traffic fatalities that this project would invariably cause. A full analysis of the increase in traffic fatalities and the associated costs must be undertaken.

Traffic impact reports may help to identify potential traffic impacts, but does not address traveler safety. Accident frequency is expected to increase, but no mitigation to reduce accidents are documented. Accident fatalities are expected to increase, yet the DEIS suggests it will not impact emergency service expenses, nor does it identify who will pay for emergency response. Measures to improve traffic safety must be identified and mitigation negotiated with ADOT and the

improvements must be completed prior to construction of the mine, if it is permitted.

The DEIS fails to consider the practical aspects of operating a large truck while travelling smaller state highways 77, 79 and 177.

The DEIS ignores an additional hazard for bicyclists due to increased mine traffic. There are no shoulders for bicyclists to escape to in the event trucks traveling in opposite directions need to take up all of the lane spaces in each direction on Highways 77 or 177. In addition, there are curves that will only reduce safe distances between truck and bicyclists; particularly at the tail end of trailers due to the off tracking of the trailer. Increased southbound truck traffic will increase the risk of injury or death to bicyclists on SR77 and 177.

The proposed project would degrade both Highway 77 and 177 for all users. Unnecessary crashes due to lack of roadway design to accommodate more trucks will only further exacerbate the efficiency of these Highways.

The role of the Arizona Department of Transportation (ADOT) has been overlooked in the DEIS's description of decisions that must be made in the transportation arena. Neither the description of decision making agencies nor the discussion of relevant laws, regulations, policies and plans related to transportation describe the obligation of the applicant to obtain a permit from ADOT for access and encroachment onto state highways. The USFS must improve their coordination with ADOT and include an analysis of this new proposal in a revised or supplemental DEIS.

The DEIS not only fails to identify appropriate mitigation for safety measures but fails to discuss the obligations of Resolution Copper to finance such mitigation. Resolution Copper should be required to pay for all transportation mitigation measures required by ADOT, as well as any mitigation measures required for National Forest System roads.

The DEIS did not discuss (or glossed over to the point we missed it) as discussion of the consequences of s collision, derailment, or spill from a train hauling very toxic copper concentrate to its final destination. The consequences of an accident featuring a train carrying copper concentrate would be potentially disastrous. In addition to addressing a railroad accident, the DEIS should have addressed the consequences of chronic spillage of copper concentrate (and in the event that railroad cars were open) chronic blowing of copper concentrate from railroad cars or from the loadout facility itself during loading of railroad cars or from other actions at the loadout facility.

Overly Narrow Spatial Bounds of Analysis

The DEIS does a particularly poor job of analyzing the impacts to Highway 60, already heavily travelled by large trucks, and intersections with smaller arteriales for the Loading facility, the West Plant, East Plant, and any of the tailings alternatives. Further, the DIES does not identify what other mine-related shipments will arrive by rail and whether there will be additional HAZMAT risks associated with the area.

Additionally, signatories to these comments have repeatedly heard Resolution Copper officials say in public forums that the copper concentrates will be shipped from the loadout facility to a port near Guaymas, where they would be put on a ship for overseas delivery to a smelter or sent by rail to some other smelting facility. The DEIS needs to identify the route the copper would take from the loadout facility to the railroad head and the capacity of commercial rail to handle these shipments. Analysis then needs to extend to the proposed routing area. For example, east-west traffic in heavily populated Rio Rico and at more than thirty-two other major road-railway intersections will be blocked at least twice daily for the additional trains along the line between Phoenix and the border. A revised or supplemental DEIS must analyze the effects on traffic on air quality (Nogales has already been designated as a "non- attainment area" area by EPA), safety, traffic flow and commerce in Rio Rico and other communities affected by the route, including the city of Nogales. Downtown Nogales already has a serious problem with automobile and truck traffic due to long delays at the border for trains traveling to and from Mexico. Downtown traffic stops when a train crosses the border and there is only one bridge crossing the railroad tracks. Clearly, there would be additional traffic delays due to trains carrying concentrate.

The analysis of impacts on air quality, traffic, safety, and any other relevant issues then needs to extend to the same types of issues in Nogales, Mexico and south of the border. Should the mine go forward, these types of transboundary impacts will be caused by a federally- approved action within the United States for which reasonably foreseeable effects will occur in Mexico. NEPA requires agencies to include analysis of reasonably foreseeable transboundary effects of proposed actions in their analysis of proposed actions in the United States. Officials of environmental and transportation agencies in the State of Sonora and the federal government of Mexico should be engaged in helping to provide information for this analysis.

In short, the spatial bounds of the transportation analysis is significantly inadequate and is a major failure of the DEIS. Analysis must be provided to the public for review and comment in a revised DEIS or supplemental draft EIS, not just presented in the FEIS.

Inadequately Identified and Analyzed Mitigation

Carpooling is identified as the least expensive mitigation measure with the most improvement in Level of Service, however, there is no supporting documentation describing carpool costs, the traffic impact on the car-pool parking locations or the costs associated with acquiring land, paving a parking lot, and roadway improvements that will be necessary to access carpooling parking lot locations. Carpooling does nothing but move the traffic impact from mine employee traffic to other locations that the DEIS does not identify. Carpooling cannot be considered for mitigation, since it can not be legally enforced.

Physical mitigation for impacts to traffic are completely inadequate. The proffered carpooling is not well explained, including whether and how and by whom such a requirement would be enforced.

An in-depth assessment of passing lanes on SR77 must be completed and must consider level of service, average travel speeds, public safety and potential mitigation measures.

Additionally, reduced property values for property that is dependent upon affected highways for access are not identified, nor is mitigation suggested compensating affected parties for the reduced values.

The DEIS is completely silent on the safety hazard that increased mine traffic would have on school buses carrying our children to and from school. This must be addressed in a new or supplemental DEIS.

If safety is a true concern for the USFS and mining proponents, the only viable solution is to prohibit all mining traffic while school buses are on the route.

Cumulative Effects

The USFS must fully review the impacts from all "past, present, and reasonably foreseeable future actions." These are the "cumulative effect/impacts" under NEPA. To comply with NEPA, the USFS must consider all direct, indirect, and cumulative environmental impacts of the proposed action. 40 CFR §§ 1502.16, 1508.8, 1508.25(c). Cumulative effects are defined as:

> [T]he impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. 40 CFR § 1508.7.

The DEIS is organized in a way that makes it almost impossible to evaluate the impact of past, present and reasonably foreseeable projects. Instead, the Cumulative Impact sections repeatedly state that they are assessing only reasonably foreseeable projects and that "past and present actions are assessed as part of the affected environment." (See identical statements at e.g. 157, 206, 233, 269, and 292.). None of the DEIS's Cumulative Impact sections refers back to specific "past and present actions" in a way that would allow the analysis required. The NEPA requirement to analyze cumulative impacts prevents agencies from undertaking a piecemeal review of environmental impacts. Earth Island Institute v. U.S. Forest Service, 351 F.3d 1291, 1306-07 (9th Cir. 2003).

The Cumulative Effects Sections are, in general, cursory. A few major projects (Pinto Valley Mine Expansion, Ripsey Wash Tailings Project) are mentioned in many Sections but discussion of probable cumulative effects is brief. The only cumulative effect noted in the "Geology Minerals and Subsidence Cumulative Effects Section is that mining may "exhaust the supply of desired rock materials…." (158). The Transportation and Access Cumulative Effects Section lists 9 projects which could each have a cumulative effect with Resolution Copper's mine but never considers whether the combination of all 10 projects might have an impact greater than the sum of its parts.

In a cumulative impact analysis, an agency must take a "hard look" at all actions. "An EA's analysis of cumulative impacts must give a sufficiently detailed catalogue of past, present, and future projects, and provide adequate analysis about how these projects, and differences between the projects, are thought to have impacted the environment. … Without such information, neither the courts nor the public ... can be assured that the [agency] provided the hard look that it is required to provide." Te-Moak Tribe of Western Shoshone v. U.S. Dept. of Interior, 608 F.3d 592, 603 (9th Cir. 2010) (rejecting EA for mineral exploration that had failed to include detailed analysis of impacts from nearby proposed mining operations).

The Cumulative Impact sections of the DEIS list several foreseeable projects, mostly at other mine sites within the geographic area. For example, the Cumulative Impact section covering

Environmental Justice lists three major mining projects in the works. The requirement for a "catalogue" of expected projects is thus satisfied.

However, analysis is completely lacking. The Environmental Justice Cumulative Impact Section contains a single sentence of "analysis": "These projects could potentially contribute to effects on low-income or minority populations through the projected life of the Resolution Copper Mine (50-55 years.)"

A cumulative impact analysis must provide a "useful analysis" that includes a detailed and quantified evaluation of cumulative impacts to allow for informed decision-making and public disclosure. Kern v. U.S. Bureau of Land Management, 284 F.3d 1062, 1066 (9th Cir. 2002); Ocean Advocates v. U.S. Army Corps of Engineers, 361 F.3d 1108 1118 (9th Cir. 2004).

An adequate water supply is a prerequisite for any Arizona project. The DEIS Cumulative Effects Section on Water Quantity (pps 340-342) lists five nearby projects which may add to or diminish local supplies. The DEIS does not attempt to compare or quantify their effects. Water for increased housing in nearby towns was determined to be "too speculative" to be considered (p. 341), and although hundreds of users have been assured supply to over 100,000 housing lots between Highway 60 and Florence, "it is not possible to quantify the cumulative water use in this area, but it is reasonable to note that groundwater demand is substantial and growing." (342)

The Cumulative Effects section discusses "East Salt River Valley Water Supplies" and "Regional Water Supplies" but neglects to consider the 2019 Drought Contingency Plan which will cut Colorado River water to Arizona, with Pinal County suffering the most. The Drought Contingency Plan was, of course, entered into in order to avoid even greater cuts in water supply otherwise required after a Level 1 shortage in Lake Mead. This error is compounded by the above-noted failure of the DEIS to review the impacts from dewatering, as both connected actions as well as cumulative impacts under NEPA.

Arizona faces even more drastic cuts in Colorado River water if water levels in Lake Mead continue to drop. At a Level 2 shortage, Arizona will lose another 400,000 acre-feet per year, and at a Level 3 shortage, Arizona's allotment drops another 480,000 acre-feet per year. The potential impact of further cuts in Colorado River water is greater than, for example, the addition of two water troughs and two storage tanks to the Millsite Range (at 342) but is ignored in the DEIS.

The NEPA obligation to consider cumulative impacts extends to all "past," "present," and "reasonably foreseeable" future projects. Blue Mountains, 161 F.3d at 1214-15; Kern, 284 F.3d

at 1076; Hall v. Norton, 266 F.3d 969, 978 (9th Cir. 2001) (finding cumulative analysis on land exchange for one development failed to consider impacts from other developments potentially subject to land exchanges); Great Basin Mine Watch v. Hankins, 456 F.3d 955, 971-974 (9th Cir. 2006)(requiring "mine-specific … cumulative data," a "quantified assessment of their [other projects] combined environmental impacts," and "objective quantification of the impacts" from other existing and proposed mining operations in the region).

The Cumulative Effects Sections of the DEIS repeatedly name other major mining projects-either new mines, expansions, or tailings relocations which may have cumulative impacts. However, the DEIS lacks the required "mine-specific … cumulative data," a "quantified assessment of their [other projects] combined environmental impacts," and "objective quantification of the impacts."

The Cumulative Effects Sections of the DEIS fail to utilize available information to properly disclose cumulative impacts of the proposed tailings storage facility and the potential public health and safety impacts the facility presents. The DEIS confines itself, in Chapter 3, to a short discussion of nearby mines and tailings dumps, and cites Bowker Associates and its studies of tailings dam failures (p. 515). Only a few short sentences are devoted to nearby tailings failures over the past years, including the large spill into Pinto Creek in 1997. Lacking is an overview of the situation with TSF's and dams throughout the state and nation.

The Health and Safety Cumulative Effects Section should mention the work the U.S. Army Corps of Engineers has been doing on documenting TSF's and the dams that contain them. The ACOE has been publishing a National Inventory of Dams on these facilities since the early 1970's, the most recent published in January of this year. According to this latest report, there are 1232 such facilities in the US holding about 12.2 billion cubic meters of accumulated tailings. Of these dams, 295 are rated as "high potential hazard" in the event of failure. Of the 25 largest TSF's, 5 are in Arizona, with 4 of those 5 rated high hazard. The DEIS should review this data, and, if any of those four most dangerous dams are near Superior, the Cumulative Effects Section of the Health and Safety discussion should evaluate the effect of a major catastrophe at another mine on Resolution Copper's operation.

As the Ninth Circuit has held:

> Our cases firmly establish that a cumulative effects analysis "must be more than perfunctory; it must provide a useful analysis of the cumulative impacts of past, present, and future projects." Klamath–Siskiyou, 387 F.3d at 994 (emphasis added) (quoting Ocean Advocates v. U.S. Army Corps of Eng'rs, 361 F.3d 1108,

> 1128 (9th Cir.2004)). To this end, we have recently noted two critical features of a cumulative effects analysis. First, it must not only describe related projects but also enumerate the environmental effects of those projects. See Lands Council v. Powell, 395 F.3d 1019, 1028 (9th Cir.2005) (holding a cumulative effects analysis violated NEPA because it failed to provide "adequate data of the time, place, and scale" and did not explain in detail "how different project plans and harvest methods affected the environment"). Second, it must consider the interaction of multiple activities and cannot focus exclusively on the environmental impacts of an individual project. See Klamath–Siskiyou, 387 F.3d at 996 (finding a cumulative effects analysis inadequate when "it only considers the effects of the very project at issue" and does not "take into account the combined effects that can be expected as a result of undertaking" multiple projects).

Oregon Natural Resources Council Fund v. Brong, 492 F.3d 1120, 1133 (9th Cir. 2007).

NEPA regulations also require that the agency obtain the missing "quantitative assessment" information:

> When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking.
>
> (a) If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement.
>
> (b) If the information relevant to reasonably foreseeable significant adverse impacts cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the agency shall include within the environmental impact statement:
>
> (1) A statement that such information is incomplete or unavailable;
>
> (2) a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment;
>
> (3) a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment, and

(4) the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. For the purposes of this section, "reasonably foreseeable" includes impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.

40 CFR § 1502.22. "If there is 'essential' information at the plan- or site-specific development and production stage, [the agency] will be required to perform the analysis under § 1502.22(b)." Native Village of Point Hope v. Jewell, 740 F.3d 489, 499 (9th Cir. 2014). Here, the adverse impacts from the Project when added to other past, present or reasonably foreseeable future actions is clearly essential to the USFS' determination (and duty to ensure) that the Project complies with all legal requirements and minimizes all adverse environmental impacts.

"[W]hen the nature of the effect is reasonably foreseeable but its extent is not, we think that the agency may not simply ignore the effect. The CEQ has devised a specific procedure for 'evaluating reasonably foreseeable significant adverse effects on the human environment' when 'there is incomplete or unavailable information.' 40 C.F.R. § 1502.22." Mid States Coalition for Progress v. Surface Transportation Board, 345 F.3d 520, 549-550 (8th Cir. 2003) (emphasis in original).

Thus, in this case, the USFS must fully consider the cumulative impacts from all past, present, and reasonably foreseeable future projects in the region on, at a minimum, water and air quality including ground and surface water quantity and quality, recreation, cultural/religious, wildlife, transportation/traffic, scenic and visual resources, etc. At a minimum, this requires the agency to fully review, and subject such review to public comment in a draft EIS, the cumulative impacts from all other mining, grazing, recreation, energy development, roads, etc., in the region.

In addition to the herein-noted failures to consider all direct, indirect and cumulative impacts, the DEIS also fails to analyze the impacts from the smelting of the ore concentrate, despite admitting that is part of the overall project. DEIS at 51, noting that the copper concentrate will be prepared "for delivery to an off-site smelter." There can be no doubt that copper smelting will have serious air quality and other impacts, yet there is no discussion of this connected action and its cumulative impacts.

Reasonably Foreseeable Actions and Analysis

As mentioned above, the first fundamental flaw in the discussions labeled "cumulative effects analysis" in the DEIS involves failure to identify the appropriate time period for analysis and failure to identify important "reasonably foreseeable" actions.

Development of Other Mining Claims

The DEIS sets forth a set of assumptions regarding the proposed project, including, but not limited to, that the operation of the proposed project would occur over a 40-year period, that operation would be uninterrupted, that the price of copper would remain constant, and that the mine would operate at full capacity/full employment for the entire time period. Obviously this is an unreasonably overly optimistic assumption, since no mining operation has ever achieved such a constant level of production. This assumption is challenged elsewhere in these comments and should be addressed in a revised or supplemental DEIS. But if, after further analysis, the USFS comes to the conclusion that this assumption is logically appropriate, because the demand for copper is sustained at this level over the 40-year projected lifetime of the proposed project, this exceptionally strong demand for copper would clearly apply to the other Resolution Copper holding adjacent to Oak Flat -- and at a bare minimum, at least one of the additional mines would enter production during this period of time.

Cumulative effects for Recreation

Meaningful discussion and analysis of the direct, indirect, and cumulative impacts from the loss of recreational resources at Oak Flat in the DEIS is woefully inadequate.

The DEIS describes a variety of recreational uses in the Oak Flat area, but stops short of anything resembling meaningful analysis of these uses. The DEIS looks only at acreage, failing entirely to include specific, meaningful analysis of recreational use details (including things like recreational use numbers for these activities, seasonal variations in use, expected increases in recreational use due to population growth). Permanent loss of Oak Flat will push recreational users onto other areas. These direct, indirect, and cumulative impacts must be analyzed, but are conspicuously absent from the DEIS beyond a mere passing mention.

Rock climbers, hikers, backpackers, campers, and non-motorized users also use public and private areas surrounding the mine project area including Upper and Lower Devil's (Gaan)

Canyon. Solitude, tranquility, and outdoor features are important features to non-motorized recreational users. The recreational features on these nearby lands (which draw users) will almost certainly be impacted by dewatering, noise, dust, view degradation, subsidence and other mine impacts. The DEIS admits that in addition to the loss of recreational resources at Oak Flat, there will also be "potential loss of access to adjacent lands because movement across those areas would become prohibited." (DEIS p. 495). This is admitted, but never analyzed. These impacts will certainly change recreational use patterns, but none of these things are studied in the DEIS.

The DEIS contains no analysis on the indirect or cumulative impacts of this significant loss of recreational resources, such as (but certainly not limited to) the economic impact. Data is readily available from industry groups, Federal studies, and others showing that outdoor recreation is a major, growing economic contributor, both nationally and to the State of Arizona. Although estimates and methods of measurement differ, sources affirmatively conclude that outdoor recreation generates many hundreds of billions of dollars in consumer spending nationally.[40] Data also shows that outdoor recreation generated more than $21 billion in the State of Arizona alone. The DEIS should have studied the potential impacts from the losses of all recreational resources at Oak Flat from this project including trails, campsites, thousands of rock climbing routes and boulders.

Mitigation for the loss of recreational resources is also insufficient. The DEIS (p.498) states that one "non-discretionary measure" is that Resolution Copper is "[d]eveloping traditional and sport climbing open to the public on Resolution Copper property outside of the mining footprint through agreement with Queen Creek Coalition. Further details can be found on the Queen Creek Coalition website and the agreement with REI." No information whatsoever appears anywhere else in the DEIS or its appendices (even Appendix J on mitigation regarding how this measure is supposedly non-discretionary, or what the contents of the agreement with REI and Queen Creek Coalition consists of (these are not on the DEIS project website, and have not been made public and not subject to comment in this DEIS). Declining to provide further discussion and directing readers to an outside website is insufficient for purposes of discussing this supposed mitigation measure.

"Mitigation must 'be discussed in sufficient detail to ensure that environmental consequences have been fairly evaluated." *City of Carmel-By-the-Sea v. U.S. Dep't of Transp.,* 123 F.3d 1142, 1154 (9th Cir. 1997) (quoting *Robertson v. Methow Valley Citizens Council,* 490 U.S. 332, 353,

[40] *See* Outdoor Industry Association https://outdoorindustry.org/advocacy/ (2017 data on recreation). *See also* U.S. Dept. of Commerce, Bureau of Economic Analysis, Outdoor Recreation Satellite Account: https://apps.bea.gov/regional/orsa/stateMap.cfm (2017 data on recreation). ¶

104 L.Ed. 2d 351 (1989)). "A mere listing of mitigation measures is insufficient to qualify as the reasoned discussion required by NEPA." *Northwest Indian Cemetery Protective Ass'n v. Peterson,* 795 F.2d 688, 697 (9th Cir. 1986) (rev'd on other grounds), 485 U.S. 439 (1988).

Impacts to the Arizona Trail, one of only a handful of Congressionally-designated National Scenic Trails under the 1968 National Trails System Act (added in 2009 via P.L. 111-11, codified at 16 U.S.C. § 1244(a)(27)) are not fully analyzed in the DEIS. Crossing of the Arizona Trail will "interfere with the nature and purposes of the Arizona Trail" (DEIS p. 501). This is contrary to the purpose of the legislative designation as a National Scenic Trail (16 U.S.C. § 1242(a)(2)) which specifies that scenic trails are "so located as to provide for maximum outdoor recreation potential and for the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the areas through which such trails may pass." Although robust, publicly available documentation exists regarding the characteristics of the Arizona Trail which is required for Scenic Trail designation under 16 U.S.C. § 1244(b), it is apparent that none of this documentation was reviewed.

The DEIS lists only a few short-term limitations on access during construction. Long-term impacts and discussions of actual meaningful mitigation measures (and analysis of the potential effectiveness of those measures) is disappointingly inadequate. Furthermore, to the extent that mitigation to the Arizona Trail is discussed at all as a vague and non-specific promise to construct road crossings, pipeline crossings or reroutes to "minimize impediments…and visual impacts" to the Arizona Trail, this is only a voluntarily proposed and non-required measure and cannot be reasonably relied upon or analyzed as an actual mitigation plan. Additionally, the DEIS fails entirely to discuss how the potential impacts to the Arizona Trail from this project relate to the ongoing "Arizona National Scenic Trail Comprehensive Plan" (which is also being undertaken by the Tonto National Forest and which is anticipated being released for public comment in May 2020) – in fact, the ongoing "Arizona National Scenic Trail Comprehensive Plan" is not discussed or even mentioned in the DEIS, even as a reasonably foreseeable action.

Impacts from the project on the adjacent, privately-owned climbing resources at Atlantis Canyon and the Pond are not studied in the DEIS. To the extent an agreement has been signed to keep these areas open (the details of which are not public), this cannot properly be considered a mitigation measure since no analysis of its effectiveness has ever been done as required by NEPA. Furthermore, the prior version of this agreement with the Access Fund for access to these areas was unilaterally revocable at any time and, since the current agreement has never been shown to the public, there is no reason to believe that it does not contain these same terms, therefore this tentative arrangement cannot possibly be considered a meaningful mitigation measure. "[O]mission of a reasonably complete discussion of possible mitigation measures

would undermine the 'action forcing' function of NEPA. Without such a discussion, neither the agency nor other interested groups and individuals can properly evaluate the severity of the adverse effects." *Robertson v. Methow Valley Citizens Council,* 490 U.S. 332, 352 (1989).

Connected Actions

The DEIS is silent on connected actions related to the actions proposed in the DEIS. Not only does this violate NEPA, it also directly contradicted the NDAA which mandated a single EIS for all federal actions related to this project.

NEPA regulations specifically require an analysis of the impact on the environment "which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." 40 CFR § 1508.7. Thus, the fact that some of the activities will occur on private lands does not eliminate NEPA's requirement that the Forest Service analyzed the environmental impacts of those private land activities. Indeed, the 9th Circuit Court of Appeals (which includes Arizona) squarely held that a federal agency is required to analyze the cumulative and connected impacts occurring on private land, even if that activity does not require federal agency approval. Natural Resources Defense Council v. U.S. Forest Service, 421 F.3d 757, 815-815 (9th Cir. 2005). There, the Court specifically held that federal agencies must consider the cumulative impacts associated with off-site and private land activities.

We have argued as far back as our Pre-Feasibility Drilling Plan comments in April of 2009 that the dewatering of shafts #9 & #10 shafts at the East Plant are Connected to the larger mine now being discussed in this DEIS. The Forest Service has consistently rejected that argument but now, as discussed elsewhere in this document, the Forest Service incorrectly says that the dewatering of shafts 9 & 10 are a permanent part of the no action alternative is cannot select rather than being connected to the Resolution Copper project.

Similarly, The DEIS discusses briefly the need for an additional powerline corridor paralleling the MARRCO corridor, but defers a detailed analysis that is required under both NEPA and the NDAA.

Likewise other powerlines feeding power to this project are mentioned but not discussed as is any real discussion of the actual route and design of pipeline and road access corridors. For that matter, all mitigation and monitoring plans outlined in the DEIS are connected actions with this

project and should have been discussed in detail in this document no matter what the ownership of land underlying the proposed measure.

For each of these activities, they are either connected, related, or cumulative actions which must be fully analyzed in this NEPA document.

Apache Leap Special Management Area (SMA)

The SMA document mandates, (although it is unclear of the enforcement mechanism) that seismic monitoring, fencing, and other measures must be implemented to mediate the effect of Resolution Copper's proposed project. Although impacts from the proposed project on the SMA are discussed, we could not find any discussion in the DEIS of how, when, and by whom, these measures would be implemented. As the SMA is a Connected action to this project, that information should have been included in this DEIS.

DRAFT 404 PERMIT COMMENTS

In addition to the above comments addressed to the Corps and USFS, the following additional comments pertain more directly to the Corps' review of Resolution's application for a CWA Section 404 permit, although they should also be considered by the USFS.

Congress enacted the CWA in 1972 to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. § 1251(a). The Act sets several goals, including attainment and preservation of "water quality which provides for the protection and propagation of fish, shellfish, and wildlife . . . ." Id. § 1251(a)(2). To further its goals, the Act prohibits "discharge of any pollutant" into navigable waters except in accordance with the CWA terms. Id. § 1311(a).

The Corps issues permits for the discharge of dredged or fill material pursuant to section 404 and subject to the Corps' and EPA's 404(b)(1) Guidelines (Guidelines). 33 U.S.C. § 1344; 40 C.F.R. pt. 230. Corps regulations governing the issuance of Section 404 permits declare that "[m]ost wetlands constitute a productive and valuable public resource, the unnecessary alteration or destruction of which should be discouraged as contrary to the public interest." 33 C.F.R. § 320.4(b)(1); *see also* id. § 320.4(b)(2) (identifying eight types of wetland functions important to the public interest).

The Corps' and EPA's 404(b)(1) Guidelines impose important limitations on the Corps' ability to issue a Section 404 permit. 40 C.F.R. pt. 230. The Corps must ensure compliance with the

404(b)(1) Guidelines before issuing a permit. The Guidelines impose important limitations on when a Section 404 permit may be issued. Id. The Guidelines prohibit the permitting of any discharge of dredged or fill material: 1) if there is a practicable alternative to the proposed discharge, 2) if the discharge causes or contributes to violations of applicable state water quality standards, 3) if the discharge will cause or contribute to significant degradation of the environment, or 4) unless all appropriate steps have been taken to minimize potential adverse impacts. § 230.10. The 404(b)(1) Guidelines provide that significant adverse effects on human health or welfare; aquatic life and other water dependent wildlife; aquatic ecosystem diversity, productivity, and stability; or recreational, aesthetic, and economic values are effects contributing to significant degradation. § 230.10(c)(1)–(4). These factors both individually and cumulatively must be considered when evaluating the specific details of the 404 application.
The Corps cannot authorize a discharge without "sufficient information to make a reasonable judgment as to whether the proposed discharge will comply with [the Section 404(b)(1)] Guidelines." § 230.12(a)(3)(iv); *see* 33 C.F.R. §§ 320.2(f) and 320.4(a)(1). EPA notes that:
the record must contain sufficient information to demonstrate that the proposed discharge complies with the requirements of Section 230.10(a) of the Guidelines. The amount of information needed to make such a determination and the level of scrutiny required by the Guidelines is commensurate with the severity of the environmental impact (as determined by the functions of the aquatic resource and the nature of the proposed activity) and the scope/cost of the project. *See* Environmental Protection Agency, Memorandum: Appropriate Level of Analysis Required for Evaluating Compliance with the Section 404(b)(1) Guidelines Alternatives Requirements,
https://www.epa.gov/cwa-404/memorandum-appropriate-level-analysis-required-evaluating-compliance-section-404b1.

As discussed herein, the proposed discharge does not comply with the 404(b)(1) Guidelines. Pursuant to the Guidelines, no discharge of dredged or fill material shall be permitted if, among other things, a practicable alternative to the proposed discharge would have less adverse impact on the aquatic ecosystem. 40 C.F.R. § 230.10. The Corps also cannot authorize any discharge of dredged or fill material that will cause or contribute to significant degradation of the waters of the United States. § 230.10(c). The "degradation or destruction of special aquatic sites, such as filling operations in wetlands, is considered to be among the most severe environmental impacts covered by the[] Guidelines." § 230.10(d).

Under the 404(b)(1) guidelines, the Corps is required to consider the following effects, individually and collectively, that contribute to significant degradation:

(1) Significantly adverse effects of the discharge of pollutants on human health or welfare, including but not limited to effects on municipal water supplies, plankton, fish, shellfish, wildlife, and special aquatic sites.
(2) Significantly adverse effects of the discharge of pollutants on life stages of aquatic life and other wildlife dependent on aquatic ecosystems, including the transfer, concentration, and spread of pollutants or their byproducts outside of the disposal site through biological, physical, and chemical processes;
(3) Significantly adverse effects of the discharge of pollutants on aquatic ecosystem diversity, productivity, and stability. Such effects may include, but are not limited to, loss of fish and wildlife habitat or loss of the capacity of a wetland to assimilate nutrients, purify water, or reduce wave energy; or
(4) Significantly adverse effects of discharge of pollutants on recreational, aesthetic, and economic values.

§ 230.10(c). As shown herein, the proposed mine will violate these requirements and thus a 404 permit cannot be issued.

The Corps is required to base this determination on factual determinations, evaluations, and tests required under the guidelines, and to focus in particular on the persistence and permanence of the effects. Id. The Guidelines require the Corps to make certain factual determinations addressing the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment.864 This includes determinations on (a) physical substrate; (b) water circulation, fluctuation, and salinity determinations; (c) suspended particulate/turbidity determinations; (d) contaminant determinations; (e) aquatic ecosystem and organism determinations; (f) proposed disposal site determinations; (g) determinations of cumulative effects on the aquatic ecosystem; and (h) determinations of secondary effects on the aquatic ecosystem. § 230.11(a)–(h).

When a project is not "water dependent," as in the case of the mine, and the project would fill "special aquatic sites," including wetlands, the Corps' regulations create a rebuttable presumption that there are practicable and environmentally preferable alternatives, and such alternatives are presumed to have less adverse impact unless "clearly demonstrated" otherwise. 40 C.F.R. § 230.10(a)(3); Sierra Club v. Flowers, 423 F. Supp. 2d 1273, 1352 (S.D. Fla. 2006). This substantive requirement mandates the Corps to select the least environmentally damaging practicable alternative (LEDPA).

An alternative is practicable "if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes." 40

C.F.R. § 230.10(a)(2). Practicable alternatives include "activities which do not involve a discharge of dredged or fill material," as well as "discharges of dredged or fill material at other locations" where such discharges would result in fewer impacts to the aquatic environment. § 230.10(a)(1). The applicant has the burden of demonstrating that no feasible alternative exists, and the Corps must engage in a reasoned analysis of this issue. Flowers, 423 F. Supp. 2d at 1356–57.

The Corps cannot blindly and uncritically accept an applicant's study of alternatives and its assertions that no practicable alternative exists. Friends of the Earth v. Hintz, 800 F.2d 822, 835–36 (9th Cir. 1986). Under the regulations, any "practicable" alternative to achieve the basic and overall project purposes must be determined to be cost-effective, when viewed from the perspective of the industry as a whole. The financial circumstances of a particular applicant are not considered relevant if an alternative could be achieved practicably by a "typical" applicant. The preamble to the 404(b)(1) regulations states: "Our intent is to consider those alternatives which are reasonable in terms of the overall scope/cost of the proposed project. The term economic might be construed to include consideration of the applicant's financial standing, or investment, or market share, a cumbersome inquiry which is not necessarily material to the objectives of the Guidelines. We consider it implicit that, to be practicable, an alternative must be capable of achieving the basic purpose of the proposed activity." 45 Fed. Reg. 85,339 (Dec. 24, 1980).

But the least environmentally damaging practicable alternative need not be the least-costly, nor the most profitable. Louisiana Wildlife Federation, Inc. v. York, 761 F.2d 1044, 1048 (5th Cir. 1985) (noting that the Corps had properly chosen "alternatives that reduced both the applicants' profit and the economic efficiency of their proposed operations in order to preserve other environmental values"). The regulations presume that less environmentally damaging alternatives are available to the applicant and practicable, unless the applicant clearly demonstrates otherwise. In the absence of such a clear showing, the Corps is required to deny the permit application. *See* 40 C.F.R. § 230.12(a)(3)(i), (iv). Thus, in this case, the preferred tailings location in Skunk Camp does not comply with these requirements.

To ensure the mandatory CWA requirements are satisfied, the Corps must evaluate the direct, secondary, and cumulative impacts of the activity on a number of resources. *See, e.g.*, 33 C.F.R. §§320.4(a)(1), 336.1(c)(5)(endangered species), 336.1(c)(8)(fish and wildlife); 40 C.F.R. §§230.11(a)-(h), 230.20-23(aquatic ecosystem), 230.53(aesthetics). The EPA Guidelines require the Corps to make detailed factual determinations regarding the individual and collective effects associated with the discharge activity, and "no discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the United

States." 40 C.F.R. §230.10(c). "Findings of significant degradation related to the proposed discharge shall be based upon appropriate factual determinations, evaluations, and tests required by subparts B and G …, with special emphasis on the persistence and permanence of the effects outlined in those subparts." Id.

The "factual determinations, evaluations, and tests" mandated in subpart B include Section 230.11, which requires that "[t]he determinations of effects of each proposed discharge shall include the following: . . .

> (h) *Determination of secondary effects on the aquatic ecosystem.*
>
> (1) **Secondary effects are the effects on an aquatic ecosystem that are *associated with a discharge* of dredged or fill materials, but do not result from the actual placement of the dredged or fill material.** Information about secondary effects on aquatic ecosystems shall be considered prior to the time final section 404 action is taken by permitting authorities.
>
> (2) . . . Activities to be conducted on fast land created by the discharge of dredged or fill material in waters of the United States may have secondary impacts within those waters which should be considered in evaluating the impact of creating those fast lands.

40 C.F.R. §230.11(h)(emphasis added). The Guidelines also require the Corps to "control runoff and other discharges from activities to be conducted on the fill." §230.77(a).

Thus, the secondary effects that the Corps is required to consider are not limited in time or space to just the initial discharge. Rather, they encompassed all activities and impacts "associated with" the fill activities. Furthermore, "[f]undamental to these Guidelines is the precept that dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact **either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern**." 40 C.F.R. §230.1(c)(emphasis added).

Indeed, according to the regulatory preamble to EPA's promulgation of the 404(b)(1) Guidelines: "in authorizing a discharge which will create fast lands the permitting authority should consider in addition to the direct effects of the fill itself the effects on the aquatic environment of any reasonably foreseeable activities to be conducted on that fast land." 45 Fed.Reg. 85336, 85340-41 (Dec. 24, 1980). And, regarding the "factual determinations" in §230.11 (including

secondary effects in 230.11(h)), EPA stated: "in response to many comments, we have moved the provisions on cumulative and secondary impact to the Factual Determination section to give them further emphasis. We agree that such impacts are an important consideration in evaluating the acceptability of a discharge site." 45 Fed.Reg. 85343.

In another rulemaking implementing the CWA, the Corps and EPA reiterated that the Corps' must fully consider the indirect/cumulative impacts as well as direct impacts from the discharge itself:

> EPA's longstanding interpretation of Section 404, as reflected in the Section 404(b)(1) Guidelines, demonstrates that EPA and the Corps are not limited to considering solely the environmental effects of the discharge itself. The Guidelines expressly require consideration of "secondary effects," which are defined as
>
> > effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material.
>
> 40 CFR 230.11(h).
> . . .
>
> EPA and the Corps believe that considering the primary and secondary effects of a discharge is clearly consistent with the language and intent of Section 404 to ensure protection of the aquatic system from effects associated with the discharge of dredged and fill material.

58 Fed.Reg. 45008, 45012 (Aug. 25, 1993).[41]

The agencies highlighted the Tenth Circuit's decision in Riverside Irrigation District v. Andrews, 758 F.2d 508 (10th Cir. 1985):

> In this case, the Corps denied nationwide permit coverage for the construction of

[41] Although that rulemaking focused on whether "incidental fallback" from activities should be considered a "discharge of fill material" (not at issue in this case), and not on the scope of review for secondary effects, both agencies detailed their position on secondary effects "to help the public understand how we administered the Section 404 program generally." 58 Fed.Reg. 45012.

> a dam, the operation of which would have resulted in depleted stream flows that would adversely affect habitat of an endangered species. **Even though the discharge of fill material itself to construct the dam would not have had an adverse impact, the court held that the CWA authorized the Corps to consider the total environmental impact of the discharge, including indirect effects such as the impact of the operation of the dam on flows downstream and associated wildlife impacts.**

58 Fed.Reg. 45012 (emphasis added). The court in Riverside concluded that "the Corps was required to consider all effects, direct and indirect, of the discharge for which authorization was sought." 758 F.2d at 513.

Additional courts have acknowledged the Corps' duty to consider secondary and cumulative effects resulting from issuance of a 404 permit. In Greater Yellowstone Coalition v. Flowers, 359 F.3d 1257, 1272, n. 15 (10th Cir.2004), the Tenth Circuit upheld a Corps 404 permit in part because of the Corps' analysis of the "upland aspects" of the entire development, not just the limited direct impact of the fill itself: "the Corps' §404(b)(1) analysis should, and we believe did, take into account the impact of the Canyon Club development as a whole on bald eagle nesting and foraging habitat." The court highlighted the Corps' requirement to consider the impacts on the "aquatic ecosystem," which includes "habitat for interrelated and interconnecting communities and populations of plants and animals." Id., quoting 40 C.F.R. §230.3(c).

In confirming the need to consider the adverse impact of the "development as a whole" on wildlife habitat and species, the court further found that: "A discharge of dredged or fill material may adversely affect these species either by directly impacting these [wildlife habitat] elements, [citing §230.30(b)(2)], or by '*facilitating incompatible activities*,' *id*., §230.30(b)(3)." Id. (emphasis supplied by court). At Resolution, there is no question that issuance of the 404 Permit "facilitates incompatible activities" of the Mine's construction and operations, which will adversely affect wildlife and habitat.

In Sierra Club v. Van Antwerp, 709 F.Supp.2d 1254 (S.D.Fla.2009), the plaintiffs challenged the issuance of Section 404 permits to limestone mining companies. In order to determine whether the permitted activities would cause or contribute to "significant degradation" of the aquatic ecosystem, "[t]he Court must decide whether the Corps considered, as required by the CWA and implementing regulations, as well as NEPA, the significant adverse effects on municipal water supplies (which were a reasonably foreseeable result of the mining)." Sierra Club, 709 F.Supp.2d at 1270.

In Sierra Club v. U.S. Army Corps of Engineers, 2012WL13040281 (S.D.Tex.2012), the plaintiffs challenged the issuance of a 404 permit for a stretch of new highway. The court relied on the "secondary effects" analysis requirements in 40 C.F.R. §230.11(h), and the "cumulative effects" determinations in §230.11(g), to find that the Corps failed to consider the "reasonably foreseeable development" and cumulative effects on the nearby operation of a dam and associated water flow conditions. Id. at *18-19 ("Federal Defendants do not dispute that the Corps was required to consider the cumulative impacts at Addicks [the nearby dam] under the CWA and the 404 Guidelines.").

The same was true in Fox Bay Partners v. U.S. Corps of Engineers, 831 F.Supp. 605 (N.D.Ill.1993), where the court upheld the Corps' denial of a 404 permit for a commercial marina. The court relied on §230.11(h) and §230.10(c) to find that "the Corps must look not only at the direct effects of a discharge but also at the indirect effects." Id. at 609. There, even though "[n]o one claims that the proposed fill or construction [of a marina boat ramp] itself will cause a significant degradation of the waters of the Fox River and Chain-O-Lakes," the court found that the Corps properly considered the degradation that would result from increased boat traffic on the river and lakes that would result from building the boat ramp. Id.

The court's analysis in Sayler Park Vill. Council v. U.S. Army Corps of Engineers, 2003WL22423202 (S.D.Ohio 2003) is also applicable here, as the court enjoined the upland development associated with a 404 permit for a barge facility on the Ohio River, where "the upland portion . . . would be practically useless without the water-based portion" and the upland development would have potential adverse visual effects on nearby historic properties. The court highlighted the need for an injunction of the entire project, including the upland portion, as "Federal courts have recognized that both economic pressure and regulatory inertia may substantially and improperly impact the decision-making of a federal agency." Id.

In Save Our Sonoran v. Flowers, 408 F.3d 1113 (9th Cir.2003), a case challenging a 404 permit, the court upheld a preliminary injunction against the entire development, despite the fact that the actual acreage of the WOTUS discharge was limited. There, the Corps failed to review the impacts from the project as a whole, focusing only on the limited direct impacts from the fill discharge. "[B]ecause the uplands are inseparable from the washes, the district court was correct to conclude that the Corps' permitting authority, and likewise the court's authority to enjoin development, extended to the entire project." Id. at 1124. *See also* White Tanks Concerned Citizens v. Strock, 563 F.3d 1033 (9th Cir. 2009):

Because this project's viability is founded on the Corps' issuance of a Section 404 permit, the entire project is within the Corps' purview. *SOS* makes this clear. 408 F.3d at 1124. In *SOS,* we

affirmed an injunction barring any development pending adequate environmental review. We did so "[b]ecause no development could occur without impacting jurisdictional waters." Id. at 1042 (quoting Save Our Sonoran).

The Corps cannot issue a 404 permit if it "would be contrary to the public interest." 33 C.F.R. §320.4(a)(1). This requires the Corps to consider "the probable impacts" of a proposed project on "[a]ll factors which may be relevant to the proposal[,] including the cumulative effects." Id. "Evaluation of the probable impact which the proposed activity may have on the public interest requires a careful weighing of all those factors which become relevant in each particular case." Id.

> All factors which may be relevant to the proposal must be considered including the cumulative effects thereof: among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership and, in general, the needs and welfare of the people.

Id.

The Corps must fully consider the impacts from the entire mine in making its public interest determination. "To require [the Corps] to ignore the indirect effects that would result from its actions would be to require it to wear blinders that Congress has not chosen to impose." Riverside, 758 F.2d at 512. In addition to the above-analyzed cases, the Ninth Circuit has recognized the Corps' duty to consider these impacts in order to ensure that issuance of the 404 permit is in "the public interest." In Ocean Advocates, after finding that the Corps failed to consider the cumulative impacts from increased shipping traffic resulting from the issuance of a 404 permit for an oil refinery dock, the court noted that upon remand and consideration of these effects, "the Corps may impose conditions on **the operation** of permitted terminals at any time 'to satisfy legal requirements or to otherwise satisfy the public interest.' 33 C.F.R. §325.4(a)." 402 F.3d at 871 (emphasis added).

In Clatsop Residents Against Walmart v. U.S. Army Corps of Engineers, 735 Fed.Appx. 909 (9th Cir.2018), the court upheld a Corps 404 permit needed to construct a Walmart, including the Corps' public interest review, because the Corps had "balanced the 'benefits which reasonably may be expected to accrue from the proposal . . . against its reasonably foreseeable detriments.' 33 C.F.R.§320.4(a)(1)," which included the potential indirect detrimental effects of the Walmart

"on small businesses." Id. at 912; see also Corps' brief in Clatsop, 2017WL1757558, **45-46 (noting that the Corps' public interest determination considered the potential indirect effects of the Walmart, including adverse impacts on smaller businesses and traffic).

The same was true in Greater Yellowstone Coalition, 359 F.3d at 1272 n. 15, discussed above, where the Corps successfully argued to the court that it properly considered the impacts of the "development as a whole" on wildlife and habitat, not just impacts from the fill itself. The Corps had argued that the impacts of a proposed project "beyond those associated with the proposed discharge into waters of the United States – such as the environmental impacts of upland aspects of the overall project – are for the most part meant to be addressed . . . through the Corps' public interest review," and that the Corps had "thoroughly considered and addressed the impacts on bald eagles from upland aspects of the proposed Project as part of its public interest and NEPA reviews." Corps/Appellee's brief to Tenth Circuit, 2003WL23723859, *34.

If the Corps properly considered in its public interest determinations these larger regional cumulative effects to wildlife from the golf course development in Greater Yellowstone, and on the regional economy and traffic resulting from the Walmart project in Clatsop, then it certainly must consider the cumulative and indirect impacts from construction and operation of the Resolution Mine and all associated facilities and impacts – impacts that show the mine/project is not in the public interest and thus the 404 permit cannot be issued.

The 404(b)(1) Guidelines also prohibit the Corps from issuing a 404 permit "unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem." 40 C.F.R. §230.10(d). Those seeking a 404 permit must mitigate the impacts of the proposed dredge and fill activities by "avoiding, minimizing, rectifying, reducing, or compensating for resource losses." 33 C.F.R. §320.4(r)(1). The purpose of the compensatory mitigation program is to "offset unavoidable impacts to waters of the United States authorized through" 404 permits. 40 C.F.R. §230.9l(a)(l). *See also* §230.93(a). Mitigation is required for "significant resource losses which are specifically identifiable, reasonably likely to occur, and of importance to the human or aquatic environment." 33 C.F.R. §320.4(r)(2). These adverse effects to aquatic resource functions, whether direct or indirect, must be mitigated. Id.; 40 C.F.R. §230.93(a).

Additionally, under NEPA, an EIS must: (1) "include appropriate mitigation measures not already included in the proposed action or alternatives," 40 C.F.R. §1502.14(f), and (2) "include discussions of: . . . Means to mitigate adverse environmental impacts (if not already covered under 1502.14(f))." 40 C.F.R. §1502.16(h). "All relevant, reasonable mitigation measures that could improve the project are to be identified, even if they are outside the jurisdiction of the lead

agency or the cooperation agencies. . ." *Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations*, 46 Fed.Reg. 18026, 18031 (March 23, 1981).

As part of reviewing and approving the mitigation plan, Corps regulations require that Resolution provide "financial assurance" to cover mitigation costs: "(n) *Financial assurances.* (1) The district engineer shall require sufficient financial assurances to ensure a high level of confidence that the compensatory mitigation project will be successfully completed, in accordance with applicable performance standards. . . . " 33 C.F.R. §332.3(n). "The rationale for determining the amount of the required financial assurances must be documented in the administrative record for either the DA permit or the instrument." 33 C.F.R. §332.3(n)(2).

"The final mitigation plan must include the items described in paragraphs (c)(2) through (c)(14) of this section.. . ." 33 C.F.R. §332.4(c)(1)(i). Item (c)(13) is "Financial assurances." 33 C.F.R. §332.4(c)(13). The mitigation plan must include: "A description of financial assurances that will be provided and how they are sufficient to ensure a high level of confidence that the compensatory mitigation project will be successfully completed, in accordance with its performance standards (see §332.3(n))." §332.4(c)(13); *see also* §332.3(k)("permit conditions . . . must . . .(iv) Describe any required financial assurances or long-term management provisions for the compensatory mitigation project, unless they are specified in the approved final mitigation plan.").

"[T]he district engineer must assess . . . the costs of the compensatory mitigation project." 40 C.F.R. §230.93(a)(1). "District engineers must document the analysis used to determine the amount of the financial assurance, and must include this analysis in the administrative records for their permits." Guidance on the Use of Financial Assurances, and Suggested Language for Special Conditions for Department of the Army Permits Requiring Performance Bonds, Regulatory Guidance Letter No. 05-1 (February 14, 2005) 2 (attached).

Draft Practicability Analysis - Section 404 Permit

Considering the scope of the tailings site facilities -- the amount, 1.37 billion tons, and the impact, the alternatives, analysis, and mitigation under Section 404 of the Clean Water Act are woefully inadequate. Factors considered by the USFS included "locations within a reasonable proximity to the Resolution mine site, favorable topography, sufficient storage capacity, and a configuration suitable for conventional tailings impoundment construction as described in the GPO." (Draft Practicability Analysis pg 4). These factors are not appropriate for consideration of a 404 permit. For the 404 permit, the focus must be on whether practicable alternatives exist that

are less damaging to the environment and on limiting degradation to waters. Further, a public interest review must be done. This clearly was not done here.

Had the focus been on a less damaging alternative, clearly something that limited the amount of tailings, such as alternative mining methods or multiple brownfield sites for tailings would have been preferred. Why did the site have to accommodate the "total volume of tailings?" Why wasn't an alternative considered that included fewer tailings, limiting how much can actually be removed from the mine, or an alternative mining method that would result in few tailings? Why weren't additional brownfield locations considered? Perhaps two of the brownfield sites that already have infrastructure in place. Why pollute even more of our waters with use of a greenfield site? If there are two sites in places where there has already been substantial impact from mining, how does that create more of a footprint or more of a risk than destroying a whole new area?

The Near West Dry TSF Alternative would result in "dissolved copper loading of Queen Creek, an impaired water." (Draft Practicability Analysis pg 19). How could this alternative be practicable, considering this significant impact?

Likewise, the Skunk Camp Alternative is not practicable. It will cause undue harm to the Dripping Spring Wash basin, resulting in impacts to the Gila River. The language in the Draft Practicability Analysis regarding the Skunk Camp Alternative is disturbing as it indicates that "only ephemeral drainages" are included in the footprint (Draft Practicability Analysis pg 13) -- as if these ephemeral drainages are insignificant and unimportant. While there are attempts to ignore their significance, it is undeniable that ephemeral waters are critical in an arid environment such as this and should be protected by the Clean Water Act, especially due to the connections to the Gila. Destroying whole new sections of ephemeral drainages is not the least harmful option. Note that this alternative assumes that an aquifer protection permit can be issued with the point of compliance miles from the tailings facility. This seems to be a bit of a stretch.

Impacts of Arizona Department of Environmental Quality Efforts to Assume Primacy on 404 Permits

The Arizona Department of Environmental Quality (ADEQ) is considering seeking primacy for this important Section 404 Clean Water Act program and because of the potential and significant changes, we think it is something the Forest Service should have considered. There are many issues related to that assumption that have potential to have a significant and negative impacts on waters of the United States that are affected by this proposed mine. In addition to the fact that the

state will have no public interest review and no NEPA analysis, there are serious concerns about expertise in administering the program, protection of cultural resources, and proper consultation related to endangered species, among others.

Of grave concern is the possible outcome that because ADEQ intends to fund the program through permitting fees, the agency will become motivated to quickly issue permits that would otherwise require careful consideration. If the state elects to assume primacy and the costs that come with it, a dedicated funding source must be developed so that the state is not incentivized to issue permits for the wrong reasons and so there is funding for program staff during times when fewer permits are requested, such as economic downturns.

Another concern that has been widely voiced across stakeholder groups is that because this program has been administered by the Army Corps of Engineers, ADEQ does not possess the expertise or experience to run the program. This concern is not independent of funding concerns, since without general fund commitments or significant federal funds, it is difficult to imagine how the agency will be able to bring in additional experts. A fee-funded program will take time to generate funds, but the costs associated with program assumption will be immediate.

There will also be a lack of clarity on which waters will be subject to state assumption. Regulation of "navigable waters" of the U.S. will, of necessity, remain under the purview of the Army Corps, since by law it cannot be delegated to the states. To our knowledge, the Corps has not sorted out or mapped much of what could be termed navigable waters of the U.S. within Arizona. Such a process is essential in order to facilitate an orderly assumption of primacy, but it is not within ADEQ's capacity to conduct it. This is a fact- and science-intensive process that is expensive, complex, and time-consuming. The state of Florida was recently delayed in its rush to assume 404 primacy when their unrealistic timeline did not allow sufficient time for the Army Corps to make these determinations.

If ADEQ assumes responsibility for the 404 permit program, there will be no implementation of the National Environmental Policy Act (NEPA) for major projects that now require 404 permits, and the state has no comparable environmental impact assessment law. Without NEPA, the public is robbed of an opportunity to review and analyze comprehensive information about the environmental and related economic and social impacts of a proposed action and to advocate for their communities and for the environment.

We are additionally concerned that endangered species and cultural resources will not receive the protections that they do under a federal program. A state assuming primacy must work to implement alternative means of coordination with "other federal resource programs." If permits will be administered under state law, rather than federal law, the state must develop "alternative

mechanisms" to "ensure compliance with the requirements of the federal Endangered Species Act, National Historic Preservation Act, and similar federal programs." (Clean Water Act, Section 404) Even if a state-led program develops guidelines or procedures that are modelled after the protections of NEPA, the National Historic Preservation Act, and the Endangered Species Act (ESA), policies and even rules may not offer the equivalent legal protections of a federal law. Federal agencies also have mandates to coordinate with one another, so to retain the benefits of collaboration, a state assuming primacy must work to implement alternative means of coordination with other federal resource programs.

There are nuances on issues around 404 regulations that have been established and/or settled in the federal courts. Changing this regulatory framework at the state level invites the possibility that some of these legal issues could be reopened in a new wave of litigation.

Incorporation by Reference

Throughout the DEIS, there are various reports and papers that are referenced as support for parts of the text. There are also reports characterized as being 'DEIS References" posted on the website. However, nowhere in the text of the DEIS does it explain to the public precisely what information is being "incorporated by reference" as part of the DEIS as per the Council on Environmental Quality's NEPA regulations at 40 C.F.R. §1502.21. This should be clarified in a revised or supplemental DEIS.

Failure to Comply With All Environmental Standards and Requirements

As noted herein, because of the DEIS' failure to fully consider all of the project's direct, indirect, and cumulative impacts, as well as a complete analysis of all background/baseline conditions, the USFS cannot ensure that the project will comply with all applicable air, water, and other environmental standards.

This is true whether the USFS regulates the project under its Part 228 or Part 251/262 regulations. For example, under § 251.56(a)(1)(C), the USFS must: "Require compliance with applicable air and water quality standards established by or pursuant to applicable Federal or State law." The "Operator shall comply with applicable Federal and State air quality standards, including the requirements of the Clean Air Act, as amended (42 U.S.C. 1857 et seq.)." 36 CFR 228.8(a); 228.8(b)(same, for water quality requirements/standards and the Clean Water Act).

Failure to Minimize All Adverse Environmental Impacts and Protect Public Resources

Even under the USFS' erroneous decision to regulate the project solely through its Part 228 regulations, the agency failed to minimize all adverse impacts, as shown herein. Under the Organic Act and Part 228 regulations, the agency must "maintain and protect fisheries and wildlife which may be affected by the operations." 36 C.F.R. §228.8(e). These impacts also violate USFS's duties to "minimize adverse environmental impacts on National Forest surface resources." 36 C.F.R. §228.8. "The operator also has a separate regulatory obligation to 'take all practicable measures to maintain and protect fisheries and wildlife habitat which may be affected by the operations.' 36 C.F.R. §228.8(e)." Rock Creek Alliance v. Forest Service, 703 F.Supp.2d 1152, 1164 (D. Montana 2010) (mine approval violated Organic Act and 228 regulations by failing to protect water quality and fisheries). "Under the Organic Act the Forest Service must …require [the project applicant] to take all practicable measures to maintain and protect fisheries and wildlife habitat." Id. at 1170.

The CWA, Organic Act, and agency regulations preclude USFS from approving aspects of a mining operation that would violate federal or state water quality standards.

> Under the Clean Water Act Section 313, the Forest Service cannot authorize mining operations that do not comply with state and federal water quality regulations, including a state's antidegradation policy. 33 U.S.C. § 1323(a).

Save Our Cabinets v. U.S. Dept. of Agriculture, 254 F.Supp.3d 1241, 1249 (D. Mont. 2017)(USFS approval of mining project violated duties under CWA and Organic Act to ensure compliance with water quality standards). *See also* Hells Canyon Presv. Council v. Haines, 2006WL2252554, *4-5 (D. Or. 2006)(USFS mine approvals violated state CWA standards).

The Organic Act mandates the same compliance, as the Part 228 regulations "further require that mining operators comply with applicable state and federal water quality standards including the Clean Water Act; [and] take all practicable measures to maintain and protect fisheries and wildlife habitat." Save Our Cabinets at 1250. The 228 regulations require that the operator submit sufficient information to enable the agency to ensure that the Project will comply with all applicable state and federal requirements to protect water quality and fisheries. *See* 36 C.F.R. §§228.4(c)(3), 228.8(b), 228.8(e).

In addition, regardless of whether the proper Part 251 regulations, or the improper Part 228 regulations are used, the Organic Act prevents the USFS from adversely affecting public waters, such as the springs that will be eliminated/dewatered by the mine. DEIS at 329 (admitting that many springs, such as Bored Spring, would be eliminated: "The loss of water to this spring would likely lead to complete loss of this riparian area."). These springs are covered by a federal

water right. DEIS at 333 (Table 3.7.1-6. "Summary of water right filings associated with GDEs impacted by groundwater drawdown.").

This is also true for the critical wetlands, riparian areas, and Groundwater Dependent Ecosystems (GDEs) will be severely impacted by the dewatering. DEIS at 304 (noting USFS Manual 2520). *See also* DEIS at 315, Figure 3.7.1-7 ("Groundwater-dependent ecosystems of concern.")(showing GDE springs to be dewatered). In addition to the Executive Order on Wetlands Protection (which requires the USFS to protect wetlands), the Organic Act requires the USFS to protect public land water resources, which has not been done.

> [N]ational forests …shall be as far as practicable controlled and administered in accordance with the following provisions. No national forest shall be established, except to improve and protect the forest within the boundaries, or for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States.

16 U.S.C. §475. "The legislative debates surrounding the Organic Administration Act of 1897 and its predecessor bills demonstrate that Congress intended national forests to be reserved for only two purposes – 'to conserve the water flows, and to furnish a continuous supply of timber for the people.'" U.S. v. New Mexico, 438 U.S. 696, 707 (1978).[42] "The objects for which the forest reservations should be made are the … preservation of forest conditions upon which water conditions and flows are dependent." Id. at 708.

New Mexico recognized that the "preservation" of conditions for water flow was aimed primarily at providing water for uses outside the forest boundaries – contradicting the agency's position here that it has no authority over actions on the forests that may eliminate or impair off-forest resources. "Congress authorized the national forest system principally as a means of enhancing the quantity of water that would be available to the settlers of the arid West." New Mexico, 438 U.S. at 713. Yet instead of "enhancing" water supplies, the dewatering will eliminate hundreds of millions of gallons of water *each year* that would otherwise be available to downstream water users, including federal water rights.[43]

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[42] New Mexico held that the Organic Act created federal reserved water rights for these, but not other, purposes.

[43] USFS has recognized its obligations to protect water conditions on its lands to achieve this purpose. In U.S. v. Jesse, the agency successfully argued "that instream flows are required to maintain the natural channels in a state of relative equilibrium in order to deliver water to the

Although the Act itself and New Mexico shows that the agency's abdication of authority here is invalid, this does not mean that mining is precluded whenever they effect downstream water supplies. "Congress intended the national forests to be put to a variety of uses … *not inconsistent with the two principle purposes of the forests*." Id. at 716 (emphasis added).

The fact that USFS's failure to "preserv[e] forest conditions upon which water conditions and flows are dependent" stems from groundwater dewatering/pumping instead of direct removal of surface waters, does not eliminate this aspect of the Organic Act. Federal authority to protect reserved water rights inherent in a federal reservation (such as an Indian reservation or national forest) embodies both surface water and the groundwater connected to the surface flow. The Ninth Circuit recently affirmed this connection, focusing on the key issue – whether groundwater is needed to meet a primary purpose of the reservation. In Agua Caliente, the court held that "if the purposes underlying a reservation envision access to water," than that includes protecting both surface and appurtenant groundwaters. 849 F.3d at 1270. "'[T]he United States can protect its water from subsequent diversion, whether the diversion is of surface or groundwater.' [Cappaert, 426 U.S. at 143]. If the United States can protect against groundwater diversions, it follows that the government can protect the groundwater itself." Aqua Caliente, at 1271.

Here, USFS never considered whether its approval of the project is "consistent with" one of the "primary purposes" of the Coronado National Forest – "enhancing" and "preserving" water conditions/flows

In addition, no mitigation is proposed/analyzed to protect the Forest Service's own water rights on its lands. USFS must ensure that federal water rights are not impaired or used by private interests to the detriment of the purposes for which the rights were acquired or created. Federal water rights are "superior to the rights of future appropriators." Cappaert, 426 U.S. at 138. "[T]he United States can protect its water from subsequent diversion, whether the diversion is of surface or groundwater." Id. at 143. "Where reserved rights are properly implied, they arise without regard to equities that may favor competing water uses. *See* Cappaert v. U.S., 426 U.S. 128, 138-39." Colville Confederated Tribes v. Walton, 752 F.2d 397, 405 (9th Cir. 1985).

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ultimate user under favorable conditions." 744 P.2d 491, 498 (Colo. 1987). The Court agreed that surface actions/conditions directly affect groundwater and the purposes of the Act, noting that "evaporation is the worst dissipator of moisture, and the need to "insur[e] springs a greater supply for a longer time." Id. at 496, n. 5.

The USFS cannot disregard its duty to protect such federal property. "Only Congress, and not an executive branch agency, can authorize the disposition of federal property." High Country Citizens Alliance v. Norton, 448 F.Supp.2d 1235, 1248 (D. Colo. 2006), *citing* Gibson v. Chouteau, 80 U.S. 92, 99 (1871). The court in High Country found that the Interior Department failed to protect federally reserved waters to the detriment of its reserved right. Id. at 1253. *See also* Lake Berryessa Tenants' Council v. U.S., 588 F.2d 267, 271 (9th Cir. 1978)(federal agency "cannot by their conduct cause the Government to lose its valuable rights by their acquiescence, laches, or failure to act.").

The fact that Arizona has yet to formally adjudicate these rights does not mean that they do not exist or deserve protection. In Cappaert, no decree or even quantification of water was necessary for the Supreme Court to conclude the federal reserved water right was impacted. 426 US at 133-134. The federal government is under an obligation to protect federal water rights, despite the fact that "the State of Montana was in the process of determining water rights within the state, an undertaking expected to consume many years." Joint Board of Control of the Flathead, Mission, and Jocko Irrigation Districts v. United States, 832 F.2d 1127, 1130 (9th Cir. 1987). The Circuit emphasized the agency's "duty" to protect the reserved water flows. Id. at 1132.

Illegal Amendment of Forest Plan

The DEIS is also under the mistaken belief that the USFS must amend the Tonto National Forest Plan:

> A consistency review between the GPO and the current forest plan indicates that approval and eventual implementation of the GPO would result in changed conditions that are inconsistent with existing forest plan direction. Approval of the GPO would therefore require a project-specific forest plan amendment to modify one or more plan components, i.e., standards and guidelines. The scope and scale of the necessary forest plan amendment would be narrow in scope and scale, i.e., limited to the GPO project area; and limited to the substantive rule provisions at §219.10 that are directly related to the amendment.

DEIS at 10. *See also* DEIS at 12 (Table 1.4.3-1, "Forest Plan amendments for the Resolution Copper Project and Land Exchange.").

That is wrong. First, this relies on the mistaken view that the agency's authority over the project is limited to reviewing the GPO. Second, the agency is prohibited from amending the Forest Plan if it would violate its duties under the Organic Act to protect the forest from destruction and depredations. Although the agency does not have the authority to deny the land exchange

(assuming that all other laws are met, which as noted herein is not the case), it certainly has the authority, and duty, to protect public resources affected by the mine (which the agency does not have to approve).

Thus, the proposed Forest Plan amendments violate the Organic Act and the National Forest Management Act. This is also true because under the NFMA, the agency cannot amend a Forest Plan unless the amendment is supported by a legally-adequate EIS, which as shown herein, has not been done.

VI. CONCLUSION

In conclusion, we thank you for the opportunity to comment on this matter. Any correspondence regarding this matter should be addressed to each and every one of the signers of these comments at the addresses below. This DEIS is riddled with mistakes, missing information, and imbalanced analyses. The Forest Service can do better than this. Because of the significance of the errors, the problems cannot be corrected by going straight to a final EIS. The Forest Service must prepare a revised DEIS for public review and comment that addresses all of the deficiencies noted in these comments. Please contact Roger Featherstone with the Arizona Mining Reform Coalition, (520) 777-9500, if there are questions about these comments.

Sincerely,

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Paul Robinson is the Research Director for the Southwest Research and Information Center.

The San Carlos Apache Tribe ("Tribe") is a federally recognized tribe, organized pursuant to the provisions of Section 16 of the Indian Reorganization Act of June 18, 1934 (48 Stat. 984). Located on the San Carlos Apache Indian Reservation, approximately three hours east of Phoenix, the Tribe has been a leading opponent of the Resolution Copper Mine Project and the Land Exchange provided under Section 3003 of the National Defense Authorization Act of 2015. Under the Act, the land exchange would convey to private ownership culturally significant and sacred lands, including Oak Flat (known in Apache as Chich'il Biłdagoteel) and the surrounding area listed on the National Register of Historic Places as the *Chich'il Biłdagoteel Historic District and Traditional Cultural Property*. The Tribe has opposed the mine project and land exchange for over fifteen years. The Tribe gratefully acknowledges the dedicated and steadfast assistance in the Tribe's opposition efforts by the Apache Stronghold, a non-profit organization headed by Elder and former Chairman and Council Member Wendsler Nosie, Sr. The Tribe also gratefully recognizes the invaluable assistance of the Tribe's Historic Preservation Officer, Vernelda Grant, and her staff.

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VIII. References

Agência Nacional de Mineração [National Mining Agency], 2019. Resolução Nº 4, de 15 de Fevereiro de 2019 [Resolution No. 4 of February 15, 2019], 1 p. Available online at: http://www.in.gov.br/materia/-/asset_publisher/Kujrw0TZC2Mb/content/id/63799094/do1-2019-02-18-resolucao-n-4-de-15-de-fevereiro-de-2019-63799056

Allen, R. A., Pereira, L. S., Raes, D., & Smith, M. (1998). Crop evapotranspiration - Guidelines for computing crop water requirements - FAO Irrigation and drainage paper 56. In *Food and Agriculture Organization of the United States*. Retrieved from http://www.fao.org/3/X0490E/X0490E00.htm

Allhands, J., 2018. What happens to Arizona when a water shortage is declared on Lake Mead? AZ Central, May 17, 2018. Available online at: https://www.azcentral.com/story/opinion/op-ed/joannaallhands/2018/05/17/lake-mead-declares-shortage-what-happens-arizona-water/618745002/

AquaResource Inc. 2011. "Integrated Surface and Groundwater Model Review and Technical Guide." For The Ontario Ministry of Natural Resources.

Arizona, Carl Hehnke, Resolution Copper, Geoff Ballantyne, Rio Tinto, Hamish Martin, Resolution Copper, William Hart, Resolution Copper, Adam Schwarz, Northparkes Mines, and Holly Stein, Colorado State University, 2012 Society of Economic Geologists, Inc., Special Publication 16, pp. 147–166. KCB 2019. Resolution Copper Mining LLC, DEIS Alternatives Failure Modes, Klohn Crippen Berger,

Arizona Department of Environmental Quality, n.d. Arizona mining guidance manual BADCT [Best Available Demonstrated Control Technology)]: Publication No. TB 04-01, 298 p. Available online at: http://static.azdeq.gov/wqd/badctmanual.pdf

Arizona Mining Reform Coalition et al., 2016. Scoping comments for the Resolution Copper Mine DEIS, 166 p. Available online at: http://www.azminingreform.org/sites/default/files/docs/scoping%20comments%20FINAL%2

0with%20attachments.pdf

Assembleia Legislativa de Minas Gerais [Legislative Assembly of Minas Gerais], 2019. Legislação Mineira (Lei 23291, de 25/02/2019) [Mining Legislation of February 25, 2019]. Available online at: https://www.almg.gov.br/consulte/legislacao/completa/completa.html?tipo=LEI&num=23291&ano=2019

AusIMM (Australasian Institute of Mining and Metallurgy), 2012. Cost estimation handbook, 2nd ed.: Monograph 27, Australasian Institute of Mining and Metallurgy, Carlton, Victoria, Australia, 524 p.

Bates, B., T. Bayley, and H. Barter. 2018. Simulation of Drawdown Impacts from Desert Wellfield. Project #: 605.75. Technical memorandum. Tucson, Arizona: Montgomery and Associates. September 13.

BGC, 2018. Resolution Copper Project EIS: Review of Numerical Groundwater Model Construction and Approach Mining and Subsidence Area) - DRAFT. Project No.: 1704005.03. Golden, Colorado: BGC Engineering Inc. November.

BGC Engineering USA Inc. 2018c. Resolution Copper Project EIS Hydrologic Model Results for DEIS Alternatives. Project No.: 1704-003. Golden, Colorado: BGC Engineering USA Inc. October 30.

Bleiwas, D.I., 2011. Estimates of electricity requirements for the recovery of mineral commodities, with examples applied to Sub-Saharan Africa: U.S. Geological Survey Open-File Report 2011–1253, 108 p. Available online at: https://pubs.usgs.gov/of/2011/1253/report/OF11-1253.pdf

Bleiwas, D.I., 2012. Estimated water requirements for the conventional flotation of copper ores: U.S. Geological Survey Open-File Report 2012-1089, 17 p. Available online at: https://pubs.usgs.gov/of/2012/1089/pdf/ofr2012-1089.pdf

Blodgett, S. and J.R. Kuipers, 2002. Technical report on underground hard-rock mining—Subsidence and hydrologic environmental impacts: Center for Science in Public Participation, Bozeman, Montana, 50 p. Available online at: http://www.csp2.org/files/reports/Subsidence%20and%20Hydrologic%20Environmental%20Impacts.pdf

Bluhm, S., R.G. Moreby, F. von Glehn, and C. Pascoe, 2013. Life-of-mine ventilation and refrigeration planning for Resolution Copper Mine: The Australian Mine Ventilation

Conference, Adelaide, South Australia, July 1-3, 2013, pp. 125-138.

Bregel, E., 2016. Resolution Copper mine—venturing 7,000 feet below Earth's surface: Arizona Daily Star, June 4, 2016. Available online at: https://tucson.com/news/resolution-copper-mine-venturing-feet-below-earth-s-surface/article_44ca18f8-7a29-5562-9833-dd6611c968fc.html

Bregel, E., 2016. Resolution Copper mine—venturing 7,000 feet below Earth's surface: Arizona Daily Star, June 4, 2016. Available online at: https://tucson.com/news/resolution-copper-mine-venturing-feet-below-earth-s-surface/article_44ca18f8-7a29-5562-9833-dd6611c968fc.html

Buckles, Avi (2008). A Class III Cultural Resources Inventory of 302 acres in the Pinal Highlands, Pinal and Gila Counties, Arizona (Cultural Resources Report 2008-21). Tucson, AZ: WestLand Resources, Inc.

Campaña, J., L. Valenzuela, and A. Figueroa, 2015. The Quillayes sand tailings dam in Chile—design and operation: Proceedings Tailings and Mine Waste 2015 Vancouver, BC, 14 p. Available online at: https://open.library.ubc.ca/cIRcle/collections/59368/items/1.0320846

Canadian Dam Association, 2013. Dam safety guidelines 2007 (2013 edition), 88 p.

Castro, M. C., and P. Goblet, Calibration of regional groundwater flow models: Working toward a better understanding of site-specific systems, Water Resour. Res., 39(6), 1172, doi:10.1029/2002WR001653, 2003

Charbeneau, R.J., 2000. Groundwater hydraulics and pollutant transport: Long Grove, Illinois, Waveland Press, 593 p.

Cherry, J., 2011. It seems like mining is the easy part; addressing societal issues as part of developing the Resolution copper mine in Arizona: Abstracts with Programs – Geological Society of America Annual Meeting, v. 43, p. 355.

Cody Routson. 2011. Second Century Southwest Megadrought. Accessed at http://www.southwestclimatechange.org/blog/13285

Cornwall et al 1971. "Geologic Map of the Sonora Quadrangle, Pinal and Gila Counties, Arizona." Cornwall, H.R., N.G. Banks, and C.H. Phillips, U.S. Geological Survey. U.S. Department of the Interior, 1971. DEIS 2019. Draft Environmental Impact Statement (DEIS) for the Resolution Copper Project and Land

Doherty, J.E., and Hunt, R.J., 2010, Approaches to highly parameterized inversion—A guide to

using PEST for groundwater-model calibration: U.S. Geological Survey Scientific Investigations Report 2010– 5169, 59 p.

Doherty, J.E., Hunt, R.J., and Tonkin, M.J. 2010. Approaches to highly parameterized inversion: A guide to using PEST for model-parameter and predictive-uncertainty analysis: U.S. Geological Survey Scientific Investigations Report 2010–5211, 71 p.

E&MJ (Engineering and Mining Journal), 2014. Sinking America's deepest shaft: Engineering and Mining Journal—April 2014—Features. Available online at: https://www.e-mj.com/features/sinking-america-s-deepest-shaft/

E&MJ (Engineering and Mining Journal), 2014. Sinking America's deepest shaft: Engineering and Mining Journal—April 2014—Features. Available online at: https://www.e-mj.com/features/sinking-america-s- deepest-shaft/

Eary, T., 2018g. Common Inputs Common to all Operational Models of Tailings Circuit S lute Chemistry. Technical memorandum. Loveland, Colorado: Enchemica, LLC. July 18. https://www.resolutionmineeis.us/documents/eary-enchemica-common-model-inputs-2018

Eary, T. 2018. Block Cave Geochemical Model - 2018 Update on Calculation Approach and Results. Technical memorandum. Loveland, Colorado: Enchemica, LLC. June 26.

Eary, T. 2018f. Block Cave Geochemical Model - 2018 Update on Calculation Approach and Results. Technical memorandum. Loveland, Colorado: Enchemica, LLC. June 26. https://www.resolutionmineeis.us/sites/default/files/references/eary-enchemica-block-cave-geochemical-model-2018.pdf

EIA (U.S. Energy Administration Information), 2018. Frequently Asked Questions. Available online at: https://www.eia.gov/tools/faqs/faq.php?id=97&t=3

Emerman, S.H., 2018. Potential impact of geothermal water on the financial success of the Resolution Copper Mine, Arizona: Report to Arizona Mining Reform Coalition, 14 p. Available online at: https://www.azminingreform.org/sites/default/files/docs/Arizona_Mining_Reform_Coalition_Report.pdf . (See also Appendix)

Emerman, S.H., 2018b. Evaluation of a buffer zone at an ilmenite mine operated by Rio Tinto on the shores of Lakes Besaroy and Ambavarano, Madagascar: Report to The Andrew Lees Trust, 39 p. Available online at: http://www.andrewleestrust.org/docs/ALT_UK_Emerman_Report_Buffer_Zone_Eng_2018.p

df . (See also Appendix)

Emerman, S.H., 2019b. Evaluation of predictions of land subsidence due to panel caving at the Resolution Copper Mine, Arizona: Report to Arizona Mining Reform Coalition, 17 p. (See also Appendix)

Emerman, S.H. 2019. Projected consumption of electricity and water by the proposed Resolution Copper mine, Arizona: Report to Arizona Mining Reform Coalition, 13 p. (See also Appendix)

Exchange, SWCA for the US Forest Service, Tonto National Forest, August 2019 Gestring 2019. U.S. Operating Copper Mines: Failure to Capture & Treat Wastewater By Bonnie

Fagerström, C. 2015. Copper mining in Chile and its electric power demand: Bachelor's Thesis, Mechanical and Production Engineering, Novia University of Applied Sciences, 76 p. Available online at https://www.theseus.fi/bitstream/handle/10024/91170/Fagerstrom_Christoffer.pdf?sequence=1&isAllowed=y

FEMA (Federal Emergency Management Agency), 2005. Federal guidelines for dam safety—Earthquake analyses and design of dams: FEMA-65, 75 p. Available online at: https://www.ferc.gov/industries/hydropower/safety/guidelines/fema-65.pdf

FEMA (Federal Emergency Management Agency), 2013. Selecting and accommodating inflow design floods for dams: FEMA-94, 38 p. Available online at: https://www.fema.gov/media-library-data/1386108128706-02191a433d6a703f8dbdd68cde574a0a/Selecting_and_Accommodating_Inflow_Design_Floods_for_Dams.PDF

Fetter, C.W., 2001. Applied hydrogeology, 4th ed: Prentice-Hall, Upper Saddle River, New Jersey, 598 p. **[book]**

for Resolution Copper Mining LLC, January 2019. Kliche 2017. Technical Memorandum for Alternative Mining Methods, Resolution Copper Mining, LLC,

Freihoefer, A., D. Mason, P. Jahnke, L. Dubas, and K. Hutchinson, 2009, Regional Groundwater Flow Model of the Salt River Valley, Phoenix Active Management Area, Model Update and Calibration: Arizona Department of Water Resources, Modeling Report No. 19.

Gabora, M., Martin, N., Clements, N. 2014. Application of the Null Space Monte Carlo Method in a Groundwater Flow Model of Mine Pit Dewatering. An Interdisciplinary Response to Mine Water Challenges - Sui, Sun & Wang (eds).

Gestring, B., 2019. U.S. Operating Copper Mines: Faulure to Capture & Treat Wastewater. For Earthworks. https://earthworks.org/publications/u-s-operating-copper-mines-failure-to-capture-treat-waste water/

Gestring, Earthworks, May 2019 Hehnke et al 2012. Geology and Exploration Progress at the Resolution Porphyry Cu-Mo Deposit,

Gunson, A.J., 2013. Quantifying, reducing and improving mine water use: Ph.D. Thesis, Mining Engineering, University of British Columbia, 285 p. Available online at: https://open.library.ubc.ca/cIRcle/collections/ubctheses/24/items/1.0071942

Haile, J.P. and K.J. Brouwer, 1994. Modified centerline construction of tailings embankments: Third International Conference on Environmental Issues and Waste Management in Energy and Mineral Production, August 1994, Perth, Australia, 7 p. Available online at: http://mssi.nrs.gov.bc.ca/1_CIMMountPolley/DOC1535.pdf

Hatch 2016. Appendix Q: Final Draft Report: Prediction of Block Cave Water Chemistry. In General Plan of Operations, Resolution Copper Mining. Scottsdale, Arizona. January 8. https://www.resolutionmineeis.us/documents/hatch-2016

Healy, R. W. (2010). Estimating groundwater recharge. In *United States Geological Survey*. Retrieved from https://pubs.er.usgs.gov/publication/70189200

Hehnke, C., G. Ballantyne, H. Martin, W. Hart, A. Schwarz, and H. Stein, 2012. Geology and exploration progress at the Resolution porphyry Cu-Mo deposit, Arizona, *in* Hedenquist, J.W., M. Harris, and F. Camus (eds.), Geology and genesis of major copper deposits and districts of the world; a tribute to Richard H. Sillitoe: Special Publication (Society of Economic Geologists, CD-ROM), v. 16, pp. 147-166.

Höffmann, J., Leake, S.A., Galloway, D.L., and Wilson, A.M., 2003, MODFLOW-2000 Ground-Water Model--User Guide to the Subsidence and Aquifer-System Compaction (SUB) Package: U.S. Geological Survey Open-File Report 03-233, 44 p.

Hopkins, Maren P., Colwell, Chip, Ferguson, T. J., & Hedquist, Saul L. (2015). Ethnographic and Ethnohistoric study of the Superior area, Arizona. Prepared for Resolution Copper Mining. Tucson, AZ: Anthropological Research, L.L.C. **CR-EX-05**

Hotter and Drier, Saunders *et al*., 2008:5.

Houston, S., W.X. Chavez, and A.R. Campbell, 2010. Investigation of supergene processes at the Resolution copper deposit: Abstracts with Programs – Geological Society of America Annual Meeting, v. 42, p. 582.

https://www.researchgate.net/publication/252321691_Fundamental_Concepts_of_Recharge_in_the_Des ert_Southwest_A_Regional_Modeling_Perspective

INAP (International Network for Acid Prevention), 2009. Global Acid Rock Drainage (GARD) Guide. Table 5-1: Methods for Geochemical Characterization. http://www.gardguide.com/index.php?title=Table_5-1

Independent Expert Engineering Investigation and Review Panel, 2015. Report on Mount Polley Tailings Storage Facility breach: Report to Ministry of Energy and Mines and Soda Creek Indian Band, 156 p. Available online at: https://www.mountpolleyreviewpanel.ca/sites/default/files/report/ReportonMountPolleyTailingsStorageFacilityBreach.pdf

IPCC, 2007: Summary for Policymakers. In: Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Groups III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, M. Tignor and H.L. Miller (Eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA (www.ipcc.ch/SPM13apr07.pdf) ("IPCC Report").

IPCC, 2007: Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, M. Tignor and H.L. Miller (Eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA (http://ipcc-wg1.ucar.edu/wg1/wg1-report.html).

IPCC, 2007: Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, M. Tignor and H.L. Miller (Eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA (http://ipcc-wg1.ucar.edu/wg1/wg1-report.html).

IPCC, 2018: Summary for Policymakers. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W.

Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. *World Meteorological Organization, Geneva, Switzerland, 32 pp.* https://www.ipcc.ch/site/assets/uploads/2018/11/pr_181008_P48_spm_en.pdf

Jeyapalan, J.K., 1981. Flow failures of some mine tailings dams: Geotechnical Engineering, v. 12, pp. 153-166.

Jyrkama, M. I., and J. F. Sykes (2006), Sensitivity and uncertainty analysis of the recharge boundary condition, Water Resour. Res., 42, W01404, doi:10.1029/2005WR004408.

Karl, T. R., J. M. Melillo, and T. C. Peterson (eds.). 2009. Global Climate Change Impacts in the United States. Cambridge University Press

Keay, T. 2018. Locations of historical pumping. Personal communication from Todd Keay, Montgomery and Associates, to Chris Garrett, SWCA Environmental Consultants. Clarification requested regarding DEIS. Email dated December 12, 2018.

Klohn Crippen Berger, 2017. Study of tailings management technologies: Report to Mine Environment Neutral Drainage (MEND) Program, MEND Report 2.50.1, 164 p. Available online at: http://mend-nedem.org/wp-content/uploads/2.50.1Tailings_Management_TechnologiesL.pdf

Klohn Crippen Berger Ltd. 2018d. Resolution Copper Project: DEIS Design for Alternative 6 - Skunk Camp. Doc. # CCC.03-81600-EX-REP-00006 - Rev.1. Vancouver, Canada: Klohn Crippen Berger Ltd. August 8.

Klohn Crippen Berger Ltd. 2019c. Resolution Copper Project: DEIS Design for Alternative 6 Skunk Camp, Appendix IV Seepage Estimate Amendment. Doc. # CCC.03-81600-EX-REP-0006 Rev.2. Vancouver, Canada: Klohn Crippen Berger Ltd. January 30.

Kolm, K.E., Van Der Heijde, P., 1996. Conceptualization and characterization of envirochemical systems. Calibration and Reliability in Groundwater Modelling (Proceedings of the Model CARE 96 Conference held at Golden, Colorado, September 1996). IAHS Publ. no. 237, 1996.

Koppelaar, R.H.E.M. and H. Koppelaar, 2016. The ore grade and depth influence on copper energy inputs: Biophysical Economics and Resource Quality, v. 1. Available online at: https://link.springer.com/article/10.1007%2Fs41247-016-0012-x

Kühn, Berndt (2014). *Chronicles of War: Apache and Yavapai Resistance in the Southwestern United States and Northern Mexico, 1821-1937*. Tucson: Arizona Historical Society.

Larrauri, P.C. and Lall, U., 2018. Tailings dams failures—Updated statistical model for discharge volume and runout: Environments, v. 5. Available online at: doi:10.3390/environments5020028.

Laubscher, D., 2000. A practical manual on block caving: Report to the Internal Caving Study (1997-2000), 525 p. Available online at: https://www.resolutionmineeis.us/documents/laubscher-2000

Leonard, Kathryn (2019) Letter from Arizona State Historic Preservation Officer to Tonto National Forest Superintendent Neil Bosworth, September 19, 2019. **CR-EX-01**

Lindeman, Michael W., and Whitney, Gregory J. (2003). The Resolution Project: Results of an archaeological survey in Pinal County, Arizona (Technical Report No. 2003-10). Tucson, AZ: Desert Archaeology.

Maest, A.S. and J.R. Kuipers (primary), C.L. Travers, and D.A. Atkins (contributing). 2005. *Predicting Water Quality at Hardrock Mines: Methods and Models, Uncertainties, and State-of-the-Art.* Earthworks, Washington, DC. Available: https://earthworks.org/publications/predicting_water_quality_at_hardrock_mines/.

Maest, A.S. and Nordstrom, D.K. 2017. A geochemical examination of humidity cell tests. Applied Geochemistry 81, p. 109–131. Abstract: http://www.sciencedirect.com/science/article/pii/S088329271730197X

MapCruzin, 2019a. Arizona Administrative Boundaries GIS Shapefile. Available online at: https://mapcruzin.com/free-united-states-shapefiles/free-arizona-arcgis-maps-shapefiles.htm

Meza-Cuadra, G., C. Pantano, and D. Oliver. 2018a. Resolution Copper Groundwater Flow Model - Predicted Flows to Block Cave. Memorandum. Greenwood Village, Colorado: WSP. September 28.

Montgomery and Associates Inc. 2017b. Analysis of Groundwater Level Trends, Upper Queen Creek/Devils Canyon Study Area: Resolution Copper Mining LLC, Pinal County, Arizona. Prepared for Resolution Copper. Tucson, Arizona: Montgomery and Associates Inc. February 2.

Mudd, G., 2008. Sustainability reporting and water resources—A preliminary assessment of embodied water and sustainable mining: Mine Water and the Environment, v. 27, pp. 136-144.

Mudd, Zhehan Weng, and Simon M. Jowitt, Economic Geology, v. 108, pp. 1163–1183, August 30,

2012.

Mudd et al 2012. A Detailed Assessment of Global Cu Resource Trends and Endowments, Gavin M.

MWH Americas, 2019. Appendix G: Geochemical Characterization Data Summary Report. https://www.resolutionmineeis.us/documents/mwh-2013

MWH Americas, Inc., 2013. Geochemical characterization data summary report. Prepared for Resolution Copper Mining, LLC. August. 461pp. https://www.resolutionmineeis.us/sites/default/files/references/mwh-2013.pdf

Nathanson, J.A. and R.A. Schneider, 2014. Basic environmental technology—water supply, waste management and pollution control, 6th ed.: Upper Saddle River, New Jersey, Pearson, 456 p. **[book]**

Neuman, S.P., and Weiranga, P.J. 2003. A Comprehensive Strategy of Hydrogeologic Modeling and Uncertainty Analysis for Nuclear Facilities and Sites (NUREG/CR-6805)

Nevada Bureau of Land Management, 2013. Rock characterization and water resources analysis guidance for mining activities. 10pp. https://www.blm.gov/download/file/fid/11348

Newell, E., and C. Garrett, 2018. 2018d. Water Resource Analysis: Assumptions, Methodology Used, Relevant Regulations, Laws, and Guidance, and Key Documents. Process memorandum to file. Phoenix, Arizona: SWCA Environmental Consultants. August 8.

Northey, S., N. Haque, and G. Mudd, 2013. Using sustainability reporting to assess the environmental footprint of copper mining: Journal of Cleaner Production, v. 40, pp. 118-128.

Northey, S.A., G.M. Mudd, T.T. Werner, N. Haque, and M. Yellishetty, 2019. Sustainable water management and improved corporate reporting in mining: Water Resources and Industry, v. 21. Available online at: https://doi.org/10.1016/j.wri.2018.100104

Northey, S.A and Haque, N., 2013. Life cycle based water footprint of selected metal production—Assessing production processes of copper, gold and nickel: CSIRO, Australia, 43 p.

Nosie, Wendsler, Sr., Ronnie Lupe, Jaime Fullmer, Ivan Smith, Charles Vaughn, Todd Honyaoma, Sr. (2007). Letter to President George W. Bush, June 20, 2007. **CR-EX-06**

O'Brien, G. 2010a. Technical Memorandum: Groundwater Flow Model Construction and Calibration. Document No. 198/10-320874-5.3. Prepared for Rosemont Copper Company.

Tucson, Arizona: Tetra Tech. July 26

Panteah, Sr., Val R. (2019). Letter from Pueblo of Zuni Tribe Chairman to Tonto National Forest Superintendent Neil Bosworth, September 30, 2019. **CR-EX-04**

Parker 2017. Geologic and Mineral Resource Model - Suitability for Declaration of Mineral Resources and Support for Mine Plans to Develop a Block or Panel Cave Mine, Letter prepared exclusively for Resolution Copper Mining (RCM), by Harry M. Parker, Amec Foster Wheeler E&C Services Inc., March 14, 2017.

Petersen, M.D., Moschetti, M.P., Powers, P.M., Mueller, C.S., Haller, K.M., Frankel, A.D., Zeng, Yuehua, Rezaeian, Sanaz, Harmsen, S.C., Boyd, O.S., Field, Ned, Chen, Rui, Rukstales, K.S., Luco, Nico, Wheeler, R.L., Williams, R.A., and Olsen, A.H., U.S. Geological Survey Open-File Report 2014–1091, 243 p., 2014. Wong et al 2013. Site-Specific Seismic Hazard Analyses for the Resolution Mining Company Tailings

Petley, D., 2019. The speed of the Brumadinho tailings dam landslide: AGU100 Blogosphere—The Landslide Blog, February 4, 2019. Available online at: https://blogs.agu.org/landslideblog/2019/02/04/brumadinho-tailings-dam-landslide/

Phillips, M., 2016. Inside the billion-dollar dig to America's biggest copper deposit: Bloomberg Businessweek, March 4, 2016. Available online at: https://www.bloomberg.com/features/2016-arizona-copper-mine/

Prucha, B., 2019. Review of Hydrologic Impacts In the Draft Environmental Impact Statement Resolution Copper Project and Land Exchange August 2019. (See also Appendix)

Prucha, R., S. M. Benson, and P. A. Witherspoon. 1987. Conceptual Model of the Klamath Falls, Oregon Geothermal Area. Proceedings of the 12th Annual Workshop, Geothermal Reservoir Engineering, 20-22 January 1987, Stanford, California.

Rambler, Terry (2019). Letter from San Carlos Apache Tribe Chairman to Tonto National Forest Superintendent Neil Bosworth, July 10, 2019. **CR-EX-02**

Rambler, Terry (2019). Letter from San Carlos Apache Tribe Chairman to Tonto National Forest Superintendent Neil Bosworth, September 30, 2019. **CR-EX-03**

Reilly, T.E., and Harbaugh A.W., 2004. Guidelines for Evaluating Ground-Water Flow Models, USGS, Scientific Investigations Report 2004-5038

Resolution Copper, 2018a. Resolution Copper project profile, Available online at: https://resolutioncopper.com/wp-content/uploads/2016/03/Resolution-Copper-Project-Profile.

pdf

Resolution Copper, 2018b. Get fast facts—a quick look at the Resolution Copper project. Available online at: https://resolutioncopper.com/resolution-copper-mine/get-fast-facts/

Resolution Copper, 2018b. No. 9 Shaft Project. Available online at: https://resolutioncopper.com/no-9-shaft-project/

Resolution Copper, 2018b. Project Facts. Available online at: https://resolutioncopper.com/wp-content/uploads/2018/07/Project-Facts-May-2018.pdf

Resolution Copper, 2018c. No. 9 Shaft Project. Available online at: https://resolutioncopper.com/no-9-shaft-project/

Resolution Copper Mining, 2014a. General plan of operations, vol. 1, 337 p. Available online at: http://www.resolutionmineeis.us/sites/default/files/project-files/resolution-copper-gpo-vol-1-20160509.pdf

Resolution Copper Mining, 2014b. General plan of operations, vol. 2, 97 p. Available online at: http://www.resolutionmineeis.us/sites/default/files/project-files/resolution-copper-gpo-vol-2-figures-20160509.pdf

Resolution Copper Mining, 2014c. General plan of operations, vol. 3, 1961 p. Available online at: http://www.resolutionmineeis.us/sites/default/files/project-files/resolution-copper-gpo-vol-3.pdf

Rio Tinto, 2018. Resolution. Available online at: https://www.riotinto.com/copperanddiamonds/resolution-4682.aspx

Roemer, G, Gabora, M., Hudson, A., Williamson, M., 2012. Hydrogeologic and Geochemical Prediction of Rosemont Pit Lake Using Three Different Modeling Programs. 9th Intl. Conf. on Acid Rock Drainage, At Ottawa, CA.

Salt River Project, 2019. Facts about SRP. Available online at: https://www.srpnet.com/about/facts.aspx

Saunders, Stephen, C. Montgomery, T. Easley, and T. Spencer. 2008. Hotter and Drier, 2: The West's Changed Climate. Arizona's New Mexico's average temperatures were 2.2 1.3 degrees Fahrenheit warmer in 2003-2007 than for the previous 100 years. (Hotter and Drier, 41)Saunders 2008:43)

Simmers, I., 1988. Estimation of Natural Groundwater Recharge. Springer Netherlands.

Singh, M.M., 2010. Water consumption at copper mines in Arizona: State of Arizona, Department of Mines & Mineral Resources, Special Report 29, 18 p. Available online at: http://repository.azgs.az.gov/sites/default/files/dlio/files/nid1295/sr29waterconsumptioncoppermines.pdf

Sobek, AA, Schuller, WA, Freeman, JR, Smith, RM, 1978. Field and Laboratory Methods Applicable to Overburden and Mine Soils. https://www.resolutionmineeis.us/documents/sobek-1978

Storage Facilities Options, Southern Arizona, Ivan Wong, Eliza Nemser, Mark Dober, Susan Olig, Jacqueline Bott, and Fabia Terra, Seismic Hazards Group, URS Corporation, and Robert Darragh and Walter Silva, Pacific Engineering & Analysis, June 3, 2013.

Superior, AZ, Charles A. Kliche, P.E., PhD., November 1, 2017. Kloppenburg 2017. Summary of geological information relevant to development of the porphyry Cu-Mo Resolution deposit, Arizona. Dr Armelle Kloppenburg, 4DGeo - Applied Structural Geology, For Resolution Copper Mining LLC, May, 2017

SWCA 2017. Draft Alternatives Evaluation Report Resolution Copper Project and Land Exchange EIS, SWCA Environmental Consultants, prepared for the U.S. Forest Service, Tonto National Forest, November, 2017. USGS 2008. Documentation for the 2008 Update of the United States National Seismic Hazard Maps, Petersen, Mark D., Frankel, Arthur D., Harmsen, Stephen C., Mueller, Charles S., Haller, Kathleen M., Wheeler, Russell L., Wesson, Robert L., Zeng, Yuehua, Boyd, Oliver S., Perkins, David M., Luco, Nicolas, Field, Edward H., Wills, Chris J., and Rukstales, Kenneth S., U.S. Geological Survey Open-File Report 2008–1128, 2008.

SWCA Environmental Consultants, 2018. Final range of alternatives for detailed analysis in draft EIS: Report to U.S. Forest Service, 19 p.

Technical Guide to Ground-Water Model Selection at Sites Contaminated with Radioactive Substances, EPA 402-R-94-012, September 1994. NTIS, PB94-205804/XAB.

Tetra Tech, Inc. and R Squared, Inc., 2006. Final geotechnical assessment, report on sinkhole development at the Troy Mine and implications for the proposed Rock Creek Mine, Lincoln and Sanders Counties, Montana: Technical Report, U.S. Department of Agriculture, Forest Service Region 1, 116 p. Available online at: https://www.fs.usda.gov/nfs/11558/www/nepa/42368_FSPLT1_021711.pdf

USACE (U.S. Army Corps of Engineers), 2016. Earthquake design and evaluation for civil works projects: ER 1110-2-1806, 28 p. Available online at: https://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-1806.pdf

USDA (U.S. Department of Agriculture). (August 2019). Resolution Copper Project and Land Exchange Environmental Impact Statement. https://www.resolutionmineeis.us/sites/default/files/deis/resolution-deis-full-copy.pdf

USDA (U.S. Department of Agriculture), 2017a. Resolution Copper Project and Land Exchange Environmental Impact Statement—DRAFT alternatives evaluation report—Tonto National Forest, 74 p. Available online at: https://www.resolutionmineeis.us/sites/default/files/project-files/usfs-tonto-alternatives-evaluation-report-draft-final-201711.pdf

USDA (U.S. Department of Agriculture), 2017b. Resolution Copper Project and Land Exchange Environmental Impact Statement—DRAFT alternatives evaluation report—Appendices—Tonto National Forest, 165 p. Available online at: https://www.resolutionmineeis.us/sites/default/files/project-files/usfs-tonto-alternatives-evaluation-report-draft-final-appendices-201711.pdf

USDA (U.S. Department of Agriculture), 2018a. Snapshot—Resolution Copper Project – Tailings alternative—#2: Near West – wet {modified proposed action}, 2 p. Available online at: https://www.resolutionmineeis.us/sites/default/files/project-files/usfs-tonto-snapshot-alternative-2-20180817.pdf

USDA (U.S. Department of Agriculture), 2018a. Snapshot—Resolution Copper Project – Tailings alternative—#5: Peg Leg, 2 p. Available online at: https://www.resolutionmineeis.us/sites/default/files/project-files/usfs-tonto-snapshot-alternative-5-20180817.pdf

USDA (U.S. Department of Agriculture), 2018c. Snapshot—Resolution Copper Project – Tailings alternative—#4: Silver King – filtered, 2 p. Available online at: https://www.resolutionmineeis.us/sites/default/files/project-files/usfs-tonto-snapshot-alternative-4-20180817.pdf

USDA (U.S. Department of Agriculture), 2018d. Snapshot—Resolution Copper Project – Tailings alternative—#5: Peg Leg, 2 p. Available online at: https://www.resolutionmineeis.us/sites/default/files/project-files/usfs-tonto-snapshot-alternati

ve-5-20180817.pdf

USDA (U.S. Department of Agriculture), 2018e. Snapshot—Resolution Copper Project – Tailings alternative—#6: Skunk Camp, 2 p. Available online at: https://www.resolutionmineeis.us/sites/default/files/project-files/usfs-tonto-snapshot-alternative-6-20180817.pdf

USDA (United States Department of Agriculture) Tonto National Forest, 2019a. Resolution Copper Project and Land Exchange Environmental Impact Statement—Questions and Answers. Available online at: https://www.resolutionmineeis.us/about-project/questions-and-answers

USDA (United States Department of Agriculture) Tonto National Forest, 2019b. Resolution Copper Project and Land Exchange Environmental Impact Statement—A Practical Manual on Block Caving. Available online at: https://www.resolutionmineeis.us/documents/laubscher-2000

USDA Forest Service, 2019. Draft Environmental Impact Statement, Resolution Copper Project and Land Exchange. Volume 1. Tonto National Forest, August. 1369pp + appendices. www.ResolutionMineEIS.us.

US Department of Agriculture Tonto National Forest (2015). National Register Nomination for the Chi'chil Biłdagoteel National Register Historic District, Pinal County, Arizona (US National Park Service, National Register of Historic Places, approved March 4, 2016). http://bloximages.chicago2.vip.townnews.com/tucson.com/content/tncms/assets/v3/editorial/8/b1/8b10c3b0-77ed-560b-bd5f-bc0552df7e7c/56e363c6b87ba.pdf.pdf

US EPA, 1994. Method 1312: Synthetic Precipitation Leaching Procedure. https://www.resolutionmineeis.us/documents/epa-1994

US EPA, 2016. Aquatic Life Ambient Water Quality Criterion for Selenium in Freshwater 2016 – Fact Sheet (criterion for lotic waters). https://www.epa.gov/wqc/final-aquatic-life-ambient-water-quality-criterion-selenium-freshwater-2016

US EPA, 2018. 2018 Edition of the Drinking Water Standards and Health Advisories Tables. EPA 822-F-18-001, Office of Water. March. https://www.epa.gov/sites/production/files/2018-03/documents/dwtable2018.pdf

US EPA, 2019. National Recommended Water Quality Criteria - Aquatic Life Criteria Table. https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-ta

ble#table

US Forest Service. 2009. Climate Change Considerations in Project Level NEPA. Accessed at http://www.fs.fed.us/emc/nepa/climate_change/index.htm

USGS (U.S. Geological Survey), 2019. USGS National Hydrography Dataset (NHD) Best Resolution 20190222 for Arizona State or Territory Shapefile Model Version 2.2.1. Available online at: https://www.sciencebase.gov/catalog/item/5a96cda0e4b06990606c4d0f

USGS 2014. Documentation for the 2014 update of the United States national seismic hazard maps:

Verburg, R. and Harvey, M. 2008. Kinetic testing results of cleaner and scavenger tailings – Resolution Copper Project. Golder Associates, Technical Memorandum. To: Sergio Gonzalez, Resolution Copper Mining. July 14. 73pp. https://www.resolutionmineeis.us/documents/golder-kinetic-testing-results-2008

WebGIS, 2019. PINAL – Arizona—Terrain Data – 7.5 DEM. Available online at: http://www.webgis.com/terr_pages/AZ/dem75/pinal.html

Welch, J.R. (2017). Earth, Wind, and Fire: Pinal Apaches, Miners, and Genocide in Central Arizona, 1859-1874. *Sage Open* October-December 2017(1):1-19. DOI: 10.1177/2158244017747016. **CR-EX-07**

Wels, C. and Mackie, D., Scibek, J. 2012. Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities, British Columbia Ministry of Environment, Water Protection & Sustainability Branch, Report No. 194001.

Wobus C, Prucha R, Albert D, Woll C, Loinaz M, Jones R (2015) Hydrologic Alterations from Climate Change Inform Assessment of Ecological Risk to Pacific Salmon in Bristol Bay, Alaska. PLoS ONE 10(12): e0143905. https://doi.org/10.1371/journal.pone.0143905

Woo, K.-S., E. Eberhardt, D. Elmo, and D. Stead, 2013. Empirical investigation and characterization of surface subsidence related to block cave mining: International Journal of Rock Mechanics & Mining Sciences, v. 61, pp. 31-42. Available online at: https://www.eoas.ubc.ca/personal/erik/e-papers/13EE_IJRMMS-EmpiricalDatabase.pdf

WSP USA. 2019. Resolution Copper Groundwater Flow Model Report. Project No.: 31400968. Greenwood Village, Colorado: WSP USA. February 15.

IX. Appendices

Appendix A

Comments from the Center for Science in Public Participation

David M. Chambers, Ph.D., P. Geop.

October 28, 2019

Appendix B - (1)

Memo updating 4 reports predating DEIS

Steven H. Emerman Ph.D.

October 20, 2019

Appendix B - (2)

Potential Impact of Geothermal Water on the Financial Success of the Resolution Copper Mine, Arizona

Steven H. Emerman Ph.D.

September 14, 2018

Appendix B - (3)

Projected Consumption of Electricity and Water by the Proposed Resolution Copper Mine, Arizona

Steven H. Emerman Ph.D.

March 11, 2019

Appendix B - (4)

Evaluation of Predictions of Land Subsidence due to Panel Caving at the Resolution Copper Mine, Arizona

Steven H. Emerman Ph.D.

March 17, 2019

Appendix B - (5)

Evaluation of the Maximum Design Earthquake for the Tailings Storage Facilities for the Proposed Resolution Copper Mine, Arizona

Steven H. Emerman Ph.D.

March 27, 2019

Appendix C

Re: Review of Resolution Copper's Draft Environmental Impact Statement, August 2019: Geochemical Issues

Ann Maest, PhD; Buka Environmental

October 30, 2019

Appendix D

Deficiencies in the Socioeconomic Section of the Resolution Copper Project and Land Exchange Draft Environmental Impact Statement

Comments Prepared for
the
San Carlos Apache Tribe

By

Power Consulting Incorporated
Missoula, Montana

November 4, 2019

Appendix E

Review of Hydrologic Impacts In the Draft Environmental Impact Statement Resolution Copper Project and Land Exchange August 2019

Bob Prucha, Integrated Hydro Systems, LLC

October 9, 2019

Appendix F

Comments of the Inter Tribal Association of Arizona on the Resolution Copper Project Land Exchange Draft Environmental Impact Statement (DEIS)

November 7, 2019

Appendix G

Comments of Earthworks on the Resolution Copper Project Land Exchange Draft Environmental Impact Statement (DEIS)

November 5, 2019

Appendix H

Comments of the Access Fund on the Resolution Copper Project Draft Environmental Impact Statement (DEIS)

November 4, 2019

Appendix I

Comments from the San Carlos Apache Tribe Regarding the 404 permit application:

Public Notice/Application No.: SPL-2016-00547-MWL
Project: Resolution Copper Mine Tailings Storage Facility

November 7, 2019

Appendix J

Arizona Mining Reform Coalition *et. al.*
Scoping Comments for the Resolution Copper Mine DEIS

July 18, 2016

Appendix K

Legislative history on Southeast Arizona Land Exchange

Appendix K - (1)

Arizona Statement of Senator Jon Kyl
Before the

Subcommittee on Forests and Public Lands
Committee on Energy and Natural Resources

United States Senate
Concerning:

S. 409 – Southeast Arizona Land Exchange and Conservation Act of 2009

June 17, 2009

Appendix K - (2)

Legislative History of the Southeastern Arizona Land Exchange

September 23, 2019

Appendix K - (3)

Legislative Testimony of Bill Williams
Vice President, Resolution Copper Mining, LLC

before the

U.S. Senate Subcommittee on Public Lands and Forests

concerning

S.2466, Southeast Arizona Land Exchange and Conservation Act of 2006

May 24, 2006

Appendix K - (4)

Testimony of David Salisbury
President, Resolution Copper Mining, LLC

before the

U.S. Senate Committee on Forests and Public Lands

concerning

S. 3157, Southeast Arizona Land Exchange and Conservation Act of 2008

July 9, 2008

Appendix K - (5)

Testimony of David Salisbury
President, Resolution Copper Mining, LLC

before the

U.S. Senate Sub-Committee on Forests and Public Lands

concerning

S. 409, Southeast Arizona Land Exchange and Conservation Act of 2009

June 17, 2009

Appendix K - (6)

Testimony of Jon Cherry, Vice-President, Resolution Copper Company

before the

U.S. Senate Committee on Energy and Natural Resources

concerning

H.R. 1904, Southeast Arizona Land Exchange and Conservation Act of 2011

February 9, 2012

Appendix K - (7)

SUMMARY OF UNTRUE STATEMENTS ON THE SOUTHEAST ARIZONA LAND EXCHANGE BEFORE CONGRESS DURING THE 109 TH – 113 TH CONGRESSES

109 th Congress (2005-06)

October 8, 2019

Appendix K - (8)

TESTIMONY
S.B. 2466
THE HONORABLE MICHAEL HING
MAYOR OF SUPERIOR
May 24, 2006

Downloaded on November 5, 2019 from

https://www.energy.senate.gov/public/index.cfm/hearings-and-business-meetings?Id=8D0FC9A0-1373-44A0-AB30-B6CBAB26B85C&Statement_id=131E930F-E6FD-455C-972A-12334645896F

Appendix K - (9)

Testimony of Rosemary Shearer
Executive Director, Superstition Area Land Trust before the U.S. Senate Committee on Forests and Public Lands concerning S. 409, Southeast Arizona Land Exchange and Conservation Act of 2009

June 17, 2009

Appendix L

Wildlife Studies and Reports

Appendix L - (1)

Wildlife Vegetation and Wildlife Survey of Devil's Canyon, Tonto National Forest

Sky Jacobs and Aaron Flesch

July 21, 2007

Appendix L - (2)

Wildlife Vegetation and Wildlife Survey of Devil's Canyon, Tonto National Forest

Sky Jacobs

May 2009

Appendix L - (3)

Wildlife surveys and monitoring with the use of remote camera traps in the Greater Oak Flat Watershed near Superior, Arizona.

Roger Featherstone, Director, Arizona Mining Reform Coalition; Sky Jacobs, Wild Sonora; Sergio Avila-Villegas, Sky Island Alliance; Sandra Doumas, University of Arizona.

May 21, 2012

Appendix L - (4)

Activity in Greater Oak Flat Watershed: 2011-2019
Results of wildlife surveys and monitoring with the use of remote camera traps.

Draft Report

Roger Featherstone, Director, Arizona Mining Reform Coalition; and Richard (Ian) Alexander

November 6, 2019

Appendix M

Sky Island Alliance Springs Surveys of Oak Flat Area

Appendix M - (1)

Map of Springs Within a 10 miles Radius of Oak Flat

Date Unknown

Appendix M - (2)

Unnamed Cave Seep

Survey Summary Report, Site ID 182082
Submitted by Springs Stewardship Institute

July 13, 2016

Appendix M - (3)

Unnamed cienega 1

Survey Summary Report, Site ID 182084
Submitted by Springs Stewardship Institute

July 13, 2016

Appendix M - (4)

Swimming Hole Spring unnamed unmapped Survey Summary Report, Site ID 182085 Submitted by Springs Stewardship Institute

July 13, 2016

Appendix N

Reference Material for Appraisal Section

Appendix N - (1)

GAO Report:
FEDERAL LAND ACQUISITION
Land Exchange Process Working But Can Be Improved

February, 1987

Appendix N - (2)

CASE 0:17-cv-00905-JNE-LIB Document 27 Filed 06/16/17

UNITED STATES DISTRICT COURT
DISTRICT OF MINNESOTA

June 16, 2017

Appendix N - (3)

REAL ESTATE APPRAISAL REPORT

Project:

Superior National Forest / PolyMet Mining, Inc. – Tract #4544
Federal Tract #1 (Option 1) Land Exchange
Case File Tracking Number: FS06-0909-0092 Phase 2

July 7, 2015

Appendix N - (4)

Do the proposed lands for land swap adequately replace these sites?

Report by Dr. Robert Witzeman

Date Unknown

Appendix O

Final Environmental Assessment

Resolution Copper Hydrological and Geotechnical Data Gathering Activities Plan of Operations

Tonto National Forest

January 2016

Appendix P

Comments on the Environmental Assessment for Resolution Copper Mining Pre-feasibility Activities Plan of Operations by the Arizona Mining Reform Coalition, the Grand Canyon Chapter of the Sierra Club, EARTHWORKS, the Concerned Citizens and Retired Miners Coalition, and the Center for Biological Diversity

April 30, 2009

Appendix Q

Exaggerating the Net Economic Benefits of the Proposed Resolution Copper Mine, Superior, Arizona: A Critical Review of Resolution's Economic Impact Analysis

A Report Prepared for the
San Carlos Apache Tribe
San Carlos, Arizona

by
Power Consulting, Inc.

September 9, 2013

Appendix R

References for Cultural and Historic Resources Section

Appendix R - (1)

Letter to Tonto National Forest Supervisor Neil Bosworth from the State Historical Preservation Office

RE: Tonto National Forest (TNF) and State Historic Preservation Office (SHPO) meeting 8/29/19 regarding the Resolution Copper Mine Programmatic Agreement

CR-EX-01

September 19, 2019

Appendix R - (2)

Letter from San Carlos Apache Tribal Chairman Terry Rambler to Tonto National Forest Supervisor Neil Bosworth

CR-EX-02

July 10, 2019

Appendix R - (3)

Letter from San Carlos Apache Tribal Chairman Terry Rambler to Tonto National Forest Supervisor Neil Bosworth and Various Other Tonto National Forest Personnel

RE: Programmatic Agreement Version 6

CR-EX-03

September 30, 2019

Appendix R - (4)

Letter to Tonto National Forest Supervisor Neil Bosworth from the Pueblo of Zuni

RE: Pueblo of Zuni Comments on the Programmatic Agreement for Resolution Copper Mine (version 6)

CR-EX-04

September 30, 2019

Appendix R - (5)

Executive Summary: Ethnographic and Ethnohistoric Study of the Superior Area, Arizona

CR-EX-05

Date Unknown

Appendix R - (6)

Letter from San Carlos Apache Tribal Chairman, Wendsler Nosie, Sr., to President of the United States George W. Bush

Re: Objection to the Southeastern Arizona Land Exchange and the Resolution Copper Mining Project

CR-EX-06

June 20, 2007

Appendix R - (7)

Earth, Wind, and Fire: Pinal Apaches, Miners, and Genocide in Central Arizona, 1859-1874

SAGE Open
October-December 2017:

John R. Welch

CR-EX-07

October - December 2017

Appendix S

Material Referenced for SCP2 Report

Appendix S- (1)

Documentation for the 2008 Update of the United States National Seismic Hazard Maps

2008

Appendix S- (2)

Documentation for the 2014 Update of the United States National Seismic Hazard Maps

2014

Appendix S- (3)

Cornwall et al — Geologic map of the Sonora Quadrangle USGS 1971

1971

Appendix S- (4)

Gestring 2019. U.S. Operating Copper Mines: Failure to Capture & Treat Wastewater

Bonnie Gestring, Earthworks

May, 2019

Appendix S- (5)

Geology and Exploration Progress at the Resolution Porphyry Cu-Mo Deposit, Arizona, Carl Hehnke, Geoff Ballantyne, Hamish Martin, William Hart, Adam Schwarz, and Holly Stein, 2012 Society of Economic Geologists, Inc., Special Publication 16, pp. 147–16

2012

Appendix S- (6)

Charles A. Kliche, P.E., PhD. Technical Memorandum for Alternative Mining Methods, Resolution Copper Mining, LLC, Superior, AZ,

November 1, 2017

Appendix S- (7)

Summary of geological information relevant to development of the porphyry Cu-Mo Resolution deposit, Arizona. Dr Armelle Kloppenburg, 4DGeo - Applied Structural Geology, For Resolution Copper Mining LLC,

May, 2017

Appendix S- (8)

A Detailed Assessment of Global Cu Resource Trends and Endowments, Gavin M. Mudd, Zhehan Weng, and Simon M. Jowitt, Economic Geology, v. 108, pp. 1163–1183,

August 30, 2012

Appendix S- (9)

Site-Specific Seismic Hazard Analyses for the Resolution Mining Company Tailings Storage Facilities Options, Southern Arizona, Ivan Wong, Eliza Nemser, Mark Dober, Susan Olig, Jacqueline Bott, and Fabia Terra, Seismic Hazards Group, URS Corporation, and Robert Darragh and Walter Silva, Pacific Engineering & Analysis,

June 3, 2013

Appendix T

Material Referenced in Consultant Reports and body of AMRC DEIS Comments

Appendix T - (1)

Integrated Surface and Groundwater Model REview and Technical Guide

prepared by
AquaResource Inc.

2011

Appendix T - (2)

MODFLOW-2000, THE U.S. GEOLOGICAL SURVEY MODULAR GROUND-WATER MODEL DOCUMENTATION OF PACKAGES FOR SIMULATING EVAPOTRANSPIRATION WITH A SEGMENTED FUNCTION (ETS1) AND DRAINS WITH RETURN FLOW (DRT1)

By Edward R. Banta

2011

Appendix T - (3)

Calibration of regional groundwater flow models: Working toward a better understanding of site-specific systems

Maria Clara Castro
Department of Geological Sciences, University of Michigan, Ann Arbor, Michigan, USA

Patrick Goblet
Centre d'Informatique Ge´ologique, Ecole des Mines de Paris, Fontainebleau, France

June 28, 2003

Appendix T - (4)

Approaches to Highly Parameterized Inversion: A Guide to Using PEST for Model-Parameter and Predictive-Uncertainty Analysis

By John E. Doherty, Randall J. Hunt, and Matthew J. Tonkin

2011

Appendix T - (5)

TECHNICAL MEMORANDUM

TO: Vicky Peacey, Resolution Copper

FROM: Ted Eary, Enchemica

SUBJECT: Common Inputs Common to All Operational Models of Tailings Circuit Solute Chemistry

July 18, 2018

Appendix T - (6)

TECHNICAL MEMORANDUM

TO: Vicky Peacey, Resolution Copper

FROM: Ted Eary, Enchemica

SUBJECT: Block Cave Geochemical Model – 2018 Update on Calculation Approach and Results

July 26, 2018

Appendix T - (7)

A TECHNICAL GUIDE TO

GROUND-WATER MODEL SELECTION AT SITES CONTAMINATED WITH RADIOACTIVE SUBSTANCES

June 1994

Appendix T - (8)

Application of the Basin Characterization Model to Estimate In-Place Recharge and Runoff Potential in the Basin and Range Carbonate-Rock Aquifer System, White Pine County, Nevada, and Adjacent Areas in Nevada and Utah

By Alan L. Flint and Lorraine E. Flint

2007

Appendix T - (9)

Fundamental Concepts of Recharge in the Desert Southwest: A Regional Modeling Perspective

Alan L. Flint, Lorraine E. Flint, Joseph A. Hevesi,
U.S. Geological Survey, Sacramento, CA

and Joan B. Blainey
U.S. Geological Survey, Tucson, AZ

2004

Appendix T - (10)

ARIZONA DEPARTMENT OF WATER RESOURCES

REGIONAL GROUNDWATER FLOW MODEL OF THE SALT RIVER VALLEY PHOENIX ACTIVE MANAGEMENT AREA MODEL UPDATE AND CALIBRATION

ADAM FREIHOEFER, DALE MASON, PHILIP JAHNKE, LISA DUBAS, AND KADE HUTCHINSON

HYDROLOGY DIVISION
MODELING REPORT NO. 19

APRIL 2009

Appendix T - (11)

Application of the Null Space Monte Carlo Method in a Groundwater Flow Model of Mine Pit Dewatering

Michael Gabora, Nick Martin, Nathan Clements

August 2014

Appendix T - (12)

FINAL DRAFT REPORT: Prediction of Block Cave Water Chemistry

H. Gluski (RCM)

January 8, 2016

Appendix T - (13)

Conceptualization and characterization of envirochemical systems

KENNETH E. KOLM
Division of Environmental Science and Engineering, Colorado School of Mines
Golden, Colorado 80401, USA

PAUL K. M. VAN DER HEIJDE
International Ground Water Modeling Center, Colorado School of Mines,
Golden, Colorado 80401, USA

September, 1996

Appendix T - (14)

Table 5-1: Methods for Geochemical Characterization From GARDGuide

Downloaded from gardguide.com on 10/30/19

Appendix T - (15)

GEOCHEMICAL CHARACTERIZATION DATA SUMMARY REPORT

Prepared by:
MWH Americas, Inc.
3665 JFK Parkway, Suite 206
Fort Collins, CO

AUGUST 2013

Appendix T - (16)

Combined Estimation of Hydrogeologic Conceptual Model and Parameter Uncertainty

Prepared by
P.D. Meyer, M. Ye, S.P. Neuman (UA),
K.J. Cantrell

March 2004

Appendix T - (17)

NEVADA BUREAU OF LAND MANAGEMENT

ROCK CHARACTERIZATION AND WATER RESOURCES ANALYSIS GUIDANCE

FOR MINING ACTIVITIES

Date Unknown

Appendix T - (18)

Technical Memorandum

Groundwater Flow Model Construction and Calibration

by Tetra Tech

July 26, 2010

Appendix T - (19)

Regional Analysis of Ground-Water Recharge

By Lorraine E. Flint and Alan L. Flint

2007

Appendix T - (20)

CONCEPTUAL MODEL OF THE KLAMATH FALLS, OREGON GEOTHERMAL AREA

R. E. Prueha, S. M. Benson, and P. A, Witherspoon

1987

Appendix T - (21)

Guidelines for Evaluating Ground-Water Flow Models

By Thomas E. Reilly and Arlen W. Harbaugh

2004

Appendix T - (22)

Hydrogeologic and Geochemical Prediction of Rosemont Pit Lake Using Three Different Modeling Programs

Gaius (Guy) Roemer, Michael Gabora, Amy L. Hudson, Mark Williamson, David Levy, Grady O'Brien, and David Krizek

May, 2012

Appendix T - (23)

Aquatic Life Ambient Water Quality Criterion for Selenium in Freshwater 2016 – EPA Fact Sheet

June, 2016

Appendix T - (24)

Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities

British Columbia
Ministry of Environment
Water Protection & Sustainability Branch

Prepared by:

Christoph Wels, Ph.D., M.Sc., P.Geo.

April, 2012

Appendix T - (25)

Hydrologic Alterations from Climate Change Inform Assessment of Ecological Risk to Pacific Salmon in Bristol Bay, Alaska

Cameron Wobus, Robert Prucha, David Albert, Christine Woll, Maria Loinaz, Russell Jones

December 8, 2015